GPU Nuclear

**GPU Nuclear Corporation**
Post Office Box 388
Route 9 South
Forked River, New Jersey 08731-0388
609 971-4000
Writer's Direct Dial Number:

April 27, 1992
C321-92-2132

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
Radiological Environmental Monitoring Program (REMP) Report

Enclosed is a copy of the Oyster Creek REMP report for 1991. This submittal is made in accordance with technical specification 6 9.1.e.

If there are any questions regarding this matter, please call Brenda DeMerchant, Licensing Engineer, at (609) 971-4642.

Sincerely,

for J.J. Barton
Vice President and Director
Oyster Creek

cc: Administrator, NRC Region 1
Senior NRC Resident Inspector
Oyster Creek NRC Project Manager
Chief, Bureau of Nuclear Engineering, NJDEP

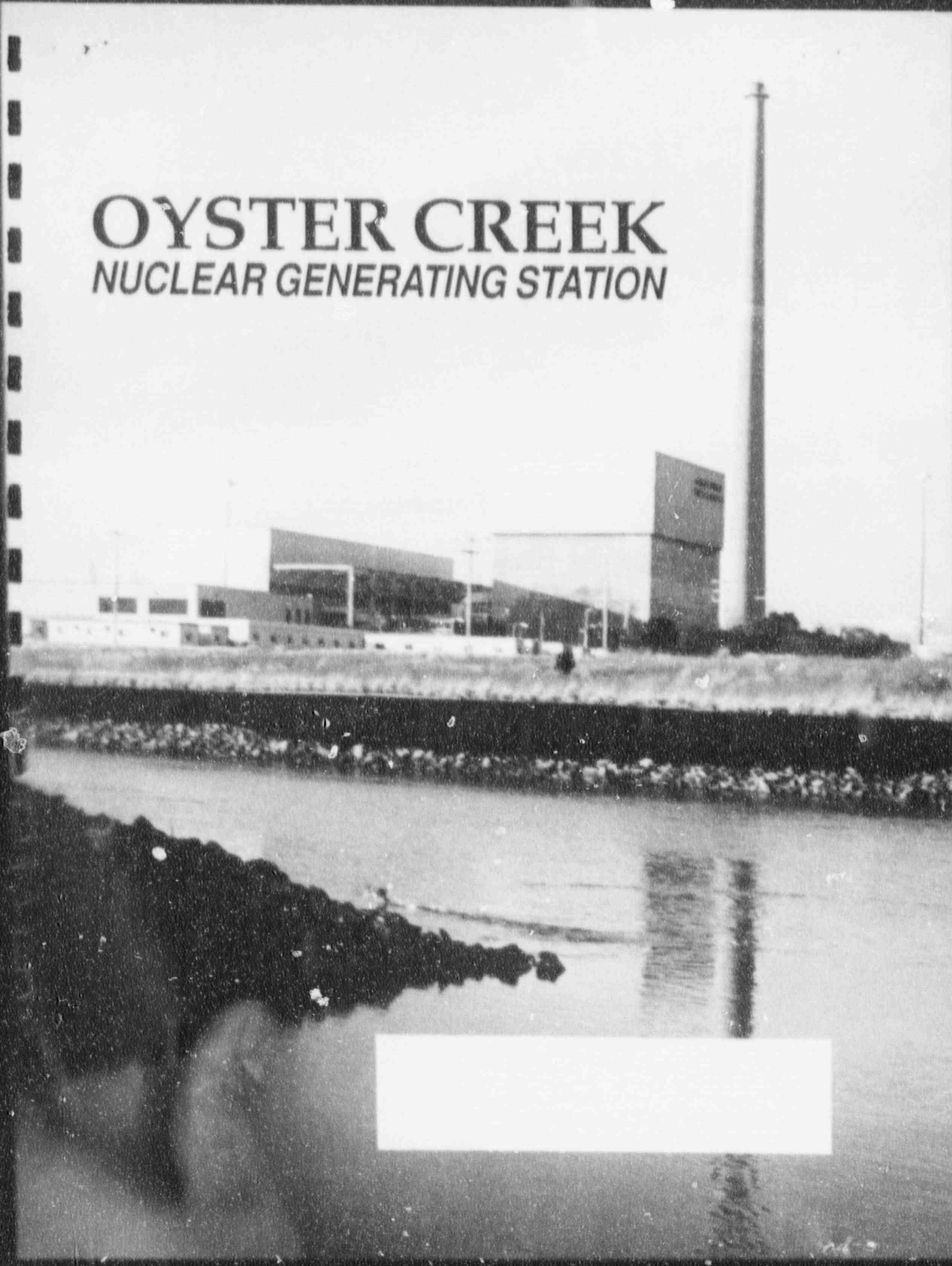
060111





JE25

# OYSTER CREEK
## *NUCLEAR GENERATING STATION*



# OYSTER CREEK

## *NUCLEAR GENERATING STATION*

# OYSTER CREEK NUCLEAR GENERATING STATION
## *Forked River, New Jersey*

*The 650 MW plant is a single-unit, five-loop General Electric Boiling Water Reactor (BWR). The site, about 800 acres, is in Lacey and Ocean Townships of Ocean County. Located approximately nine miles south of Toms River, it is about 50 miles east of Philadelphia, and 60 miles south of Newark.*

*Construction began in December 1963. The station began commercial operation on December 23, 1969, and at that time was the largest nuclear facility in the United States solely financed by a private company.*

*The Reactor Building, Turbine Building and Ventilation Stack are the most prominent structures at the site. The Reactor Building stands approximately 150 feet high with 42 feet extending below grade. The Reactor Building serves as a secondary containment and houses the primary containment (drywell), the reactor vessel and its auxiliary systems which comprise the Nuclear Steam Supply System. The drywell, which houses the reactor vessel, is constructed of high-density reinforced concrete with an inner steel liner measuring 120 feet high and 70 feet in diameter.*

*The reactor vessel is 63 feet high and 18 feet in diameter. The 652-ton reactor contains 560 fuel assemblies, each with 62 fuel rods that are 12 feet long, and 137 control rods. The reactor operates at a nominal pressure of 1,020 pounds per square inch and an average temperature of 540 degrees Fahrenheit.*

*The Turbine Building houses the turbine-generator, control room, main condensers, power conversion equipment and auxiliary systems. The turbine-generator consists of one high-pressure turbine, three low-pressure turbines, a generator and an exciter. The turbines and generator turn at 1,800 revolutions per minute to generate three-phase, 60-cycle electricity at 24,000 volts. The electricity generated is provided to the grid by two transformers which boost the voltage to 230,000 volts.*

*Steam is supplied to the high pressure turbine from the reactor. After being used to drive the turbines and generator, the steam is condensed in the main condensers and returned to the reactor vessel in the form of water through the condensate and feedwater pumps.*

*The main condensers consist of three horizontal, single pass, divided water boxes containing 44,000 tubes having a total length of about 1,875,000 feet. Cooling water is provided from Barnegat Bay, through the South Branch of the Forked River and passes through the condensers and discharges into Oyster Creek for return to Barnegat Bay. The water is pumped by four 1,000-horsepower pumps, each of which moves about 115,000 gallons per minute through the 6-foot-diameter pipes that feed the condensers.*

*The ventilation stack is 368 feet high with 26 feet extending below grade. The stack provides ventilation for the Reactor Building, Turbine Building and Radwaste Facilities.*

*Oyster Creek is owned by Jersey Central Power & Light (JCP&L) Company and operated by GPU Nuclear (GPUN) Corporation. JCP&L and GPUN are units of the GPU System.*

1991

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

PREPARED BY

OYSTER CREEK ENVIRONMENTAL CONTROLS

GPU NUCLEAR CORPORATION

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

## LIST OF FIGURES

LIST OF FIGURES (Continued)

## SUMMARY AND CONCLUSIONS

The radiological environmental monitoring performed during 1991 by the GPU Nuclear Environmental Controls Department at the Oyster Creek Nuclear Generating Station (OCNGS) is discussed in this report. The operation of a nuclear power plant results in the release of small amounts of radioactive materials to the environment. A radiological environmental monitoring program (REMP) has been established to monitor radiation and radioactive materials in the environment around the OCNGS. The program evaluates the relationship between amounts of radioactive material released in effluents to the environment and resultant radiation doses to individuals. Summaries and interpretations of the data were published semiannually from 1969-1985 and annually since 1986 (Ref. 21, 22, 23, 24, and 25). Additional information concerning releases of radioactive materials to the environment is contained in the Semi-Annual Effluent Reports submitted to the United States Nuclear Regulatory Commission (USNRC).

During 1991, as in previous years, the radioactive liquid and airborne effluents associated with the OCNGS were a small fraction of the applicable federal regulatory limits and did not have significant or measurable effects on the quality of the environment. Calculated maximum hypothetical radiation doses to the public attributable to 1991 operations at the OCNGS ranged from 0.00068 percent to a maximum of only 0.508 percent of the applicable regulatory limits. Furthermore, they were significantly less than doses received from other man-made sources and natural background sources of radiation.

Radioactive materials considered in this report are normally present in the environment, either naturally or as a result of non-OCNGS activities such as prior atmospheric nuclear weapons testing and medical industry activities. Consequently, measurements made in the vicinity of the site (indicator) were compared to background measurements to determine any impact of OCNGS operations. Samples of air, precipitation, well water, surface water, clams, sediment, . sh, crabs, vegetables, and soil were collected. Samples were analyzed for radioactivity including tritium (H-3), gross beta, and gamma-emitting radionuclides. External penetrating radiation dose measurements also were made using thermoluminescent dosimeters (TLDs) in the vicinity of the OCNGS.

The results of environmental measurements were used to assess the environmental impact of OCNGS operations, to demonstrate compliance with the Technical Specifications (Ref. 1) and applicable federal regulations, and to verify the adequacy of containment and radioactive effluent control systems. The data collected by the REMP provided a historical record of the levels of radionuclides and radiation attributable to natural causes, worldwide fallout from prior nuclear weapons tests, and the OCNGS operations.

Radiological impacts in terms of radiation dose as a result of OCNGS operations were calculated and also are discussed. The results provided in this report are summarized in the following highlights.

o During 1991, 1751 samples were taken from the aquatic, atmospheric, and terrestrial environments around OCNGS. A total of 2252 analyses were performed on these samples. Five hundred thirty-four (534) direct radiation dose measurements using TLDs also were made. Sixty-four (64) groundwater samples, including local domestic water supplies, were collected and one hundred ninety-two (192) analyses were performed on these samples.

- In addition to natural radioactivity, trace levels of cesium-137 (Cs-137) were detected in various media and were attributed to fallout from prior nuclear weapon testing and Chernobyl.

- Cobalt-60 (Co-60) was detected in sediment samples as a result of OCNGS operations. Although cobalt-60 had been detected in clams from the Barnegat Bay system in prior study years, this nuclide did not appear in clam samples collected during 1991 and has not been detected since 1987.

- The predominant radionuclides released in OCNGS effluents were xenon-135 in gases and tritium (H-3) in liquids. Estimated radiation doses to the public, attributable to 1991 effluents, ranged from 0.00068 percent to a maximum of only 0.508 percent of applicable regulatory limits.

- During 1991, the maximum whole body dose potentially received by an individual from liquid and airborne effluents combined was conservatively calculated to be about 0.00708 millirems total. The whole body dose to the surrounding population from liquid and airborne effluents was calculated to be 0.222 person-rem. This is approximately 4.5 million times lower than the dose that the total population in the OCNGS area receives from natural background sources.

# INTRODUCTION

## Characteristics of Radiation

Instability within the nucleus of a radioactive atom results in the release of energy in the form of radiation. Radiation is classified according to its nature - particulate and electromagnetic. Particulate radiation consists of energetic subatomic particles such as electrons (beta particles), protons, neutrons, and alpha particles. Because of its limited ability to penetrate the human body, particulate radiation in the environment contributes primarily to internal radiation exposure resulting from inhalation and ingestion of radioactivity.

Electromagnetic radiations in the form of x-rays and gamma rays have characteristics similar to visible light but are more energetic and, hence, more penetrating. Although x-rays and gamma rays are penetrating and can pass through varying thicknesses of materials, once they are absorbed they produce energetic electrons which release their energy in a manner that is identical to beta particles. The principal concern for gamma radiation from radionuclides in the environment is their contribution to external radiation exposure.

The rate at which atoms undergo disintegration (radioactive decay) varies among radioactive elements, but is uniquely constant for each specific radionuclide. The term "half-life" defines the time it takes for half of any amount of an element to decay and can vary from a fraction of a second for some radionuclides to millions of years for others. In fact, the natural background radiation to which all mankind has been exposed is largely due to the radionuclides of uranium, thorium, and potassium. These radioactive elements were formed with the creation of the universe and, owing to their long half-lives, will continue to be present for millions of years to come. For example, potassium-40 has a half-life of 1.3 billion years and exists naturally within our bodies. As a result approximately 4000 atoms of potassium emit radiation internally within each of us every second of our life.

In assessing the impact of radioactivity on the environment, it is important to know the quantity of radioactivity released and the resultant radiation doses. The common unit of radioactivity is the curie. It represents the radioactivity in one gram of natural radium which is also equal to a decay rate of 37 billion radiation emissions every second. Because of the extremely small amounts of radioactive material in the environment, it is more convenient to use fractions of a curie. Subunits like picocurie (one trillionth of a curie) are frequently used to express the radioactivity present in environmental and biological samples.

The biological effects of a specific dose of radiation are the same whether the radiation source is external or internal to the body. The important factor is how much radiation energy or dose was deposited. The unit of radiation dose is the rem, which also incorporates the variable effectiveness of different forms of radiation to produce biological change. For environmental radiation exposures, it is convenient to use the smaller unit of millirem to express dose (1000 millirems equals 1 rem). When radiation exposure occurs over periods of time, it is appropriate to refer to the dose rate. Dose rates, therefore, define the total dose for a fixed interval of time, and for environmental exposures, are usually measured with reference to one year of time (millirems per year).

Sources of Radiation

Life on earth has evolved amid the constant exposure to natural radiation. In fact, natural radiation is the single major source to which the general population is exposed. Although everyone on the planet is exposed to natural radiation, some people receive more than others. Radiation exposure from natural background has three components (i.e., cosmic, terrestrial, and internal) and varies with altitude and geographic location, as well as with living habits.

For example, cosmic radiation originating from deep interstellar space and the sun increases with altitude, since there is less air which acts as a shield. Similarly, terrestrial radiation resulting from the presence of naturally occurring radionuclides in the soil varies and may be significantly higher in some areas of the country than in others. Even the use of particular building materials for houses, cooking with gas, and home insulation affect exposure to natural radiation.

The presence of radioactivity in the human body results from the inhalation and ingestion of air, food, and water containing naturally occurring radionuclides. For example, drinking water contains trace amounts of uranium and radium and milk contains radioactive potassium. Table 1 summarizes the common sources of radiation and their average annual doses.

TABLE 1
(Ref. 2)
Sources and Doses of Radiation*

| Natural (82%) | | Man-made (18%) | |
|---|---|---|---|
| Source | Radiation Dose (millirems/year) | Source | Radiation Dose (millirems/year) |
| Radon | 200 (55%) | | |
| Cosmic rays | 27 (8%) | Medical X-ray | 39 (11%) |
| Terrestrial | 28 (8%) | Nuclear Medicine | 14 (4%) |
| Internal | 40 (11%) | Consumer products | 10 (3%) |
| | | Other (Releases from nat. gas, phosphate mining, burning of coal, weapons fallout, & nuclear fuel cycle) | <1 (<1%) |
| APPROXIMATE TOTAL | 300 | APPROXIMATE TOTAL | 63 |

*Percentage contribution of the total dose is shown in parentheses.

The average person in the United States receives about 300 millirems (0.3 rem) per year from natural background radiation sources. This estimate was revised from about 100 to 300 millirems because of the inclusion of radon gas which has always been present but has not previously figured in the calculations. In some regions of the country, the amount of natural radiation is significantly higher. Residents of Colorado, for example, receive an additional 60 millirems per year due to the increase in cosmic and terrestrial radiation levels. In fact, for every 100 feet above sea level, a person will receive an additional 1 millirem per year from cosmic radiation. In several regions of the world, high concentrations of uranium and radium deposits result in doses of several thousand millirems each year to their residents (Ref. 3).

Recently, public attention has focused on radon, a naturally occurring radioactive gas produced from uranium and radium decay. These elements are widely distributed in trace amounts in the earth's crust. Unusually high concentrations have been found in certain parts of eastern Pennsylvania and northern New Jersey. Radon levels in some homes in these areas are hundreds of times greater than levels found elsewhere in the United States. However, additional surveys are needed to determine the full extent of the problem nationwide. Radon is the largest component of natural background radiation and may be responsible for a substantial number of lung cancer deaths annually. The National Council on Radiation Protection and Measurements (NCRP) estimates that the average individual in the United States receives an annual dose of about 2,400 millirems to the lung from natural radon gas (Ref. 2). This lung dose is considered to be equivalent to a whole body dose of 200 millirems. The NCRP has recommended actions to control indoor radon sources and reduce exposures.

When radioactive substances are inhaled or swallowed, they are distributed within the body in a nonuniform fashion. For example, radioactive iodine selectively concentrates in the thyroid gland, radioactive cesium is distributed throughout the body water and muscles, and radioactive strontium concentrates in the bones. The total dose to organs by a given radionuclide is also influenced by the quantity and the duration of time that the radionuclide remains in the body, including its physical, biological and chemical characteristics. Depending on their rate of radioactive decay and biological elimination from the body, some radionuclides stay in the body for very short times while others remain for years.

In addition to natural radiation, we are exposed to radiation from a number of man-made sources. The single largest of these sources comes from diagnostic medical x-rays, and nuclear medicine procedures. Some 180 million Americans receive medical x-rays each year. The annual dose to an individual from such radiation averages about 53 millirems. Much smaller doses come from nuclear weapons fallout and consumer products such as televisions, smoke detectors, and fertilizers. Production of commercial nuclear power and its associated fuel cycle contributes less than 1 millirem to the annual dose of about 300 millirems for the average individual living in the United States.

Fallout commonly refers to the radioactive debris that settles to the surface of the earth following the detonation of nuclear weapons. It is dispersed throughout the environment either by dry deposition or washed down to the earth's surface by rain or snow. There are approximately 200 radionuclides produced in the nuclear weapon detonation process; a number of these are detected in fallout. The radionuclides found in fallout which produce most of the fallout radiation exposures to humans are iodine-131 (I-131), strontium-89 (Sr-89), cesium-137 (Cs-137), and strontium-90 (Sr-90). There has been no atmospheric nuclear weapon testing since 1980 and many of the radionuclides have decayed significantly. Consequently, doses to the public from fallout have been decreasing.

As a result of the nuclear accident at Chernobyl, USSR, on April 26, 1986, fallout was dispersed throughout the environment and detected in various media such as air, milk, and soil.

Nuclear Reactor Operations

Common to the commercial production of electricity is the consumption of fuel which produces heat to make steam which turns the turbine-generator which generates electricity.

Unlike the burning of coal, oil, or gas in fossil-fuel powered plants to generate heat, the fuel of most nuclear reactors is comprised of the element uranium in the form of uranium oxide. The fuel produces power by the process called fission. In fission the uranium atom absorbs a neutron (an atomic particle found in nature and also produced by the fissioning of uranium in the reactor) and splits to produce smaller atoms termed fission products, along with heat, radiation and free neutrons. The free neutrons travel through the reactor and are similarly absorbed by the uranium, permitting the fission process to continue. As this process continues, more fission products, radiation, heat and neutrons are produced and a sustained reaction occurs. The heat produced is transferred - via reactor coolant water - from the fuel to produce steam which drives a turbine-generator to produce electricity. The fission products are mostly radioactive: that is to say they are unstable atoms which emit radiation as they change to stable atoms. Neutrons which are not absorbed by the uranium fuel may be absorbed by stable atoms in the materials which make up the components and structures of the reactor. In such cases, stable atoms often become radioactive. This process is called activation and the radioactive atoms which result are called activation products.

The OCNGS reactor is a Boiling Water Reactor (BWR). The nuclear fuel is designed to be contained within sealed fuel rods arranged in arrays called bundles which are located within a massive steel reactor vessel. As depicted in Figure 1, cooling water boils within the reactor vessel producing steam for use in the turbine. After the energy is extracted from the steam in the turbine, it is cooled and condensed back into water in the main condensers. This condensate is then pumped back into the reactor vessel.

# OYSTER CREEK NUCLEAR GENERATING STATION
## SIMPLIFIED SCHEMATIC

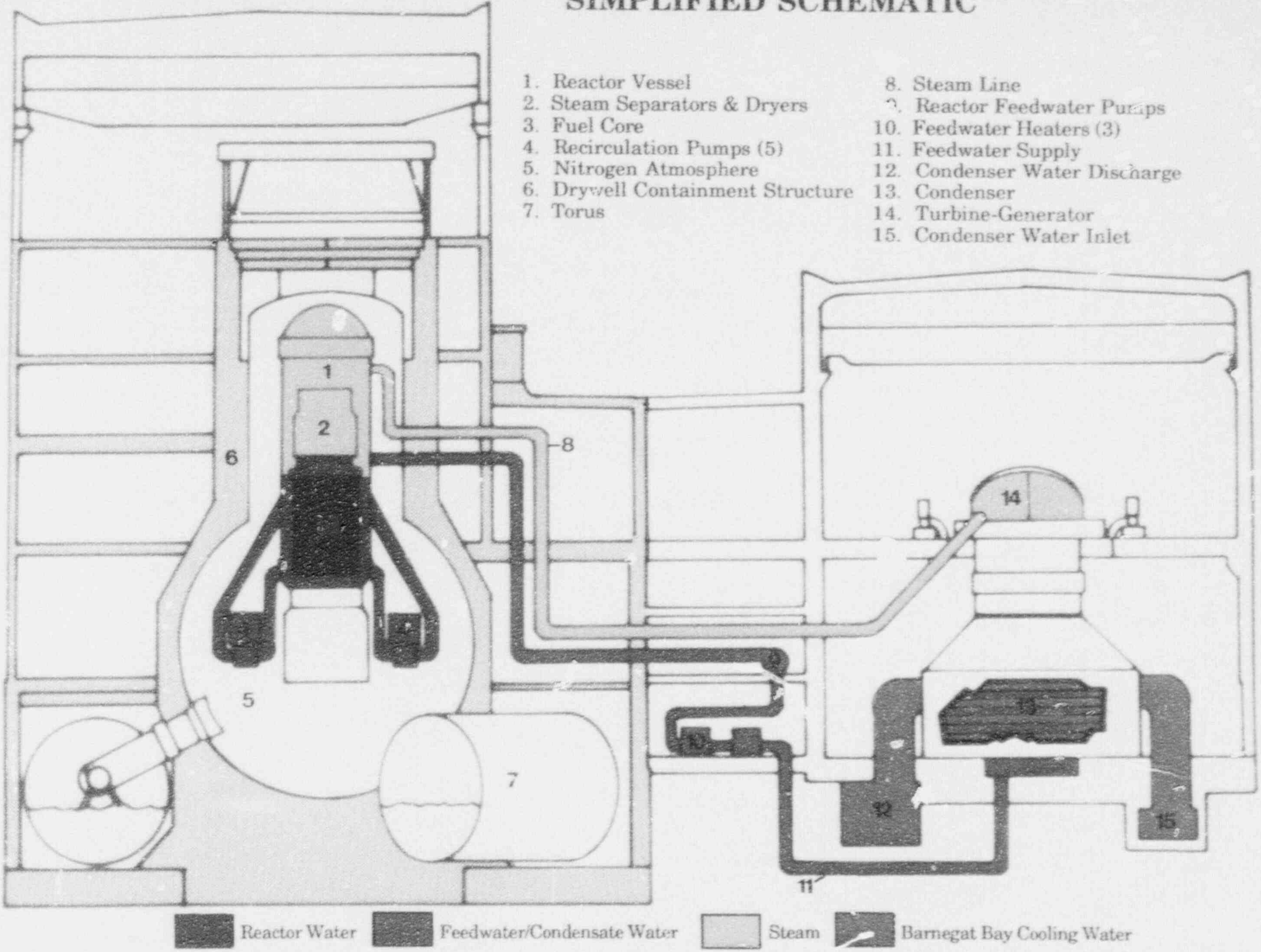



Figure 1

Several hundred radionuclides of some 40 different elements are created during the process of generating electricity. Because of reactor engineering designs, the short half-lives of many radionuclides, and their chemical and physical properties, nearly all radioactivity is contained.

The OCNGS reactor has six independent barriers that confine radioactive materials produced by the fission reaction as it heats the water. Under normal operating conditions, essentially all radioactivity is contained within the first two barriers.

The ceramic uranium fuel pellets provide the first barrier. Most of the fission products are either trapped or chemically bound in the fuel where they remain. However, a few fission products which are volatile or gaseous at normal operating temperatures may not be contained in the fuel.

The second barrier consists of zirconium alloy tubes termed fuel cladding" that resist corrosion and degradation due to high temperatures. The fuel pellets are contained within these tubes. There is a small gap between the fuel and the cladding, in which the noble gases and other volatile radionuclides collect and are contained.

The primary coolant water is the third barrier. Many of the fission products, including radioactive iodine, strontium and cesium are soluble and are retained in water in an ionic (electrically charged) form. These materials can be removed in the reactor coolant purification system. However, krypton and xenon do not readily dissolve in the coolant, particularly at high temperatures. Krypton and xenon collect as a gas above the condensate when the steam is condensed.

The fourth barrier consists of the reactor pressure vessel, turbine, condenser, and associated piping of the coolant system. The reactor pressure vessel is a 63-foot high tank with steel walls about nine inches thick. It encases the reactor core. The remainder of the coolant system includes the turbine and condenser and associated piping. This system provides containment for radioactivity in the primary coolant.

The drywell provides the fifth barrier. It is a steel-lined vessel surrounded by concrete walls approximately 4 1/2 to 7 1/4 feet thick that enclose the reactor pressure vessel and recirculating pumps and loops.

The reactor building provides the sixth barrier. It is a reinforced concrete and steel superstructure which is always maintained at a negative pressure.

Sources of Liquid and Airborne Effluents

Although the previously described barriers contain radioactivity with high efficiency, small amounts of radioactive fission products are nevertheless able to diffuse or migrate through minor flaws in the fuel cladding and into the reactor coolant. Trace quantities of reactor system component and structural materials which have been activated, also get into the reactor coolant water. Many of the soluble fission and activation products such as iodines, strontiums, cobalts, and cesiums are removed by demineralizers in the purification system of the reactor coolant. The physical and chemical properties of noble gas fission products in the primary coolant prevent their removal by the demineralizers.

Because the reactor system has many valves and fittings, an absolute seal cannot be achieved. Minute drainage of radioactive liquids from valves, piping, and/or equipment associated with the coolant system may occur in the Reactor, and/or Turbine Buildings. The noble gases become part of the gaseous wastes while the remaining radioactive liquids are collected in floor and equipment drains and sumps and are pumped to and processed in the Radwaste Building.

Reactor off-gas, consisting primarily of hydrogen and radioactive non-condensable gases, is withdrawn from the reactor primary system by steam jet air ejectors. These air ejectors drive the process stream through a 60 minute holdup pipe at approximately 110 cubic feet per minute and then into the Augmented Off-Gas (AOG) System. The holdup pipe allows radionuclides with short half-lives to decay. The Augmented Off-Gas System is a gaseous processing system which provides hydrogen conversion to water via a catalytic recombiner, removes the water (vapor) from the process stream, holds up the process stream to allow further decay of short-lived nuclides, and filters the off-gas using charcoal beds and High Efficiency Particulate (HEPA) filters prior to discharge to the base of the stack. Once the process stream enters the stack, it is diluted by building ventilation, which averages 200,000 cubic feet per minute, is monitored and sampled, and then is discharged out the top of the 368-foot stack.

The liquid waste processing system receives water contaminated with radioactivity and processes it by filtration, demineralization, and distillation. Purified radwaste water is recycled to the plant. Occasionally, it is necessary to discharge this purified water to the environment. Contaminants removed during the purification process are disposed of via the radioactive solids disposal systems. When purified water is discharged to the environment, it is first sampled, analyzed, assigned a release rate, and then released to the discharge canal which has a flow rate of 460,000 to 960,000 gallons per minute.

# DESCRIPTION OF THE OCNGS SITE

## General Information

The Oyster Creek Nuclear Generating Station is located in Lacey Township of Ocean County, New Jersey, about 60 miles south of Newark, 9 miles south of Toms River and 35 miles north of Atlantic City. It lies approximately 2 miles inland from Barnegat Bay. The site, covering 1416 acres, is situated partly in Lacey Township and, to a lesser extent, in Ocean Township. The Garden State Parkway bounds the site on the west. Overland access is provided by U. S. Route 9, passing through the site and separating a 661-acre eastern portion from the balance of the property west of the highway. The station is about 1/4 mile west of the highway and 1-1/4 miles east of the Parkway. The site property extends about 3-1/2 miles inland from the bay; the maximum width in the north-south direction is almost 1 mile. The site location is part of the New Jersey shore area with its relatively flat topography and extensive freshwater and saltwater marshlands. The south branch of Forked River runs across the northern side of the site, and Oyster Creek partly borders the southern side.

It is estimated that approximately 3.3 million people reside within a 50 mile radius of the station (Ref. 4). The nearest population center is Ocean Township (population 3731) which lies less than two miles south-southeast of the site. Two miles to the north, 14,161 people reside in Lacey Township. Dover Township, situated 9.5 miles to the north, is the nearest major population center with a population of 61,287. The region adjacent to Barnegat Bay is one of the State's most rapidly developing areas. In addition to the resident population, a sizeable seasonal influx of people occurs during the summer. This influx occurs almost exclusively along the waterfront.

Climatological Summary

Meteorological data for 1991 were obtained from an on-site weather station. Data were routinely quality assured and categorized for further analyses, including historical comparisons to both on-site and off-site sources.

Wind direction frequencies, in general, were climatologically average, with winds occurring most frequently from the western sectors and the southwest. Seasonal winds were evident, including the summer sea breeze flow (Ref. 20). Northwest winds occurred somewhat less often during the winter months of 1991 than in past years and a mild winter was the result.

In part, due to the mild winter, the average temperature was approximately 1.5 degrees higher in 1991 than in previous years. Higher than average temperatures were recorded in eleven of the twelve months.

Precipitation totals varied greatly from month to month (Fig. 2). The 1991 yearly total was 43.2 inches which was approximately 2 inches more than the Atlantic City National Weather Service historical average (1946-1981). Approximately 18 percent of the OCNGS yearly total fell in less than one day when 7.69 inches of rainfall was recorded on July 13, 1991. During this event, 1.38 inches of rain fell in a fifteen minute period.

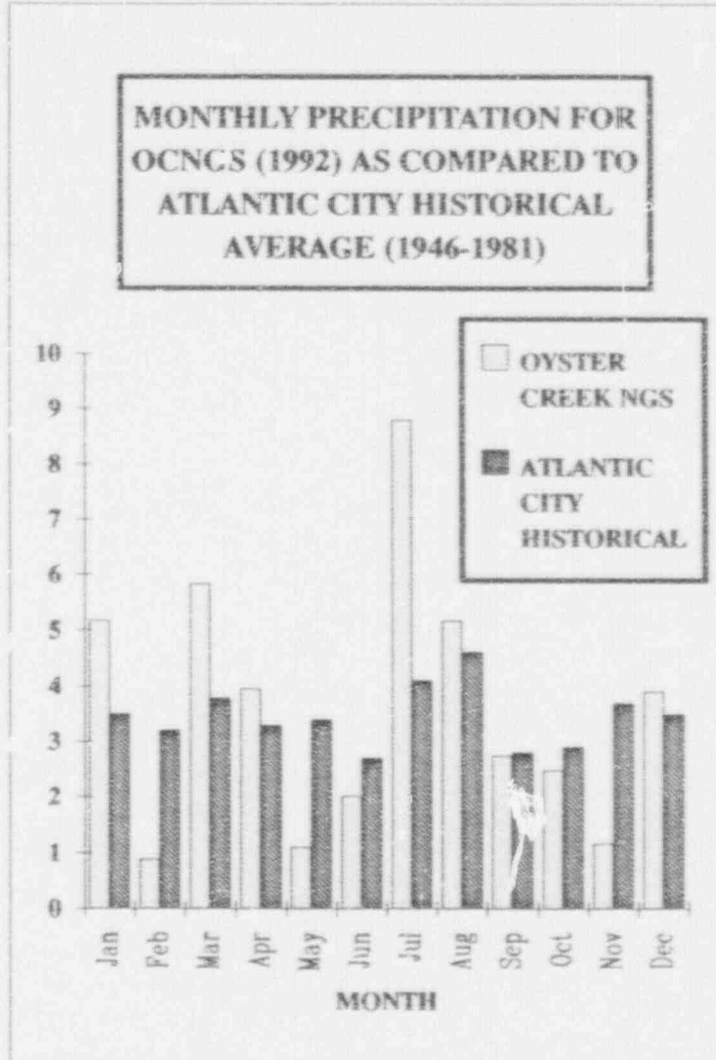
For additional site specific meteorological data, refer to the OCNGS Semiannual Effluent Release Reports for 1991.

## MONTHLY PRECIPITATION
## OYSTER CREEK NUCLEAR GENERATING STATION
## DURING 1991 COMPARED WITH HISTORICAL (1946-1981)
## ATLANTIC CITY NATIONAL WEATHER SERVICE AVERAGE PRECIPITATION DATA
## RAINFALL IN INCHES

| Month | Oyster Creek NGS | Atlantic City NWS Avg. |
|---|---|---|
| Jan | 5.17 | 3.5 |
| Feb | 0.88 | 3.2 |
| Mar | 5.83 | 3.8 |
| Apr | 3.96 | 3.3 |
| May | 1.10 | 3.4 |
| Jun | 2.01 | 2.7 |
| Jul | 8.79 | 4.1 |
| Aug | 5.17 | 4.6 |
| Sep | 2.74 | 2.8 |
| Oct | 2.48 | 2.9 |
| Nov | 1.17 | 3.7 |
| Dec | 3.91 | 3.5 |

**DAILY RAINFALL IN EXCESS OF ONE INCH PER DAY**

| Date | Total | 15-Min | Event |
|---|---|---|---|
| 11-Jan-91 | 1.52 | 0.07 | Low pressure (NE storm) |
| 2-Mar-91 | 1.23 | 0.53 | Warm front convection |
| 3-Mar-91 | 1.51 | 0.25 | Low pressure (NE storm) |
| 21-Apr-91 | 1.54 | 0.06 | Low pressure (NE storm) |
| 13-Jul-91 | 7.69* | 1.38* | Warm front convection |
| 19-Aug-91 | 2.79 | 0.29 | Hurricane Bob |
| 20-Aug-91 | 1.79 | 0.31 | Cold front passage |
| 17-Oct-92 | 1.79 | 0.24 | Low pressure (NE storm) |
| 29-Dec-92 | 1.16 | 0.12 | Low pressure (NE storm) |




* Denotes record rainfall amount.

FIGURE 2

## EFFLUENTS

### Historical Background

Almost from the outset of the discovery of x-rays in 1895 by Wilhelm Roentgen the potential hazard of ionizing radiation was recognized and efforts were made to establish radiation protection standards. The International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP) were established in 1928 and 1929, respectively, and have the longest continuous experience in the review of radiation health effects and with recommendations on guidelines for radiological protection and radiation exposure limits. In 1955, the United Nations created a Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to summarize reports received on radiation levels and the effects on man and his environment. The National Academy of Sciences (NAS) formed a committee in 1956 to review the biological effects of atomic radiation (BEAR). A series of reports have been issued by this and succeeding NAS committees on the biological effects of ionizing radiation (BEIR), the most recent being 1990 (known as BEIR V). The Federal Radiation Council (FRC) was formed in 1959 to provide a federal policy on human radiation exposures. These federal policies are approved by the President of the United States.

These committees and commissions of nationally and internationally recognized scientific experts have been dedicated to the understanding of the health effects of radiation by investigating all sources of relevant knowledge and scientific data and by providing guidance for radiological protection. Their members are selected from universities, scientific research centers and other national and international research organizations. The committee reports contain scientific data obtained from physical, biological, and epidemiological studies on radiation health effects and serve as scientific references for information presented in this report. Since its inception, the USNRC has depended upon the recommendations of the ICRP, the NCRP, and the FRC (incorporated in the United States Environmental Protection Agency in 1970) for basic radiation protection standards and guidance in establishing regulations for the nuclear industry (Ref. 5 through 8).

## Effluent Release Limits

As part of routine plant operations, limited quantities of radioactivity are released to the environment in liquid and airborne effluents. An effluent control program is implemented to ensure radioactivity released to the environment is minimal and does not exceed release limits. Radioactive effluent releases at Oyster Creek are under the regulatory jurisdiction of the USNRC. Regulations through the years have changed and reflect operating experience and advances in nuclear technology. Federal regulations as defined by Title 10 of the Code of Federal Regulations, Part 20 (10 CFR 20) establish limits on the concentrations of radioactive effluents released to the environment. Federal effluent limits are set at low levels to protect the health and safety of the public. GPU Nuclear conducts operations in a manner that holds radioactive effluents to small percentages of the federal limits.

A recommendation of the ICRP, NCRP, and FRC is that radiation exposures should be maintained at levels which are "as low as reasonably achievable" (ALARA) and commensurate with the societal benefit derived from the activities resulting in such exposures. For this reason, dose limit guidelines were established by the USNRC for releases of radioactive effluents from nuclear power plants. These guidelines are presented in the Oyster Creek Technical Specifications. Maintaining releases within these operation guidelines demonstrates that radioactive effluents are being maintained "as low as reasonably achievable".

The Oyster Creek Technical Specification dose limit guidelines are as follows:

- Technical Specification 3.6.K.1

  The dose equivalent rate outside of the EXCLUSION AREA due to radioactive noble gas in gaseous effluent shall not exceed 500 mRem/year to the total body or 3000 mRem/year to the skin.

- Technical Specification 3.6.L.1

  The air dose outside of the EXCLUSION AREA due to noble gas released in gaseous effluent shall not exceed:
  5 mrad/calendar quarter due to gamma radiation,
  10 mrad/calendar quarter due to beta radiation,
  10 mrad/calendar year due to gamma radiation, or
  20 mrad/calendar year due to beta radiation.

- Technical Specification 3.6.N.1

  The annual dose to a MEMBER OF THE PUBLIC due to radiation and radioactive material in effluents from the OCNGS outside of the EXCLUSION AREA shall not exceed 75 mRem to his thyroid or 25 mRem to his total body or to any other organ.

- Technical Specification 3.6.K.2

  The dose equivalent rate outside of the EXCLUSION AREA due to H-3, I-131, I-133, and to radioactive material in particulate form having half-lives of 8 days or more in gaseous effluents shall not exceed 1500 mRem/year to any body organ when the dose rate due to H-3, Sr-89, Sr-90, and alpha-emitting radionuclides is averaged over no more than 3 months and the dose rate due to other radionuclides is averaged over no more than 31 days.

- Technical Specification 3.6.M.1

  The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, and from radionuclides in particulate form having half-lives of 8 days or more in gaseous effluents, outside of the EXCLUSION AREA shall not exceed 7.5 mRem to any body organ per calendar quarter or 15 mRem to any body organ per calendar year.

- Technical Specification 3.6.I.1

  The concentration of radioactive material, other than noble gases, in liquid effluent in the discharge canal at the Route 9 bridge shall not exceed the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2.

- Technical Specification 3.6.I.2

  The concentration of noble gases dissolved or entrained in liquid effluent in the discharge canal at the Route 9 bridge shall not exceed $2 \times 10^{-4}$ microcuries/milliliter.

- o Technical Specification 3.6.J.1

  The dose to a MEMBER OF THE PUBLIC due to radioactive material in liquid effluents beyond the outside of the EXCLUSION AREA shall not exceed:

  1.5 mRem to the total body during any calendar quarter,
  5 mRem to any body organ during any calendar quarter,
  3 mRem to the total body during any calendar year, or
  10 mRem to any body organ during any calendar year.

Effluent Control Program

Effluent control includes plant components such as the ventilation system and filters, off gas holdup components, demineralizers, and an evaporator system. In addition to minimizing the release of radioactivity, the effluent control program includes all aspects of effluent and environmental monitoring. This includes the operation and data analysis associated with a complex radiation monitoring system, environmental sampling and monitoring, and a comprehensive quality assurance program. Over the years, the program has evolved in response to changing regulatory requirements and plant conditions. For example, additional instruments and samplers have been installed to provide that measurements of effluents remain onscale in the event of any accidental release of radioactivity.

Effluent Instrumentation: Liquid and airborne effluent measuring instrumentation is designed to detect the presence and the amount of radioactivity in effluents. Many of these instruments provide continuous surveillance of radioactivity releases. Calibrations of effluent instruments are performed using reference standards certified by the United States National Institute of Standards and Technology. Where continuous surveillance is not practicable or possible, contingencies are spelled out in the Technical Specifications. If pre-designated setpoints are reached, releases are immediately terminated.

Effluent Sampling and Analysis: In addition to continuous radiation monitoring instruments, samples of effluents are taken and subjected to laboratory analysis to identify the specific radionuclide quantities being released. A sample must be representative of the effluent from which it is taken. Sampling and analysis provide a sensitive and precise method of determining effluent composition. Samples are analyzed using the highest quality laboratory counting equipment. Radiation instrument readings and sample results are compared to ensure correct correlation.

## Effluent Data

As part of routine plant operations, limited quantities of radioactivity are released to the environment in liquid and airborne effluents. The amounts of radioactivity released vary and are dependent on operating conditions, power levels, fuel conditions, efficiency of liquid and gas processing systems, and proper functioning of plant equipment. The largest variations occur in the airborne effluents of fission and activation gases which are proportional to the augmented off gas system operation in the gas processing system and to the integrity of the fuel cladding. In general, effluents have been decreasing with time due to improved fuel integrity and increased efficiency of processing systems.

With respect to activity released during 1991, the predominant radionuclide was Xe-135 in gases and H-3 in liquids. The amount of radioactivity released is summarized and reported semiannually to the USNRC. Estimated radiation doses to the public, attributable to these effluents, were less than one percent of the applicable regulatory limits (Tables 6 and 7). A summary of the OCNGS liquid and airborne effluents for 1991 is provided in Table 2. Radioactive constituents of these effluents are discussed in the following sections.

Noble Gases: The predominant radionuclides released in airborne effluents are the noble gases krypton (Kr) and xenon (Xe). Small amounts are also released in liquid effluents. The total amounts of krypton and xenon released into the atmosphere in 1991 were 241 curies and 219 curies respectively. These noble gases were readily dispersed into the atmosphere when released and because of their short half-lives, quickly decayed into stable forms. The total quantity of xenon activity released in liquid effluents was 0.016 curies.

Iodines and Particulates: The discharge of iodines and particulates to the environment is minimized by factors such as their high chemical reactivity and solubility in water combined with the high removal efficiency of airborne and liquid processing systems.

Of the gaseous radioiodines, iodine-131 is of particular concern because of its relatively long half-life of 8 days. Particulates of relative concern are the radiocesiums (Cs-134 and Cs-137), radiostrontiums (Sr-89 and Sr-90), and activation products, manganese-54 (Mn-54) and cobalt-60 (Co-60). The total amount of iodines and particulates released from the station in 1991 was 0.21 curies in airborne effluents and 0.00016 curies in liquid effluents.

Tritium: Tritium is the predominant radionuclide released in liquid effluents and also is released in airborne effluents. Tritium is a radioactive isotope of hydrogen. It is produced

TABLE 2
RADIONUCLIDE COMPOSITION OF OCNGS EFFLUENTS FOR 1991

| Radionuclide | Half-Life | Liquid Effluents (Ci) OCNGS | Gaseous Effluents (Ci) OCNGS |
|---|---|---|---|
| H-3 | 12.3 years | 6.03 E-1 | 7.64 |
| Ar-41 | 1.8 hours | ND | 2.46 E-2 |
| Cr-51 | 27.8 days | ND | 7.19 E-5 |
| Mn-54 | 312 days | ND | 1.30 E-4 |
| Co-60 | 5.3 years | 1.34 E-4 | 1.25 E-4 |
| Kr-85m | 4.5 hours | ND | 3.71 E1 |
| Kr-87 | 76 minutes | ND | 1.17 E2 |
| Kr-88 | 2.8 hours | ND | 8.73 E1 |
| Sr-89 | 50.5 days | ND | 5.51 E-3 |
| Sr-90 | 28.8 years | ND | 2.15 E-5 |
| Tc-99m | 6.0 hours | ND | 8.84 E-3 |
| I-131 | 8.0 days | ND | 2.55 E-2 |
| Xe-131m | 11.8 days | ND | 2.72 E1 |
| I-133 | 20.9 hours | ND | 8.73 E-2 |
| Xe-133 | 5.2 days | [illegible] | 5.76 |
| I-135 | 6.7 hours | ND | 7.74 E-2 |
| Xe-135 | 9.1 hours | 1.42 E-2 | 1.86 E2 |
| Cs-137 | 30.2 years | 2.68 E-5 | 4.44 E-5 |
| Ba-140 | 12.8 days | ND | 1.10 E-3 |
| Ce-141 | 32.5 days | ND | 4.24 E-7 |
| Ce-144 | 284 days | ND | 1.55 E-6 |
| Gross Alpha | - | ND | 1.82 E-5 |

Note: All effluents expressed in scientific notation.

ND = No Activity Detected

in the reactor coolant as a result of neutron interaction with the naturally-occurring deuterium (also a hydrogen isotope) present in water. The total amount of H-3 released in liquid and airborne effluents was 8.24 curies. To place this number in perspective, the world inventory of natural cosmic ray produced tritium is 70 million curies, which corresponds to a production rate of 4 million curies per year (Ref. 9). Tritium contributions to the environment from nuclear power production are sufficiently small that they have no measurable effect on the existing environmental concentrations.

Transuranics: Transuranics are produced by neutron capture in the fuel, and typically emit alpha and beta particles as they decay. Important transuranic isotopes produced in reactors are uranium-239 (U-239), plutonium-238 (Pu-238), plutonium-239 (Pu-239), plutonium-240 (Pu-240), plutonium-241 (Pu-241), americium-241 (Am-241), plutonium-243 (Pu-243), plus other isotopes of americium and curium. They have half-lives ranging from tens to millions of years. Transuranics are mostly retained within the nuclear fuel. Because they are so insoluble and non-volatile, they are not readily transported through plant pathways to the environment. Gas and liquid processing systems remove greater than 90% of any transuranics outside the reactor coolant. Since greater than 99% of all transuranics are retained within the fuel and transuranic removal processes are extremely efficient, releases in airborne and liquid effluents are not monitored.

Carbon-14: Production of carbon-14 (C-14) in reactors is small. It is produced in the reactor coolant as a result of neutron interactions with oxygen and nitrogen. Estimates for all nuclear power production worldwide show that 235,000 curies were released from 1970 through 1990 (Ref. 10).

Carbon-14 also is produced naturally by the interactions of cosmic radiation with oxygen and nitrogen in the upper atmosphere. The worldwide inventory of natural C-14 is estimated at 241 million curies (Ref. 10). Since the inventory of natural carbon-14 is so large, releases from nuclear power plants do not result in a measurable change in the background concentration of carbon-14. Consequently, carbon-14 is not routinely monitored in plant effluents.

## RADIOLOGICAL ENVIRONMENTAL MONITORING

GPUN conducts a comprehensive radiological environmental monitoring program (REMP) at Oyster Creek to monitor radiation and radioactive materials in the environment. This program provides information on radioactivity in the environment from OCNGS releases and information on the potential principal pathways of exposure to humans.

The USNRC has established regulatory guides which contain acceptable monitoring practices (Ref. 11). The OCNGS REMP was designed on the basis of these regulatory guides along with the USNRC Radiological Assessment Branch Technical Position on Environmental Monitoring (Ref. 12). All of these guidelines have been met and in most cases the OCNGS program greatly exceeds them. The important objectives of the REMP are:

- to assess impacts to the public from OCNGS operations
- to verify in-plant controls for the containment of radioactive materials
- to determine buildup of long-lived radionuclides in the environment and changes in background radiation levels
- to provide reassurance to the public that the program is capable of adequately assessing impacts and identifying noteworthy changes in the radiological status of the environment.

## Environmental Exposure Pathways to Humans from Airborne and Liquid Effluents

Environmental transport pathways is the term for movement of radionuclides through the environment and transport to humans. The airborne pathways have basically five routes of importance: (1) direct radiation, (2) deposition on vegetation, (3) deposition on soil, (4) consumption by animals and (5) inhalation by humans. Liquid pathways have three basic routes of importance: (1) ingestion of drinking water, (2) fish and shellfish consumption and (3) exposure from shoreline sediments. Each of these possible routes that can lead to radiation exposure to humans is termed an exposure pathway. As can be seen, these routes are b... numerous and varied. While some pathways are relatively simple, such as inhalation of airborne radioactive materials, others may be complex. For example, radioactive airborne particulates may deposit onto forage which when eaten by cows may be secreted into milk, which is subsequently consumed by man. This is known as the air-grass-cow-milk pathway.

Although radionuclides can reach humans by a number of pathways, some are more important than others. The critical pathway for a given radionuclide is the one that produces the greatest dose to a population, or to a specific segment of the population. This segment of the population is known as the critical group, and may be defined by age, dietary, or other cultural factors. The dose may be delivered to the whole body or confined to a specific organ; the organ receiving the greatest fraction of the dose is known as the critical organ. This information was used to develop the Oyster Creek program.

Sampling

The OCNGS radiological environmental monitoring program consists of two phases -- the preoperational and the operational. The preoperational phase provided data which is used as a basis for evaluating increases in radiation levels and radioactivity in the vicinity of the plant after the plant became operational. The operational phase began in 1969 when the OCNGS began power generation.

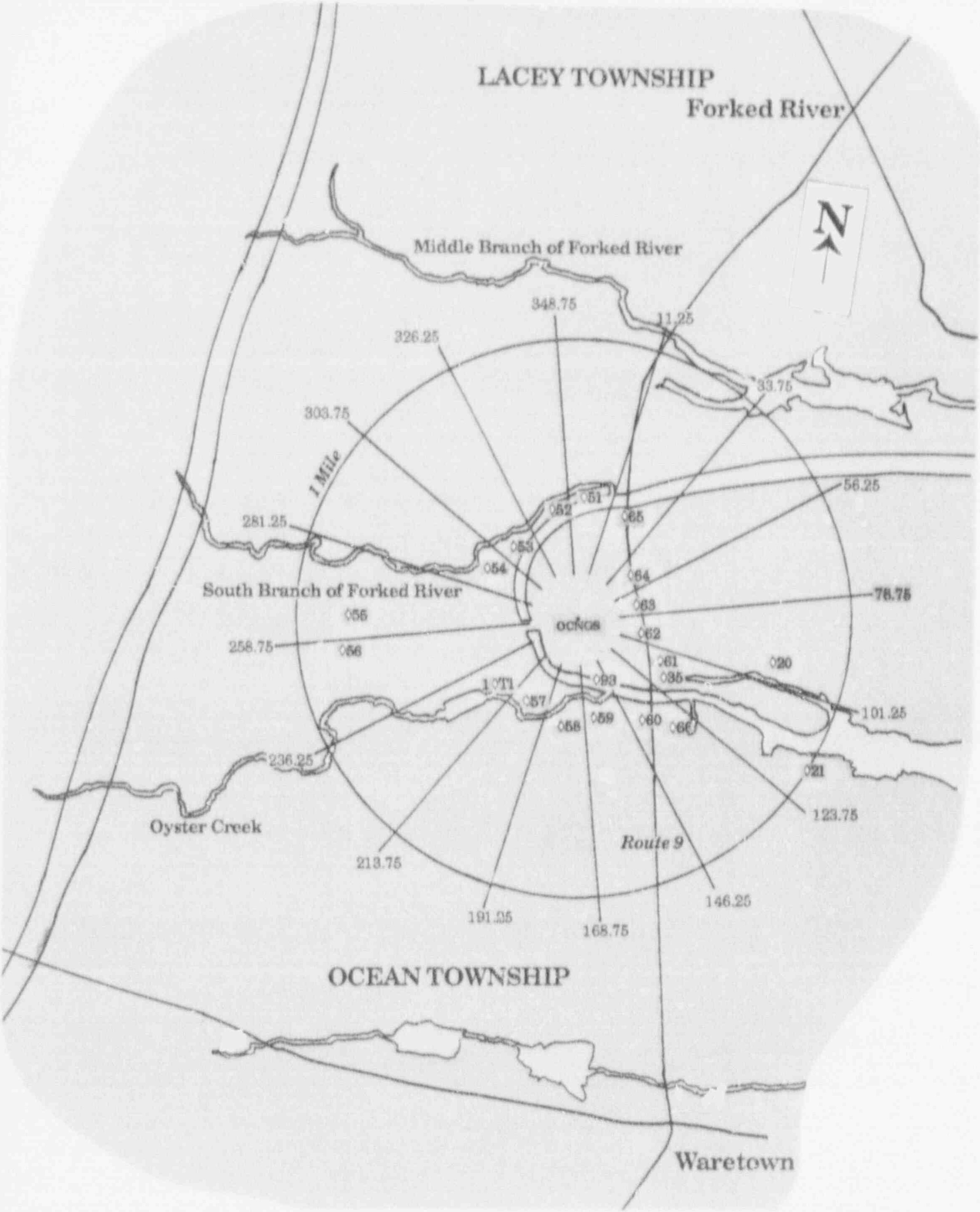
The program consists of taking radiation measurements and collecting samples from the environment, analyzing them for radioactivity content, and interpreting the results. With emphasis on the critical pathways to humans, samples from the aquatic, atmospheric, and terrestrial environments are collected. These samples include air, precipitation, well water, surface water, clams, sediment, fish, crabs, vegetables, and soil. Thermoluminescent dosimeters (TLDs) are placed in the environment to measure gamma radiation levels. The Technical Specifications and recommendations from the scientific staff of GPUN specify the sample types to be collected and analyses to be performed.

Sampling locations were established by considering meteorology, population distribution, hydrology, and land use characteristics of the local area. The sampling locations are divided into two classes, indicator and background. Indicator locations are those which are expected to show effects from OCNGS operations, if any exist. These locations were primarily selected on the basis of where the highest predicted environmental concentrations would occur. While the indicator locations are typically within a few miles of the plant, the background stations are generally at distances greater than 10 miles from the OCNGS. Therefore, background samples are collected at locations which are expected to be unaffected by station operations. They provide a basis on which to evaluate fluctuations at indicator locations relative to natural background radiation and natural radioactivity and fallout from prior nuclear weapon tests. Figures 3, 4, and 5 show the current sampling locations around the OCNGS. Table A-1 in Appendix A describes the sampling locations by distance and azimuth (compass direction) from the OCNGS.

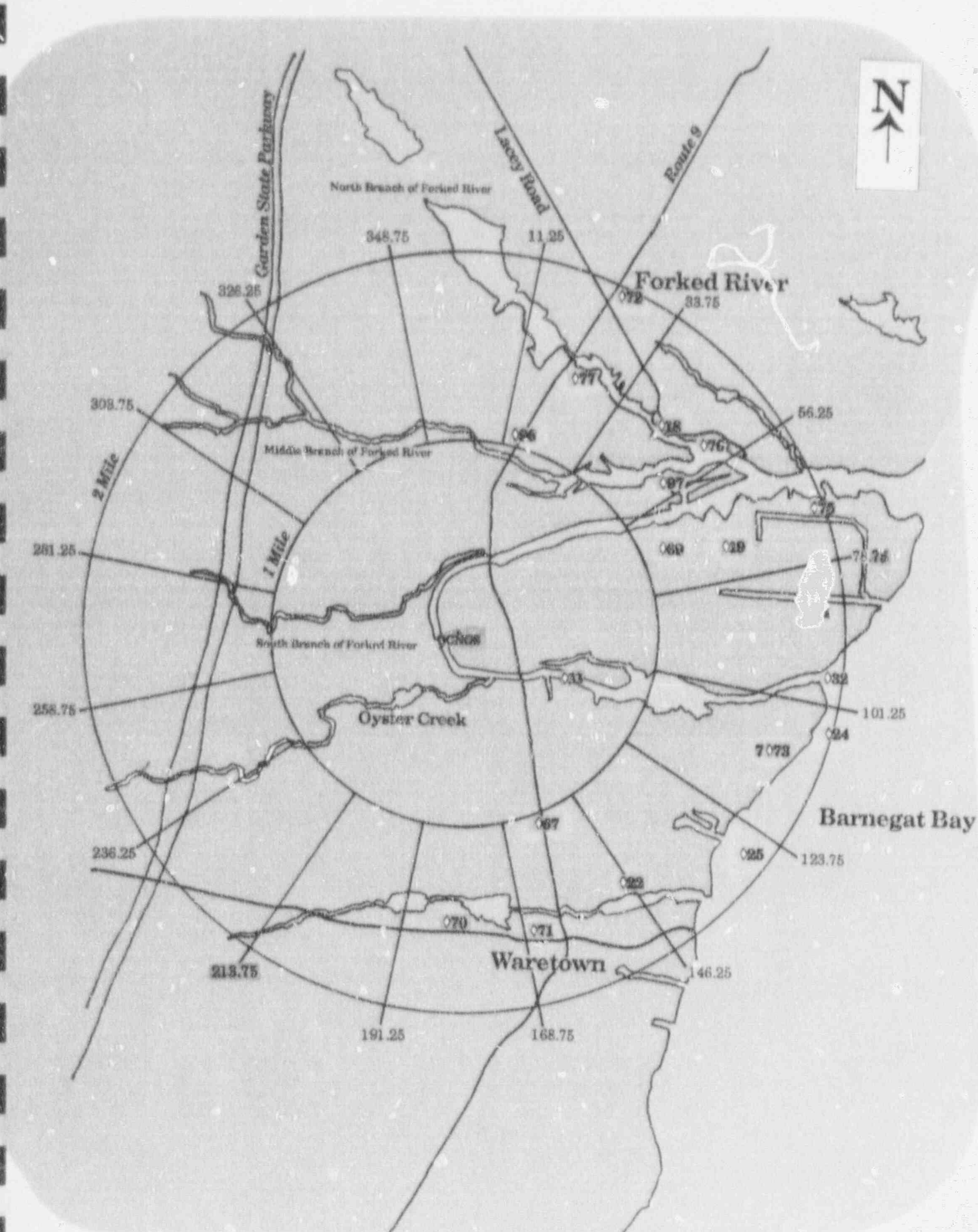
Analysis

In addition to specifying the minimum media to be collected and the minimum number of sampling locations, the Technical Specifications also specify the frequency of sample collection and the types of analyses to be performed Additionally, analytical sensitivities (detection limits) and reporting levels also are specified. Table A-2 in Appendix A provides a synopsis of the sample types, number of sampling locations, collection frequencies, number of samples collected, types of analyses and frequencies, and number of samples analyzed. Table A-3 in Appendix A presents problems encountered during 1991 in sample collection and analysis. Sample analyses which did not meet the required analytical sensitivities are presented in Appendix B. Changes in sample collection and analysis are described in Appendix C.

The analytical results are routinely reviewed by GPUN scientists to assure that established sensitivities have been achieved and that the proper analyses have been performed. All analytical results are subjected to an automated review process which ensures that Technical Specification-required lower limits of detection are met and that reporting levels are not exceeded. Investigations are conducted when anomalous values are discovered.

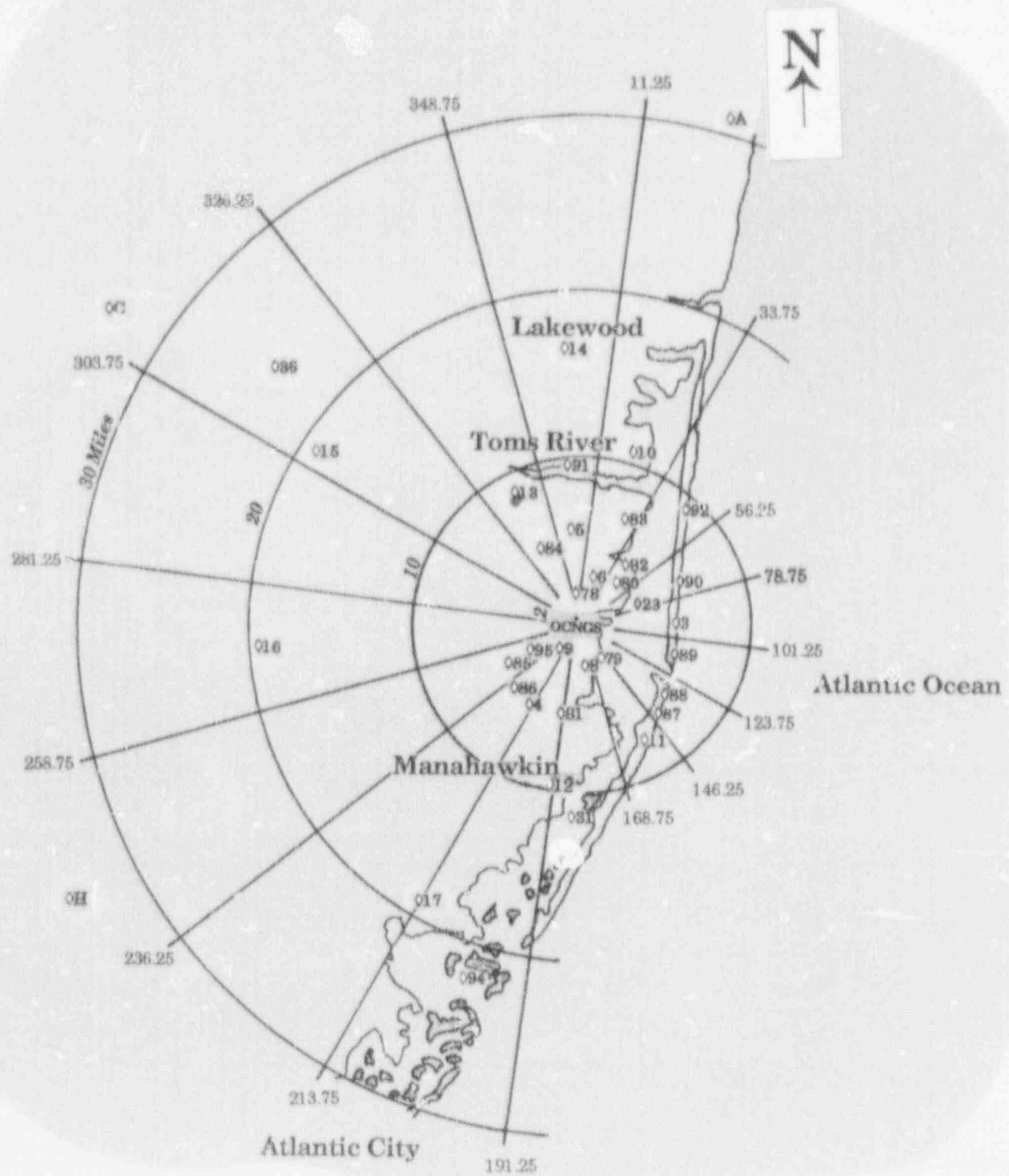



*Oyster Creek Nuclear Generating Station* (OCNGS)
Location of Radiological Environmental Monitoring Program (REMP)
Stations within 1 mile of the site




*Oyster Creek Nuclear Generating Station* (OCNGS)
Location of Radiological Environmental Monitoring Program (REMP)
Stations greater than 1 mile and within 2 miles of the site

Figure 5




*Oyster Creek Nuclear Generating Station* (OCNGS)
Location of Radiological Environmental Monitoring Program (REMP)
Stations greater than 2 miles from the site

Table 3 provides a summary of radionuclide concentrations in environmental samples from the OCNGS in 1991. The data are summarized in a format that closely resembles the suggested format presented in the USNRC Branch Technical Position (Ref. 12).

Measurement of low radionuclide concentrations in environmental media requires special analysis techniques. Analytical laboratories utilized for the OCNGS REMP use state-of-the-art laboratory equipment designed to detect beta and gamma radiation. This equipment must meet the required analytical sensitivities. Examples of the specialized laboratory equipment used are germanium detectors with multichannel analyzers for determining specific gamma emitting radionuclides, liquid scintillation detectors for tritium, low level alpha and beta counters, and coincidence counters for low level I-131 detection. Computer hardware and software used in conjunction with the counting equipment perform calculations and provide data management. Analysis methods are discussed in more detail in references 13, 14, and 15 and are also described in Appendix I.

Quality Assurance Program

A quality assurance program is conducted in accordance with guidelines provided in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs" (Ref. 16) and as required by the Technical Specifications. The OC program is documented by GPUN written policies, procedures, and records. This program is designed to identify possible deficiencies so that immediate corrective action can be taken if warranted. It also provides a measure of confidence in the results of the monitoring program in order to assure the regulatory agencies and the public that the results are valid. The quality assurance program for the measurement of radioactivity in environmental media is implemented by:

- auditing analytical laboratories
- requiring analytical laboratories to participate in the USEPA Cross-Check Program
- requiring analytical contractor laboratories to split samples for separate analysis (recounts are performed when samples are not able to be split)
- splitting samples, having the samples analyzed by independent laboratories, and then comparing the results for agreement
- requiring analytical laboratories to provide quality assurance reports showing laboratory instrument calibration and maintenance tests and results of blind, split, and duplicate analyses

The quality assurance program and the results of the USEPA Cross-Check Program are outlined in Appendices D and E, respectively.

Procedures were written and approved by the Oyster Creek Environmental Controls Department, the Quality Assurance Department, and analytical laboratories to cover all aspects of the radiological environmental monitoring program. These procedures cover such areas as sample collection, sampling equipment calibration and maintenance, laboratory analysis, and data review.

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991

THE FOLLOWING PAGES ARE A SUMMARY OF REMP DATA FOR THE SCHEDULED COLLECTION PERIOD JANUARY, 1991 THROUGH DECEMBER, 1991. DATA ARE SUMMARIZED ON AN ANNUAL BASIS, WHERE:

SAMPLE TYPE -> Media being analyzed.

ANALYSIS -> Type of analysis being performed on the particular media.

# OF ANALYSES PERFORMED -> The total number of analyses performed for a particular sample type.

LLD -> The mean lower level of detection. Please note that this value is based on samples whose results showed no detectable activity.

INDICATOR STATIONS -> The mean, minimum and maximum based on detectable activities of all indicator stations.

HIGHEST ANNUAL MEAN -> The mean, minimum and maximum based on detectable activities of the station with the highest annual mean.

Station -> The station designation with the highest annual mean.

BACKGROUND STATIONS -> The mean, minimum and maximum based on detectable activities of all background stations.

(N/TOT) -> The fraction of detectable activities/Total number of analyses performed.

**BACKGROUND STATIONS AT OCNGS**

| STATION | A,C,H,14 | 33,94 | 18 | 36 |
|---|---|---|---|---|
| SAMPLE TYPE | AIR PARTICULATE<br>AIR IODINE<br>PRECIPITATION | SEDIMENT<br>CLAMS<br>SURFACE WATER<br>FISH**<br>BLUE CRAB** | WELL WATER | VEGETABLES<br>SOIL |

* An asterisk (*) indicates no data.
** Station 94 only

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | INDICATOR STATIONS MEAN | INDICATOR STATIONS MAX | INDICATOR STATIONS (N/TOT) | HIGHEST ANNUAL MEAN MIN | HIGHEST ANNUAL MEAN MEAN | HIGHEST ANNUAL MEAN MAX Station-# | HIGHEST ANNUAL MEAN (N/TOT) | BACKGROUND STATIONS MIN | BACKGROUND STATIONS MEAN | BACKGROUND STATIONS MAX | BACKGROUND STATIONS (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIR PARTICULATE (pCi/m3) | Gross Beta | * | 674 | No LLD Reported | 6.70E-03 | 1.60E-02 | 3.10E-02 | (467/467) | 9.20E-03 | 1.67E-02 | 3.10E-02 Station-# | (52/52) 4 | 6.90E-03 | 1.65E-02 | 2.90E-02 | (207/207) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Ac-228 | 169 | 9.56E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Ba-140 | 169 | 1.96E-02 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Be-7 | 169 | 3.00E-02 | 3.20E-02 | 8.21E-02 | 1.20E-01 | (117/117) | 5.10E-02 | 8.71E-02 | 1.20E-01 Station-# | (13/13) 71 | 5.10E-02 | 8.01E-02 | 1.20E-01 | (51/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Co-58 | 169 | 2.81E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Co-60 | 169 | 3.33E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Cs-134 | 169 | 2.60E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Cs-137 | 169 | 2.37E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Fe-59 | 169 | 6.96E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | I-131 | 169 | 9.95E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | K-40 | 169 | 3.61E-02 | 1.60E-02 | 1.60E-02 | 1.60E-02 | (1/117) | 1.60E-02 | 1.60E-02 | 1.60E-02 Station-# | (1/13) 20 | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | La-140 | 169 | 1.09E-02 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Mn-54 | 169 | 2.56E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Nb-95 | 169 | 3.28E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX<br>Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Ra-226 | 169 | 1.04E-02 | 2.40E-03 | 2.40E-03 | 2.40E-03 | (1/117) | 2.40E-03 | 2.40E-03 | 2.40E-03<br>Station-# | (1/13)<br>73 | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Zn-65 | 169 | 7.43E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR PARTICULATE (pCi/m3) | Gamma Scan | Zr-95 | 169 | 4.94E-03 | <LLD | <LLD | <LLD | (0/117) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/52) |
| AIR IODINE (pCi/m3) | Iodine-131 | | 674 | 2.29E-02 | <LLD | <LLD | <LLD | (0/467) | <LLD | <LLD | <LLD | (0/52) | <LLD | <LLD | <LLD | (0/207) |
| PRECIPITATION (pCi/L) | Tritium | | 24 | 1.60E+02 | 1.60E+02 | 1.70E+02 | 1.80E+02 | (3/12) | 1.80E+02 | 1.80E+02 | 1.80E+02<br>Station-# | (1/4)<br>73 | 1.80E+02 | 1.98E+02 | 2.50E+02 | (5/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Ac-228 | 24 | 1.29E+01 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Ba-140 | 24 | 1.42E+01 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Be-7 | 24 | 2.59E+01 | 1.20E+01 | 1.20E+01 | 1.20E+01 | (1/12) | 1.20E+01 | 1.20E+01 | 1.20E+01<br>Station-# | (1/4)<br>72 | 2.20E+01 | 2.20E+01 | 2.20E+01 | (1/12) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| PRECIPITATION (pCi/L) | Gamma Scan | Co-58 | 24 | 3.49E+00 | <LLD | <LLD | <LLD | (0/12) | LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Co-60 | 24 | 4.04E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Cs-134 | 24 | 3.92E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Cs-137 | 24 | 3.27E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Fe-59 | 24 | 7.42E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | I-131 | 24 | 5.21E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | K-40 | 24 | 4.42E+01 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | La-140 | 24 | 7.17E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Mn-54 | 24 | 3.31E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| PRECIPITATION (pCi/L) | Gamma Scan | Nb-95 | 24 | 3.40E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Ra-226 | 24 | 2.20E+01 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Zn-65 | 24 | 9.33E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| PRECIPITATION (pCi/L) | Gamma Scan | Zr-95 | 24 | 5.75E+00 | <LLD | <LLD | <LLD | (0/12) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/12) |
| SURFACE WATER (pCi/L) | Tritium | | 104 | 1.56E+02 | 1.70E+02 | 1.80E+02 | 1.90E+02 | (2/78) | 1.90E+02 | 1.90E+02 | 1.90E+02 Station-# | (1/13) 32 | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Ac-228 | 104 | 1.17E+01 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Ba-140 | 104 | 1.22E+01 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Be-7 | 104 | 2.20E+01 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Co-58 | 104 | 3.12E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SURFACE WATER (pCi/L) | Gamma Scan | Co-60 | 104 | 3.64E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Cs-134 | 104 | 3.39E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Cs-137 | 104 | 2.97E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Fe-59 | 104 | 6.85E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | I-131 | 104 | 8.12E+01 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | K-40 | 104 | 5.00E+01 | 5.10E+01 | 2.29E+02 | 3.00E+02 | (75/78) | 2.10E+02 | 2.54E+02 | 2.90E+02 Station-# 25 | (13/13) | 2.10E+02 | 2.62E+02 | 3.20E+02 | (26/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | La-140 | 104 | 5.84E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Mn-54 | 104 | 2.87E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Nb-95 | 104 | 3.07E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SURFACE WATER (pCi/L) | Gamma Scan | Ra-226 | 104 | 1.85E+01 | 4.20E+00 | 1.45E+01 | 4.00E+01 | (4/78) | 4.00E+01 | 4.00E+01 | 4.00E+01 Station-# | (1/13) 23 | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Zn-65 | 104 | 8.51E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| SURFACE WATER (pCi/L) | Gamma Scan | Zr-95 | 104 | 5.15E+00 | <LLD | <LLD | <LLD | (0/78) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| WELL WATER (pCi/L) | Tritium | | 64 | 1.65E+02 | 1.50E+02 | 1.60E+02 | 1.70E+02 | (2/51) | 1.70E+02 | 1.70E+02 | 1.70E+02 Station-# | (1/12) 19 | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Ac-228 | 64 | 1.24E+01 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Ba-140 | 64 | 1.29E+01 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Be-7 | 64 | 2.35E+01 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Co-58 | 64 | 3.35E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Co-60 | 64 | 3.87E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| WELL WATER (pCi/L) | Gamma Scan | Cs-134 | 64 | 4.35E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Cs-137 | 64 | 3.16E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Fe-59 | 64 | 6.75E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | I-131 | 64 | 7.66E+01 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | K-40 | 64 | 4.25E+01 | 2.30E+01 | 2.30E+01 | 2.30E+01 | (1/51) | 2.30E+01 | 2.30E+01 | 2.30E+01 Station-# | (1/12) 19 | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | La-140 | 64 | 6.16E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Mn-54 | 64 | 3.13E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Nb-95 | 64 | 3.30E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Ra-226 | 64 | 1.97E+01 | 4.10E+00 | 4.75E+00 | 5.40E+00 | (2/51) | 5.40E+00 | 5.40E+00 | 5.40E+00 Station-# | (1/13) 1 | <LLD | <LLD | <LLD | (0/13) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | MEAN | MAX | (N/TOT) | HIGHEST ANNUAL MEAN MIN | MEAN | MAX Station-# | (N/TOT) | BACKGROUND STATIONS MIN | MEAN | MAX | (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WELL WATER (pCi/L) | Gamma Scan | Zn-65 | 64 | 1.00E+01 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| WELL WATER (pCi/L) | Gamma Scan | Zr-95 | 64 | 5.45E+00 | <LLD | <LLD | <LLD | (0/51) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/13) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Ac-228 | 13 | 5.58E+01 | 7.20E+01 | 7.20E+01 | 7.20E+01 | (1/10) | 7.20E+01 | 7.20E+01 | 7.20E+01<br>Station-# | (1/6)<br>66 | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Ba-140 | 13 | 5.69E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Be-7 | 13 | 9.44E+01 | 2.10E+02 | 2.80E+02 | 3.80E+02 | (3/10) | 2.10E+02 | 2.80E+02 | 3.80E+02<br>Station-# | (3/6)<br>66 | 1.20E+02 | 1.20E+02 | 1.20E+02 | (1/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Co-58 | 13 | 1.51E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Co-60 | 13 | 1.82E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Cs-134 | 13 | 1.74E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Cs-137 | 13 | 1.32E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Fe-59 | 13 | 3.81E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | I-131 | 13 | 1.74E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBACE (pCi/kg(WET)) | Gamma Scan | K-40 | 13 | No LLD Reported | 2.50E+03 | 3.77E+03 | 5.60E+03 | (10/10) | 2.50E+03 | 3.90E+03 | 5.60E+03 Station-# | (4/4) 35 | 3.40E+03 | 3.[illegible] | 3.60E+03 | (3/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | La-140 | 13 | 2.51E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Mn-54 | 13 | 1.40E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Nb-95 | 13 | 1.48E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Ra-226 | 13 | 8.35E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Zn-65 | 13 | 5.08E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |
| CABBAGE (pCi/kg(WET)) | Gamma Scan | Zr-95 | 13 | 2.52E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/3) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Ac-228 | 14 | 6.14E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Ba-140 | 14 | 6.50E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Be-7 | 14 | 1.24E+02 | 1.20E+02 | 2.95E+02 | 4.40E+02 | (6/10) | 3.00E+02 | 3.00E+02 | 3.00E+02 Station-# | (1/3) 35 | 9.40E+01 | 1.63E+02 | 3.00E+02 | (3/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Co-58 | 14 | 1.66E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Co-60 | 14 | 2.12E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Cs-134 | 14 | 1.64E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WE... | Gamma Scan | Cs-137 | 14 | 1.51E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Fe-59 | 14 | 4.57E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | I-131 | 14 | 2.12E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | K-40 | 14 | No LLD Reported | 3.80E+03 | 4.87E+03 | 6.10E+03 | (10/10) | 4.30E+03 | 5.13E+03 | 6.10E+03 Station-# | (3/3) 35 | 3.70E+03 | 4.15E+03 | 4.40E+03 | (4/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | La-140 | 14 | 2.87E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Mn-54 | 14 | 1.51E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Nb-95 | [illegible] | 1.57E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Ra-226 | 14 | 1.10E+02 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Zn-65 | 14 | 5.36E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| COLLARD (pCi/kg(WET)) | Gamma Scan | Zr-95 | 14 | 2.90E+01 | <LLD | <LLD | <LLD | (0/10) | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/4) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Ac-228 | 3 | 4.33E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Ba-140 | 3 | 5.33E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Be-7 | 3 | 6.00E+01 | * | * | * | (*/*) | * | * | * | (*/*) | 1.50E+02 | 2.15E+02 | 2.80E+02 | (2/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Co-58 | 3 | 1.23E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Co-60 | 3 | 1.50E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Cs-134 | 3 | 1.43E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Cs-137 | 3 | 1.17E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Fe-59 | 3 | 3.00E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | I-131 | 3 | 1.62E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | K-40 | 3 | No LLD Reported | * | * | * | (*/*) | * | * | * | (*/*) | 4.10E+03 | 6.07E+03 | 7.80E+03 | (3/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | La-140 | 3 | 1.90E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Mn-54 | 3 | 1.17E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Nb-95 | 3 | 1.23E+01 | * | * | * | (*/*) | * | | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Ra-226 | 3 | 2.50E+01 | * | * | * | (*/*) | * | * | * | (*/*) | 1.20E+01 | 1.20E+01 | 1.20E+01 | (1/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Zn-65 | 3 | 4.33E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SWISS CHARD (pCi/kg(WET)) | Gamma Scan | Zr-95 | 3 | 2.17E+01 | * | * | * | (*/*) | * | * | * | (*/*) | <LLD | <LLD | <LLD | (0/3) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Ac-228 | 6 | No LLD Reported | 1.80E+02 | 3.30E+02 | 4.70E+02 | (4/4) | 4.10E+02 | 4.40E+02 | 4.70E+02 Station-# | (2/2) 66 | 6.60E+02 | 6.65E+02 | 6.70E+02 | (2/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Ba-140 | 6 | 9.00E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Be-7 | 6 | 1.40E+02 | 3.90E+02 | 3.90E+02 | 3.90E+02 | (1/4) | 3.90E+02 | 3.90E+02 | 3.90E+02 Station-# | (1/2) 66 | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Co-58 | 6 | 1.95E+0[illegible] | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |

TABLE 5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

OYSTER CREEK NUCLEAR GENERATING STATION

JANUARY 1991 THROUGH DECEMBER, 1991

ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | INDICATOR STATIONS MEAN | INDICATOR STATIONS MAX | INDICATOR STATIONS (N/TOT) | HIGHEST ANNUAL MEAN MIN | HIGHEST ANNUAL MEAN MEAN | HIGHEST ANNUAL MEAN MAX Station-# | HIGHEST ANNUAL MEAN (N/TOT) | BACKGROUND STATIONS MIN | BACKGROUND STATIONS MEAN | BACKGROUND STATIONS MAX | BACKGROUND STATIONS (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOIL (pCi/kg(DRY)) | Gamma Scan | Co-60 | 6 | 2.67E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Cs-134 | 6 | 3.17E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Cs-137 | 6 | No LLD Reported | 4.30E+01 | 8.35E+01 | 1.50E+02 | (4/4) | 9.00E+01 | 1.20E+02 | 1.50E+02 Station-# | (2/2) 35 | 8.40E+01 | 1.22E+02 | 1.60E+02 | (2/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Fe-59 | 6 | 4.33E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | I-131 | 6 | 2.78E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | K-40 | 6 | No LLD Reported | 1.50E+03 | 2.40E+03 | 3.30E+03 | (4/4) | 3.20E+03 | 3.25E+03 | 3.30E+03 Station-# | (2/2) 66 | 4.80E+03 | 5.05E+03 | 5.30E+03 | (2/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | La-140 | 6 | 4.83E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Mn-54 | 6 | 1.98E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Nb-95 | 6 | 2.27E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |

TABLE 3
RADIOLOGICAL EN[illegible]RONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Ra-226 | 6 | No LLD Reported | 4.10E+01 | 4.26E+02 | 9.10E+02 | (4/4) | 9.20E+01 | 5.01E+02 | 9.10E+02 Station-# | (2/2) 66 | 1.70E+02 | 1.18E+03 | 2.20E+03 | (2/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Zn-65 | 6 | 8.50E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| SOIL (pCi/kg(DRY)) | Gamma Scan | Zr-95 | 6 | 3.30E+01 | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Ac-228 | 9 | 5.00E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Ba-140 | 9 | 6.10E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Be-7 | 9 | 9.33E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Co-58 | 9 | 1.32E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Co-60 | 9 | 1.58[illegible]1 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Cs-134 | 9 | 1.56E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Cs-137 | 9 | 1.26E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Fe-59 | 9 | 3.22E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | I-131 | 9 | 2.09E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | K-40 | 9 | No LLD Reported | 2.30E+03 | 2.91E+03 | 3.40E+03 | (8/8) | 2.30E+03 | 2.92E+03 | [illegible]E+03 [illegible]ion-# | (5/5) 33 | 2.50E+03 | 2.50E+03 | 2.50E+03 | (1/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | La-140 | 9 | 2.31E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Mn-54 | 9 | 1.30E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Nb-95 | 9 | 1.48E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Ra-226 | 9 | 2.14E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Zn-65 | 9 | 4.56E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| BLUE CRAB (pCi/kg(WET)) | Gamma Scan | Zr-95 | 9 | 2.49E+01 | <LLD | <LLD | <LLD | (0/8) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Ac-228 | 6 | 7.00E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Ba-140 | 6 | 9.17E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Be-7 | 6 | 1.38E+02 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Co-58 | 6 | 1.83E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Co-60 | 6 | 2.52E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Cs-134 | 6 | 2.35E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Cs-137 | 6 | 2.00E+01 | 1.90E+01 | 1.90E+01 | 1.90E+01 | (1/5) | 1.90E+01 | 1.90E+01 | 1.90E+01 Station-# | (1/5) 93 | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Fe-59 | 6 | 5.17E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | I-131 | 6 | 3.25E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | K-40 | 6 | No LLD Reported | 3.10E+03 | 3.32E+03 | 3.50E+03 | (5/5) | 3.10E+03 | 3.32E+03 | 3.50E+03 Station-# | (5/5) 93 | 3.20E+03 | 3.20E+03 | 3.20E+03 | (1/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | La-140 | 6 | 3.83E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Mn-54 | 6 | 1.92E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Nb-95 | 6 | 2.08E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Ra-226 | 6 | 1.21E+02 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Zn-65 | 6 | 5.83E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| BLUEFISH (pCi/kg(WET)) | Gamma Scan | Zr-95 | 6 | 3.45E+01 | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ac-228 | 8 | 8.75E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ba-140 | 8 | 9.25E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Be-7 | 8 | 1.46E+02 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Co-58 | 8 | 2.32E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Co-60 | 8 | 2.65E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Cs-134 | 8 | 2.38E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Cs-137 | 8 | 2.07E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Fe-55 | 8 | 5.34E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | INDICATOR STATIONS MEAN | INDICATOR STATIONS MAX | INDICATOR STATIONS (N/TOT) | HIGHEST ANNUAL MEAN MIN | HIGHEST ANNUAL MEAN MEAN | HIGHEST ANNUAL MEAN MAX Station-# | HIGHEST ANNUAL MEAN (N/TOT) | BACKGROUND STATIONS MIN | BACKGROUND STATIONS MEAN | BACKGROUND STATIONS MAX | BACKGROUND STATIONS (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | I-131 | 8 | 3.10E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | K-40 | 8 | No LLD Reported | 3.60E+03 | 3.90E+03 | 4.30E+03 | (3/3) | 3.60E+03 | 3.90E+03 | 4.30E+03 Station-# 93 | (3/3) | 3.30E+03 | 4.18E+03 | 4.70E+03 | (5/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | La-140 | 8 | 4.50E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Mn-54 | 8 | 2.20E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Nb-95 | 8 | 2.27E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ra-226 | 8 | 3.15E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Zn-65 | 8 | 6.88E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| SUMMER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Zr-95 | 8 | 3.88E+01 | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/3) | <LLD | <LLD | <LLD | (0/5) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ac-228 | 3 | 7.33E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ba-140 | 3 | 7.67E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Be-7 | 3 | 1.33E+02 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Co-58 | 3 | 2.23E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Co-60 | 3 | 2.33E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Cs-134 | 3 | 3.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX | (N/TOT) Station-# | MIN | MEAN | MAX | (N/TOT) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Cs-137 | 3 | 1.77E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Fe-59 | 3 | 5.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | I-131 | 3 | 2.60E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | K-40 | 3 | No LLD Reported | 4.00E+03 | 4.05E+03 | 4.10E+03 | (2/2) | 4.00E+03 | 4.05E+03 | 4.10E+03 | (2/2) Station-# 93 | 4.70E+03 | 4.70E+03 | 4.70E+03 | (1/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | La-140 | 3 | 3.33E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Mn-54 | 3 | 2.13E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Nb-95 | 3 | 1.80E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Ra-226 | 3 | 3.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Zn-65 | 3 | 7.33E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| WINTER FLOUNDER (pCi/kg(WET)) | Gamma Scan | Zr-95 | 3 | 3.33E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/1) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Ac-228 | 65 | 6.88E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Ba-140 | 65 | 6.57E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Be-7 | 65 | 1.18E+02 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Co-58 | 65 | 1.76E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Co-60 | 65 | 2.25E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Cs-134 | 65 | 2.42E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Cs-137 | 65 | 1.72E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Fe-59 | 65 | 4.17E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | I-131 | 65 | 2.05E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | K-40 | 65 | No LLD Reported | 7.80E+02 | 1.16E+03 | 1.70E+03 | (39/39) | 8.20E+02 | 1.25E+03 | 1.70E+03 Station-# | (13/13) 24 | 9.30E+02 | 1.36E+03 | 2.10E+03 | (26/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | La-140 | 65 | 3.12E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Mn-54 | 65 | 1.74E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Nb-95 | 65 | 1.81E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Ra-226 | 65 | 7.20E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Zn-65 | 65 | 6.11E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| CLAMS (pCi/kg(WET)) | Gamma Scan | Zr-95 | 65 | 2.97E+01 | <LLD | <LLD | <LLD | (0/39) | <LLD | <LLD | <LLD | (0/13) | <LLD | <LLD | <LLD | (0/26) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Ac-228 | 8 | 7.75E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Ba-140 | 8 | 8.38E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Be-7 | 8 | 1.31E+02 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Co-58 | 8 | 1.95E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Co-60 | 8 | 2.39E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Cs-134 | 8 | 2.13E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Cs-137 | 8 | 1.89E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | MEAN | MAX | (N/TOT) | HIGHEST ANNUAL MEAN MIN | MEAN | MAX Station-# | (N/TOT) | BACKGROUND STATIONS MIN | MEAN | MAX | (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Fe-59 | 8 | 5.63E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | I-131 | 8 | 2.56E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | K-40 | 8 | No LLD Reported | 3.70E+03 | 4.20E+03 | 4.80E+03 | (7/7) | 3.70E+03 | 4.16E+03 | 4.80E+03 Station-# | (5/5) 93 | 3.40E+03 | 3.40E+03 | 3.40E+03 | (1/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | La-140 | 8 | 3.75E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Mn-54 | 8 | 1.89E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Nb-95 | 8 | 2.05E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Ra-226 | 8 | 8.00E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Zn-65 | 8 | 7.13E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |
| TAUTOG (pCi/kg(WET)) | Gamma Scan | Zr-95 | 8 | 3.25E+01 | <LLD | <LLD | <LLD | (0/7) | <LLD | <LLD | <LLD | (0/5) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Ac-228 | 2 | 6.50E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Ba-140 | 2 | 7.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Be-7 | 2 | 1.20E+02 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Co-58 | 2 | 1.55E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Co-60 | 2 | 1.80E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Cs-134 | 2 | 1.80E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Cs-137 | 2 | 1.45E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Fe-59 | 2 | 3.50E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | I-131 | 2 | 3.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | K-40 | 2 | No LLD Reported | 2.50E+03 | 2.50E+03 | 2.50E+03 | (1/1) | 2.50E+03 | 2.50E+03 | 2.50E+03 Station-# | (1/1) 93 | 2.70E+03 | 2.70E+03 | 2.70E+03 | (1/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | La-140 | 2 | 2.50E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Mn-54 | 2 | 1.55E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Nb-95 | 2 | 1.75E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Ra-226 | 2 | 3.00E+02 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Zn-65 | 2 | 5.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| AMERICAN EEL (pCi/kg(WET)) | Gamma Scan | Zr-95 | 2 | 3.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Ac-228 | 2 | 6.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Ba-140 | 2 | 1.00E+02 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX<br>Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Be-7 | 2 | 1.30E+02 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Co-58 | 2 | 2.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Co-60 | 2 | 2.15E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Cs-134 | 2 | 1.90E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Cs-137 | 2 | 3.00E+01 | 8.60E+00 | 8.60E+00 | 8.60E+00 | (1/2) | 8.60E+00 | 8.60E+00 | 8.60E+00<br>Station-# | (1/2)<br>93 | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Fe-59 | 2 | 4.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | I-131 | 2 | 4.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | K-40 | 2 | No LLD Reported | 3.70E+03 | 3.75E+03 | 3.80E+03 | (2/2) | 3.70E+03 | 3.75E+03 | 3.80E+03<br>Station-# | (2/2)<br>93 | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | La-140 | 2 | 4.00E+01 | [illegible] | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Mn-54 | 2 | 1.45E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Nb-95 | 2 | 2.10E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Ra-226 | 2 | 3.55E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Zn-65 | 2 | 5.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| WHITE PERCH (pCi/kg(WET)) | Gamma Scan | Zr-95 | 2 | 2.95E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Ac-228 | 1 | 7.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Ba-140 | 1 | 9.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Be-7 | 1 | 1.10E+02 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Co-58 | 1 | 1.90E+01 | <LLD | <LLD | <LLD | (0/1) | [illegible] | [illegible] | <LLD | (0/1) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Co-60 | 1 | 2.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Cs-134 | 1 | 1.90E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Cs-137 | 1 | 1.80E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Fe-59 | 1 | 5.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | I-131 | 1 | 4.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | K-40 | 1 | No LLD Reported | 3.70E+03 | 3.70E+03 | 3.70E+03 | (1/1) | 3.70E+03 | 3.70E+03 | 3.70E+03 Station-# | (1/1) 33 | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | La-140 | 1 | 4.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Mn-54 | 1 | 1.50E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Nb-95 | 1 | 2.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Ra-226 | 1 | 2.00E+02 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Zn-65 | 1 | 6.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| BLOWFISH (pCi/kg(WET)) | Gamma Scan | Zr-95 | 1 | 3.00E+01 | <LLD | <LLD | <LLD | (0/1) | <LLD | <LLD | <LLD | (0/1) | * | * | * | (*/*) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Ac-228 | 32 | No LL Reported | 2.10E+02 | 3.77E+02 | 6.10E+02 | (24/24) | 5.00E+02 | 5.17E+02 | 5.40E+02 Station-# | (4/4) 33 | 4.10E+02 | 6.06E+02 | 7.70E+02 | (8/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Ba-140 | 32 | 9.47E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Be-7 | 32 | 1.52E+02 | 1.[illegible]+02 | 3.23E+02 | 8.60E+02 | (7/24) | 2.50E+02 | 4.20E+02 | 8.60E+02 Station-# | (4/4) 33 | 5.30E+02 | 5.30E+02 | 5.30E+02 | (1/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Co-58 | 32 | 2.02E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Co-60 | 32 | 2.46E+01 | 1.50E+01 | 1.02E+02 | 2.00E+02 | (6/24) | 2.00E+02 | 2.00E+02 | 2.00E+02 Station-# | (1/4) 32 | <LLD | <LLD | <LLD | (0/8) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Cs-134 | 32 | 3.17E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Cs-137 | 32 | 2.16E+01 | 1.50E+01 | 7.22E+01 | 2.00E+02 | (16/24) | 1.70E+02 | 1.90E+02 | 2.00E+02 Station-# | (4/4) 33 | 4.50E+01 | 6.32E+01 | 7.30E+01 | (6/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Fe-59 | 32 | 5.13E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | I-131 | 32 | 3.46E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | K-40 | 32 | No LLD Reported | 1.20E+03 | 6.27E+03 | 1.50E+04 | (24/24) | 1.30E+04 | 1.40E+04 | 1.50E+04 Station-# | (4/4) 33 | 9.60E+03 | 1.4[illegible]E+04 | 1.70E+04 | (8/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | La-140 | 32 | 4.28E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Mn-54 | 32 | 1.94E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |

**TABLE 3**
**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**
**OYSTER CREEK NUCLEAR GENERATING STATION**
**JANUARY, 1991 THROUGH DECEMBER, 1991**
**ANNUAL SUMMARY**

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX<br>Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Nb-95 | 32 | 2.33E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Ra-226 | 32 | No LLD Reported | 5.70E+01 | 3.22E+02 | 1.50E+03 | (24/24) | 1.30E+02 | 4.77E+02 | 1.50E+03<br>Station-# | (4/4)<br>33 | 1.10E+02 | 4.51E+02 | 1.50E+03 | (8/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Zn-65 | 32 | 8.09E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| AQUATIC SEDIMENT (pCi/kg(DRY)) | Gamma Scan | Zr-95 | 32 | 3.52E+01 | <LLD | <LLD | <LLD | (0/24) | <LLD | <LLD | <LLD | (0/4) | <LLD | <LLD | <LLD | (0/8) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Ac-228 | 7 | 6.57E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Ba-140 | 7 | 7.86E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Be-7 | 7 | 1.23E+02 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Co-58 | 7 | 1.66E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS MIN | INDICATOR STATIONS MEAN | INDICATOR STATIONS MAX | INDICATOR STATIONS (N/TOT) | HIGHEST ANNUAL MEAN MIN | HIGHEST ANNUAL MEAN MEAN | HIGHEST ANNUAL MEAN MAX Station-# | HIGHEST ANNUAL MEAN (N/TOT) | BACKGROUND STATIONS MIN | BACKGROUND STATIONS MEAN | BACKGROUND STATIONS MAX | BACKGROUND STATIONS (N/TOT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Co-60 | 7 | 2.36E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Cs-134 | 7 | 2.11E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Cs-137 | 7 | 2.12E+01 | 8.00E+00 | 1.05E+01 | 1.30E+01 | (2/6) | 8.00E+00 | 1.05E+01 | 1.30E+01 Station-# | (2/6) 93 | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Fe-59 | 7 | 5.57E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | I-131 | 7 | 2.66E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | K-40 | 7 | No LLD Reported | 3.40E+03 | 3.70E+03 | 4.20E+03 | (6/6) | 3.40E+03 | 3.70E+03 | 4.20E+03 Station-# | (6/6) 93 | 4.00E+03 | 4.00E+03 | 4.00E+03 | (1/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | La-140 | 7 | 3.24E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Mn-54 | 7 | 1.74E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Nb-95 | 7 | 2.06E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

OYSTER CREEK NUCLEAR GENERATING STATION

JANUARY, 1991 THROUGH DECEMBER, 1991

ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Ra-226 | 7 | 1.14E+02 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Zn-65 | 7 | 6.57E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| WEAKFISH (pCi/kg(WET)) | Gamma Scan | Zr-95 | 7 | 3.34E+01 | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/6) | <LLD | <LLD | <LLD | (0/1) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Ac-228 | 2 | 4.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Ba-140 | 2 | 6.00E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Be-7 | 2 | 9.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Co-58 | 2 | 1.30E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Co-60 | 2 | 1.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Cs-134 | 2 | 1.45E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Cs-137 | 2 | 1.25E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Fe-59 | 2 | 3.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | I-131 | 2 | 2.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | K-40 | 2 | No LLD Reported | 3.60E+03 | 3.60E+03 | 3.60E+03 | (2/2) | 3.60E+03 | 3.60E+03 | 3.60E+03 Station-# | (2/2) 93 | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | La-140 | 2 | 3.10E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Mn-54 | 2 | 1.25E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Nb-95 | 2 | 1.40E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Ra-226 | 2 | 1.70E+02 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | ( /2) | * | * | * | (*/*) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Zn-65 | 2 | 3.50E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
OYSTER CREEK NUCLEAR GENERATING STATION
JANUARY, 1991 THROUGH DECEMBER, 1991
ANNUAL SUMMARY

| SAMPLE TYPE | ANALYSIS | NUCLIDE | # OF ANAL. PERF. | LLD | INDICATOR STATIONS | | | | HIGHEST ANNUAL MEAN | | | | BACKGROUND STATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MEAN | MAX | (N/TOT) | MIN | MEAN | MAX Station-# | (N/TOT) | MIN | MEAN | MAX | (N/TOT) |
| STRIPED BASS (pCi/kg(WET)) | Gamma Scan | Zr-95 | 2 | 2.60E+01 | <LLD | <LLD | <LLD | (0/2) | <LLD | <LLD | <LLD | (0/2) | * | * | * | (*/*) |

## DIRECT RADIATION MONITORING

Dose rates from external radiation sources were measured at a number of locations in the vicinity of the OCNGS using thermoluminescent dosimeters (TLDs). Naturally occurring sources, including radiations of cosmic origin and natural radioactive materials in the air and ground, as well as fallout from prior nuclear weapon testing, resulted in a certain amount of penetrating radiation being recorded at all monitoring locations. Indicator TLDs were placed systematically with at least one station in each of 16 cardinal compass sectors (in a ring) at the site at a maximum distance of 1.5 miles. TLDs were also placed within a five mile radius of the OCNGS, in locations where the potential for deposition of radioactivity is known to be high, in areas of public interest, population centers, and in background locations which are typically greater than ten miles distant from the OCNGS and generally in an upwind direction.

### Sample Collection and Analysis

A state-of-the-art thermoluminescent dosimeter is used. Thermoluminescence is a process in which ionizing radiation, upon interacting with the sensitive material of the TLD (the phosphor or 'element') causes some of the energy deposited in the phosphor to be stored in stable 'traps' in the TLD material. These TLD traps are so stable that they do not decay appreciably over the course of months or even years. This provides an excellent method of integrating the exposure received over a period of time. The energy stored in the TLDs as a result of interactions with radiation is removed and measured by a controlled heating process in a calibrated reading system. As the TLD is heated, the phosphor releases the stored energy as light. The amount of light given off is directly proportional to the radiation dose the TLD received. The reading process 'zeros' the TLD and prepares it for reuse.

The TLDs in use for environmental monitoring at the OCNGS are capable of accurately measuring exposures between 1 mRem (well below normal environmental levels for the quarterly monitoring periods) and 1000 REM.

During 1991, TLDs were collected every twelve weeks from locations ranging from less than 0.2 miles to 35.1 miles from the OCNGS. Prior to July 1991, four GPUN Panasonic TLDs and one Teledyne Isotopes (vendor supplied) TLD were exposed at each of 63 monitoring locations. Two of the 63 monitoring locations were used as quality control (QC) stations at which 4 additional GPUN Panasonic TLDs and one Teledyne Isotopes TLD were exposed. A program change occurred in July 1991 in which the Teledyne Isotopes TLD network was scaled down from 63 monitoring locations to 10 monitoring locations (Appendix C). The 10 remaining monitoring locations are being used as quality control stations. The GPUN Panasonic TLD network was not altered. GPUN Panasonic TLDs provide sixteen independent detectors at each station. Teledyne Isotopes TLDs provide an additional four independent measurements.

TLDs were exposed on a 12 week basis (84 days). Because five collection dates occurred in 1991, five periods of data are listed in Tables J-1 and J-2 in Appendix J. Scheduled exposure periods were:

Table 4
TLD EXPOSURE PERIODS IN 1991

| Start Date | Collection Date |
|---|---|
| 29 Oct 90 | 21 Jan 91 |
| 21 Jan 91 | 15 Apr 91 |
| 15 Apr 91 | 08 Jul 91 |
| 08 Jul 91 | 30 Sep 91 |
| 30 Sep 91 | 23 Dec 91 |

All TLD dose rate data presented in this report have been normalized to eliminate differences caused by slightly differing exposure periods. GPUN Panasonic TLD results were normalized to a standard quarter (91.3 days) and Teledyne Isotopes data to a standard month (30.4 days). TLD dose rate data are presented in Tables J-1 and J-2 in Appendix J.

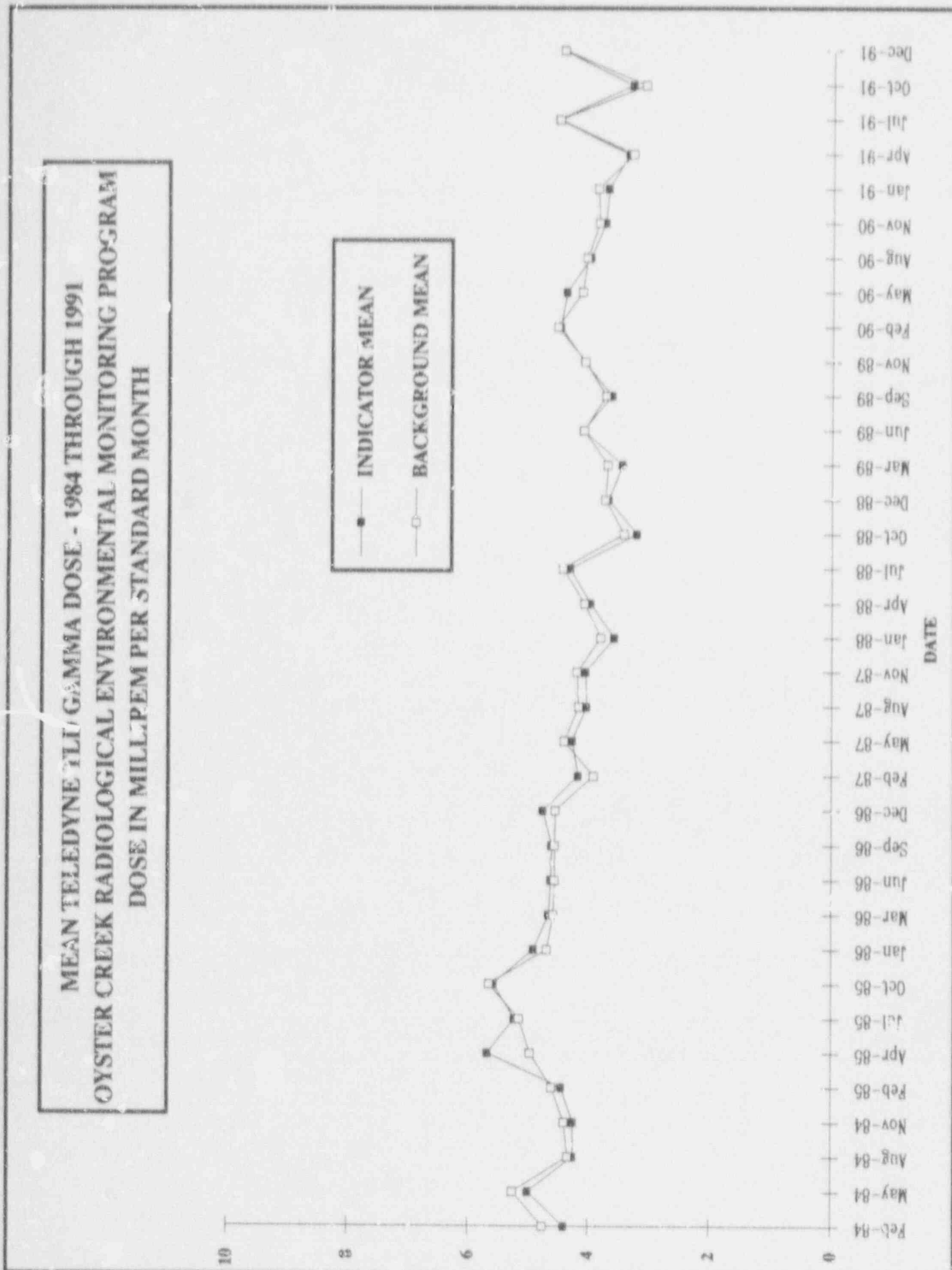
Results

In 1991, the dose rate measured at indicator stations using Teledyne Isotopes TLDs averaged 3.9 mRem/standard month and ranged from 2.6 to 6.2 mRem/standard month (Table J-1). The dose at background TLD stations averaged 3.9 mRem/standard month and ranged from 2.8 to 5.6 mRem/standard month. The mean dose rates from indicator and background stations were the same suggesting that OCNGS operation contributed little if any to off-site exposure. These results are consistent with the results of measurements from previous years (Fig. 6). Considering that the standard deviation of dose rates was as high as 1.1 mRem/standard month, the data indicate that dose rates are not significantly higher close to the OCNGS (Fig. 7).

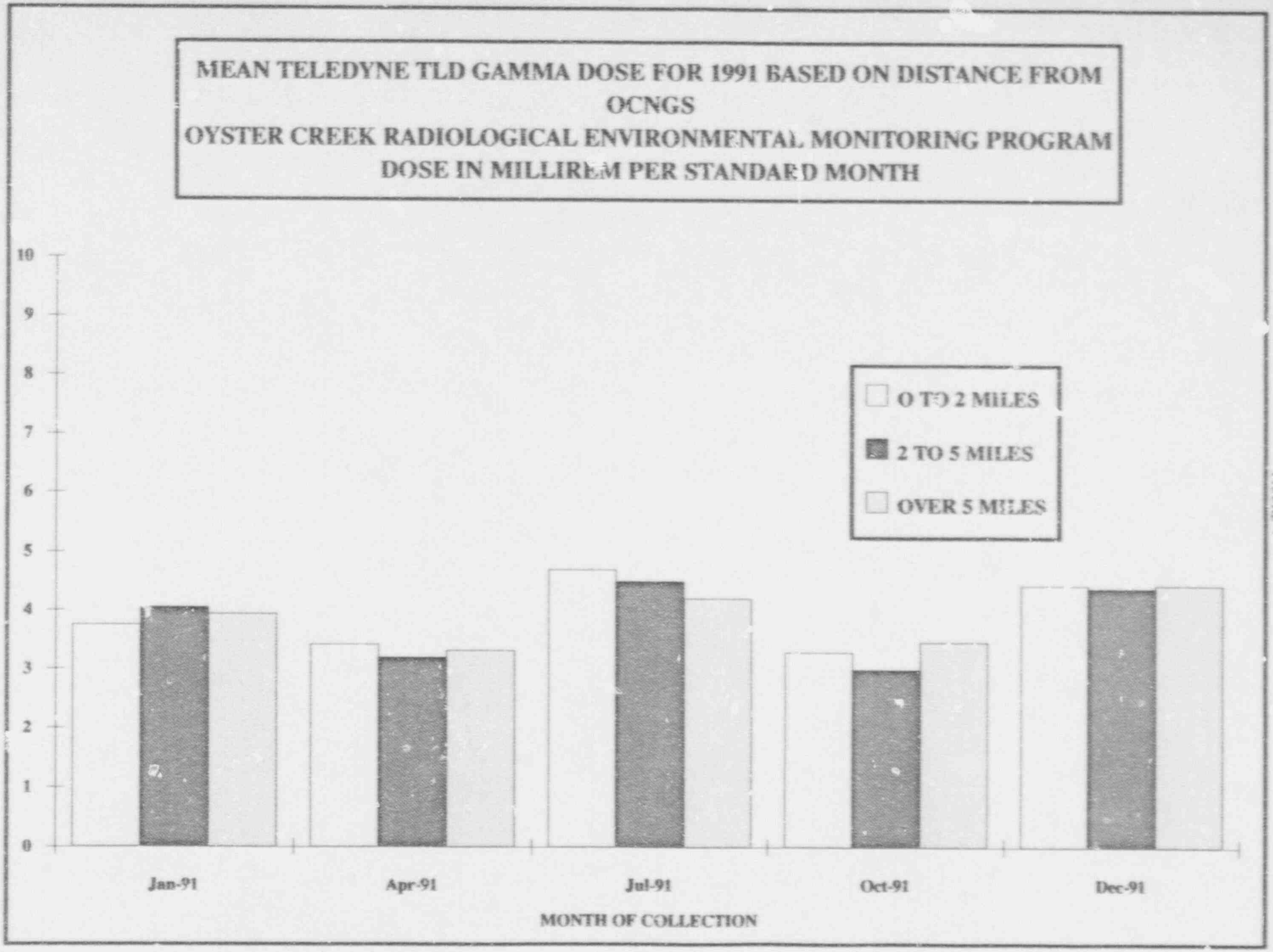
Regarding GPUN Panasonic TLD data, the mean dose rate from indicator stations was 10.50 mRem/standard quarter with a range from 8.35 to 15.83 mRem/standard quarter. The background mean dose was 11.40 mRem/standard quarter with doses ranging from 9.36 to 14.69 mRem/standard quarter. The mean background dose exceeded the mean indicator dose again suggesting OCNGS had little if any affect on off-site exposure. The standard deviation of dose rates ranged from 0.23 to 10.70 mRem/standard quarter. When GPUN Panasonic TLD data were converted to mRem/standard month for comparison with Teledyne TLD data, no relationship between dose rate and distance from the OCNGS was observed (Fig. 8).

A comparison of dose per affected compass sector between Teledyne Isotopes and GPUN Panasonic TLDs was performed using

FIGURE 6



MEAN TELEDYNE TLD GAMMA DOSE - 1984 THROUGH 1991
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
DOSE IN MILLIREM PER STANDARD MONTH
INDICATOR MEAN
BACKGROUND MEAN
0
2
4
6
8
10
Feb-84
May-84
Aug-84
Nov-84
Feb-85
Apr-85
Jul-85
Oct-85
Jan-86
Mar-86
Jun-86
Sep-86
Dec-86
Feb-87
May-87
Aug-87
Nov-87
Jan-88
Apr-88
Jul-88
Oct-88
Dec-88
Mar-89
Jun-89
Sep-89
Nov-89
Feb-90
May-90
Aug-90
Nov-90
Jan-91
Apr-91
Jul-91
Oct-91
Dec-91
DATE



MEAN TELEDYNE TLD GAMMA DOSE FOR 1991 BASED ON DISTANCE FROM OCNGS
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
DOSE IN MILLIREM PER STANDARD MONTH
10
9
8
7
6
5
4
3
2
1
0
O TO 2 MILES
2 TO 5 MILES
OVER 5 MILES
Jan-91
Apr-91
Jul-91
Oct-91
Dec-91
MONTH OF COLLECTION


FIGURE 7

**MEAN PANASONIC TLD GAMMA DOSE FOR 1991 BASED ON DISTANCE FROM OCNGS**
**OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**
**DOSE IN MILLIREM PER STANDARD MONTH**

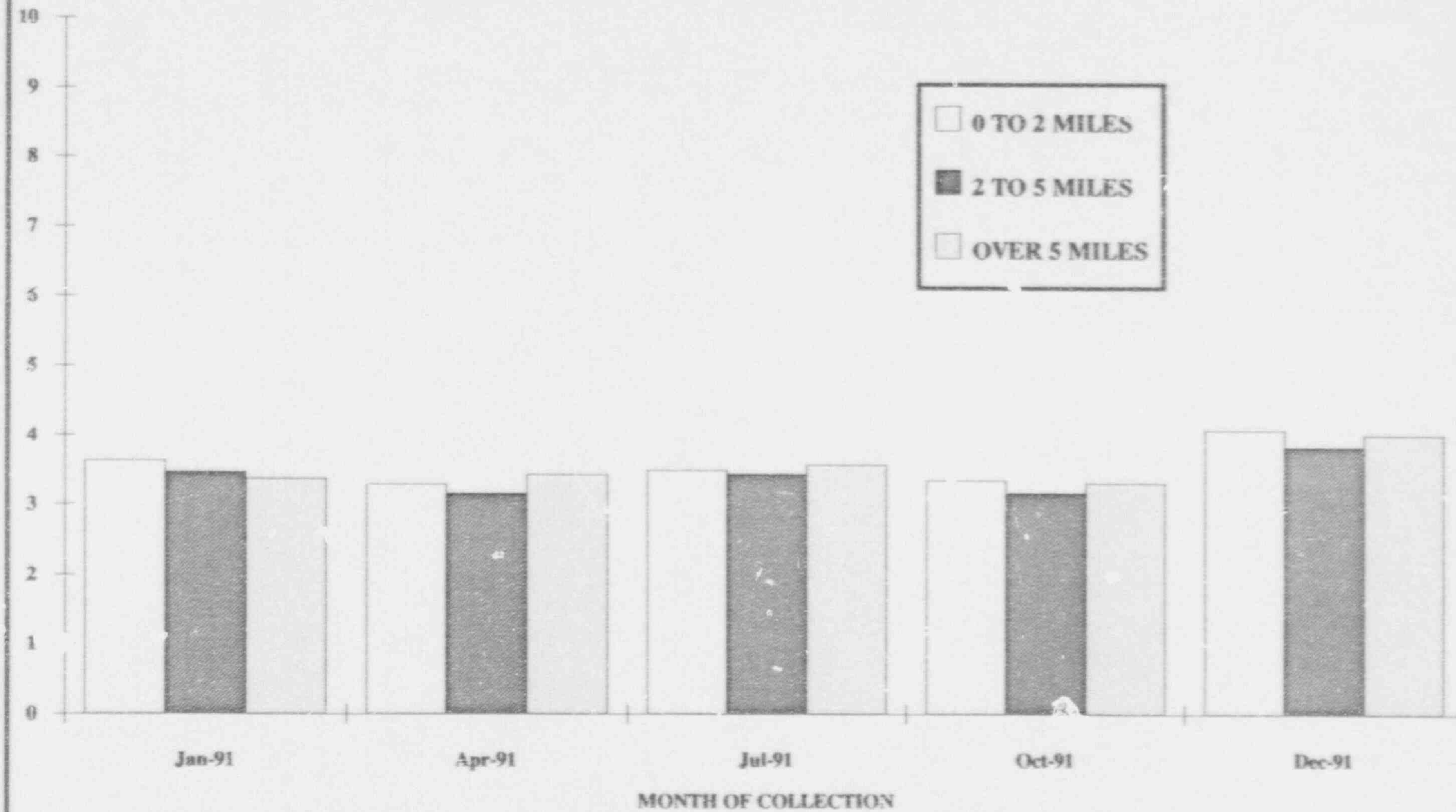
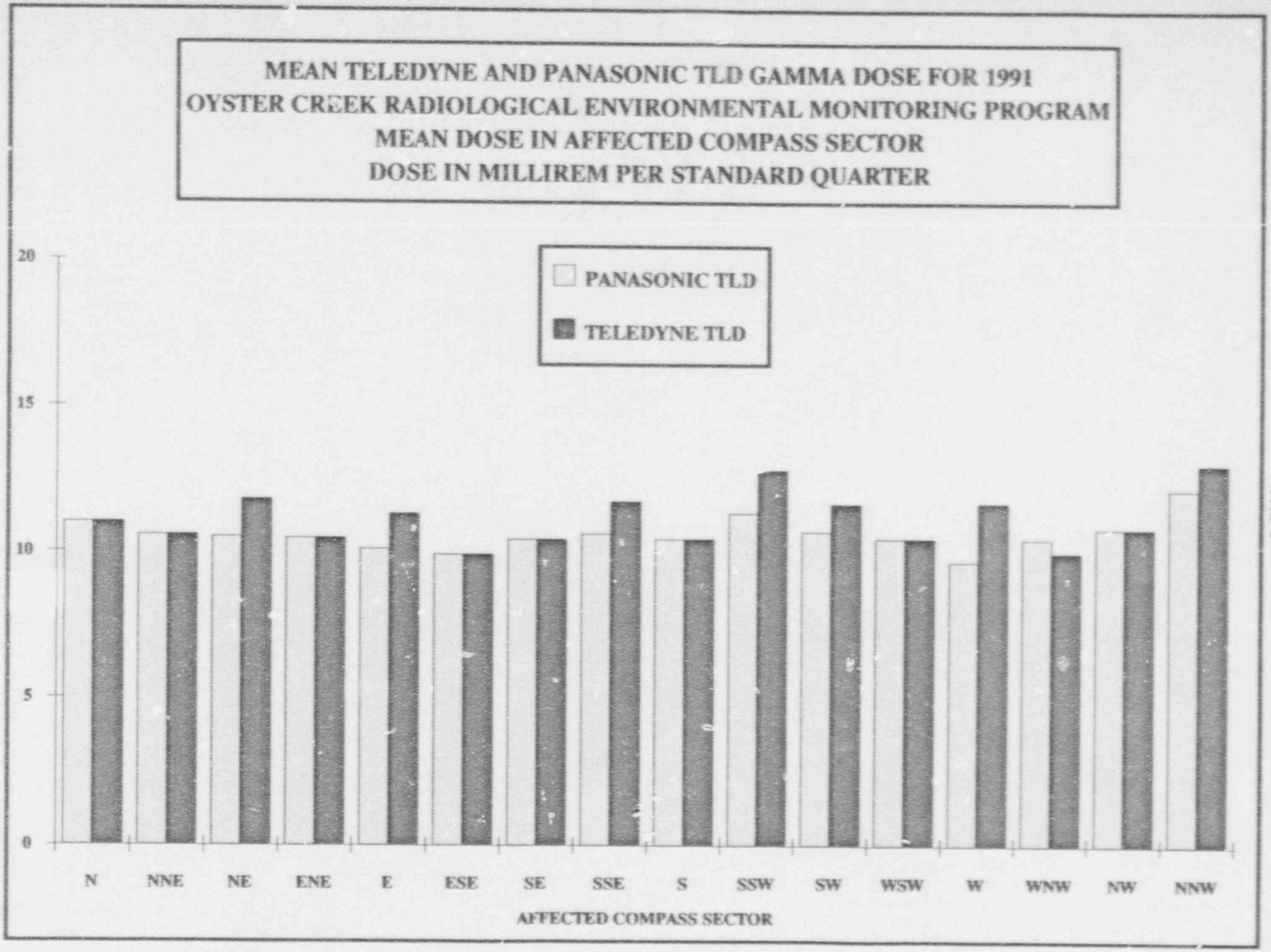



FIGURE 8

1991 data (Fig. 9). The results indicate good correlation between the dose per sector as recorded by the two independent TLD networks. In addition, the data indicate that the north-northwest sector had the highest 1991 dose. Based upon on-site meteorology for 1991, the highest air dispersion (X/Q) factors were in the southeast sector. The north-northwest sector is almost directly opposite the southeast sector which is further evidence that the OCNGS had little if any effect on off-site exposure.


MEAN TELEDYNE AND PANASONIC TLD GAMMA DOSE FOR 1991
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
MEAN DOSE IN AFFECTED COMPASS SECTOR
DOSE IN MILLIREM PER STANDARD QUARTER
PANASONIC TLD
TELEDYNE TLD
20
15
10
5
0
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
AFFECTED COMPASS SECTOR

85

FIGURE 9

## ATMOSPHERIC MONITORING

A primary exposure pathway to man is the inhalation and ingestion of radionuclides released to the atmosphere. Radioactivity in ambient air was sampled by a network of thirteen continuously operating air samplers. Precipitation samples were also collected at these thirteen locations.

Indicator air sampling and precipitation stations are located in prevailing downwind directions, local population areas, and areas of public and special interest. All indicator stations are located within 6.5 miles of the OCNGS. Background air sampling and precipitation stations are located greater than 17 miles from the site in Lakewood, Allenhurst, Cookstown, and Hammonton, NJ.

### Sample Collection and Analysis

Mechanical air samplers are used to continuously draw a recorded volume of air through a glass fiber (particulate) filter and then through a charcoal cartridge. A dry gas meter, which is temperature compensated, is used inside the air sampler to record air volumes. Internal vacuums are also measured in order to pressure correct the indicated volume. All air samplers are maintained and calibrated by GPU Nuclear instrument and control technicians.

The particulate filters were collected weekly and analyzed for gross beta radioactivity. The filters were then combined monthly by individual station locations and analyzed for gamma-emitting radionuclides.

Charcoal cartridges, used to collect gaseous radioiodines, contain activated charcoal. Charcoal cartridges were collected weekly and analyzed for iodine-131 (I-131) activity.

Precipitation samples were collected monthly using an eight-inch diameter funnel that drains into a collection container. A quarterly composite per station was then prepared. Six of the thirteen composite samples were analyzed for tritium and gamma-emitting radionuclides. The remaining seven samples were stored pending the outcome of the six analyzed samples.

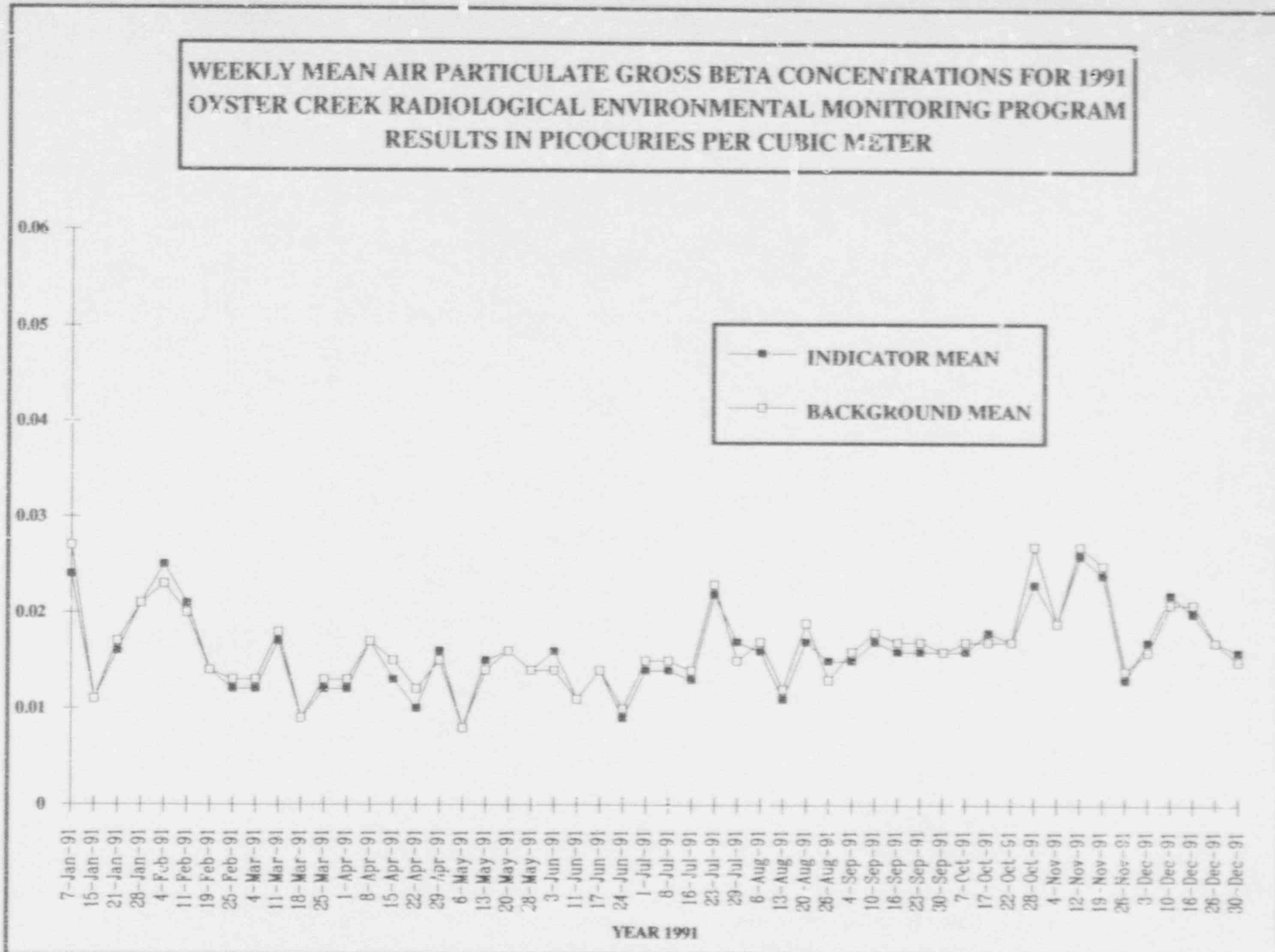
Results

The results of the atmospheric monitoring during 1991 demonstrated that, as in previous years, the radioactive airborne effluents associated with the OCNGS did not have any measurable effects on the environment.

During 1991, 675 gross beta analyses were performed on air particulate filters (Table 3). One of these analysis could not meet the required LLD because an air sampler malfunction yielded a very low total volume (Appendix B). For the purposes of the descriptive statistical analyses reported in Table 3, these results were excluded. The background mean gross beta activity (0.0165 pCi/m3) was slightly higher than the indicator mean (0.0160 pCi/m3) and all gross beta analysis results were within two standard deviations of the historical mean.

Comparison of the 1991 weekly mean air particulate gross beta concentrations for indicator and background stations indicates that indicator and background concentrations were essentially identical (Figure 10). These results are consistent with the results of gross beta analyses of air samples from previous years (Figure 11). The air particulate gross beta analysis results clearly show that effluent containing gross beta radioactivity from OCNGS operation did not have any measurable impact on the local environment.

FIGURE 10



WEEKLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS FOR 1991
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PICOCURIES PER CUBIC METER
INDICATOR MEAN
BACKGROUND MEAN
0.06
0.05
0.04
0.03
0.02
0.01
0
7-Jan-91
15-Jan-91
21-Jan-91
28-Jan-91
4-Feb-91
11-Feb-91
19-Feb-91
25-Feb-91
4-Mar-91
11-Mar-91
18-Mar-91
25-Mar-91
1-Apr-91
8-Apr-91
15-Apr-91
22-Apr-91
29-Apr-91
6-May-91
13-May-91
20-May-91
28-May-91
3-Jun-91
11-Jun-91
17-Jun-91
24-Jun-91
1-Jul-91
8-Jul-91
16-Jul-91
23-Jul-91
29-Jul-91
6-Aug-91
13-Aug-91
20-Aug-91
26-Aug-91
4-Sep-91
10-Sep-91
16-Sep-91
23-Sep-91
30-Sep-91
7-Oct-91
17-Oct-91
22-Oct-91
28-Oct-91
4-Nov-91
12-Nov-91
19-Nov-91
26-Nov-91
3-Dec-91
10-Dec-91
16-Dec-91
26-Dec-91
30-Dec-91
YEAR 1991

**MONTHLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS**
**1984 THROUGH 1991**
**OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**
**RESULTS IN PICOCURIES PER CUBIC METER**

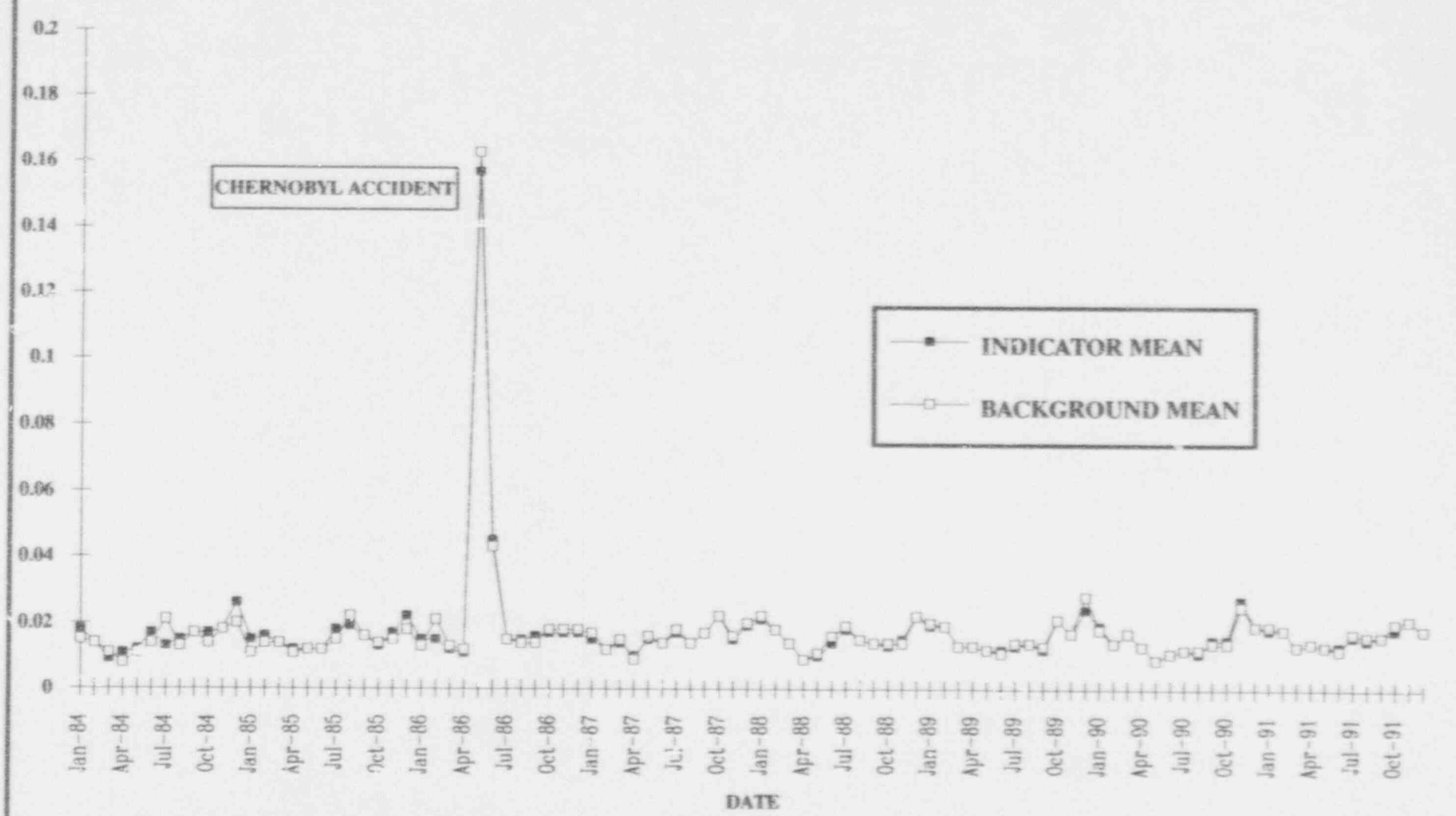



FIGURE 11

Gamma isotopic analyses were performed on 169 air particulate filter composites (Table 3). Three naturally occurring radionuclides, beryllium-7, potassium-40, and radium-226 were detected. Be-7 activity was consistently seen at both indicator and background stations in similar concentrations. Potassium-40 and radium-226 were each detected only once at indicator stations. The concentrations of each radionuclide was less than the respective yearly mean LLD and were within two standard deviations of the historical mean. None of these nuclides can be attributed to effluents from the OCNGS.

Air charcoal cartridges (675) were analyzed for iodine-131 (I-131) and no radioiodine was detected in any of the samples (Table 3). One result did not meet the required sensitivity when a malfunctioning sampler yielded a low sample volume. This result was excluded from Table 3 (Appendix B).

All 13 air iodine cartridges collected from both background and indicator stations on December 30, 1991 were found to be contaminated with a trace quantity of xenon-133 activity. Exact quantities could not be determined because of cartridge and detector unknowns. Strict compliance to procedures regarding the handling of these filters was maintained throughout the collection and pre-shipment process, suggesting the contamination source to be other than the OCNGS. Inadvertent contamination most likely occurred when the shipment of the filters, in transit via overnight air courier to the analysis laboratory, came in close proximity to this nuclide (Xe-133) which is used as a radiopharmaceutical.

With regard to precipitation sampling, 24 gamma isotopic and 24 tritium analyses were performed in 1991 (Table 3). Tritium activity was detected in 3 of 12 indicator samples and 5 of 12 background samples. The maximum and mean results from the background samples were 250 and 198 pCi/liter respectively.

The maximum and mean results from the indicator stations were slightly lower, 180 and 170 pCi/liter respectively. Considering those data, in addition to the large environmental inventory of tritium due to cosmic ray interactions and nuclear weapons testing, it is highly unlikely that the relatively minute amount of tritium in the OCNGS effluents could have had a measurable effect on existing environmental concentrations. The only other radionuclide detected was naturally occurring beryllium-7, which was identified in one indicator sample and one background sample (Table 3). The concentration detected in the background sample was 22 pCi/liter while the indicator station concentration was 12 pCi/liter. This radionuclide cannot be attributed to OCNGS effluents.

## AQUATIC MONITORING

Brackish water from Barnegat Bay is drawn in through the south branch of Forked River, pumped into the OCNGS cooling systems, and then discharged to Barnegat Bay via Oyster Creek. Fish, clams, and crabs are harvested from the bay on a recreational and, to a limited extent, commercial basis. The ingestion pathway is addressed because of fish, clam, and crab consumption.

On occasion, a radioactive liquid release is discharged under the limits established in the OCNGS Technical Specifications and 10CFR20. Highly purified water, containing traces of radioactivity, is discharged into Oyster Creek which has a minimum flow rate of slightly under one-half million gallons per minute. Samples of surface water, sediment, fish, blue crab, and hard clams were routinely collected from the OCNGS intake and discharge canals, Barnegat Bay, Manahawkin Bay, and Great Bay in order to monitor any environmental impact that may be associated with these releases.

### Sample Collection and Analysis

Surface water, sediment, and clam samples were collected every four weeks. Grab samples of surface water and sediment were collected from six indicator stations and two background stations. Grab samples of clams were collected from three indicator and two background stations. Three indicator stations for surface water and sediment are located in the OCNGS discharge canal - Oyster Creek. No clams are available for collection at these stations. Three indicator stations are located in Barnegat Bay in close proximity to the mouth of Oyster Creek. One background station is located in Manahawkin

Bay, approximately 11 miles south of the OCNGS. A second background station is located approximately 22 miles south of the OCNGS in Great Bay.

Blue crab and fish samples were collected every four weeks (when available) from two indicator stations and one background station. Both indicator stations are located in the OCNGS discharge canal and the background station is located in Great Bay. Crab pots were used to catch blue crab. The hook and line technique was used to catch fish.

All samples were analyzed for gamma-emitting nuclides; water samples were also subjected to tritium analyses.

Results

Operation of the OCNGS had no detectable effect upon the local surface water which was sampled 104 times at eight different locations during 1991. Two gamma-emitting nuclides, potassium-40 (K-40) and radium-226 (Ra-226), were detected in 101 and 4 samples respectively (Table 3). Tritium (H-3) activity was also detected in 2 samples (Table 3). These three radionuclides are naturally occurring and commonly found in salt water at or above the observed concentrations. No other radionuclides were detected in surface water samples.

Six gamma-emitting nuclides were detected in the 32 sediment samples collected during 1991 (Table 3). Four of these radionuclides, beryllium-7, potassium-40, radium 226, and actinium-228 are naturally occurring and were detected at both background and indicator stations. Cesium-137, which is a fission product, was also detected in 75 percent of background samples and 67 percent of indicator samples. As fallout, Cs-137 was widely distributed and detected in considerable abundance following atmospheric weapons tests and the

Chernobyl accident. It was also released in small quantities from the OCNGS in liquid effluents in 1991, as well as in past years. The presence of this radionuclide in a higher percentage of background samples than indicator samples suggests that the cesium-137 activity detected in Barnegat Bay sediments originated from the former sources and not OCNGS operation.

Cobalt-60 was detected in twenty-five percent of the aquatic sediment indicator station samples and none of the background station samples (Table 3). The presence of this radionuclide in Barnegat Bay sediments is of interest because it can be attributed to OCNGS liquid effluents. As documented in previous reports, OCNGS related cobalt-60 activity has been found in sediment and clams from Barnegat Bay since at least the mid-1970's. The volume of liquid effluents has been significantly reduced since that time and this decrease in the rate of input of cobalt-60 to the environment, combined with radioactive decay of the existing inventory, has resulted in a gradual decline in the cobalt-60 concentration in sediment and clams (Fig. 12 and 13). The last detectable concentration of this radionuclide in clams was during the third quarter of 1987 (Fig. 13).

Sixty-five clam samples were collected from five different locations during 1991. Gamma isotopic analyses indicated that the only gamma-emitting nuclide present was potassium-40 (K-40) which is naturally occurring and found in great abundance in salt water (Table 3).

Nine blue crab samples were collected from three locations during 1991. A gamma isotopic analysis was performed on each sample of crab meat and naturally occurring potassium-40 (K-40) was the only radionuclide identified (Table 3). The close association of this species with Barnegat Bay sediments could

**MEAN COBALT-60 CONCENTRATION IN AQUATIC SEDIMENT - 1984 THROUGH 1991**
**OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**
**RESULTS IN PICOCURIES PER KILOGRAM (DRY)**

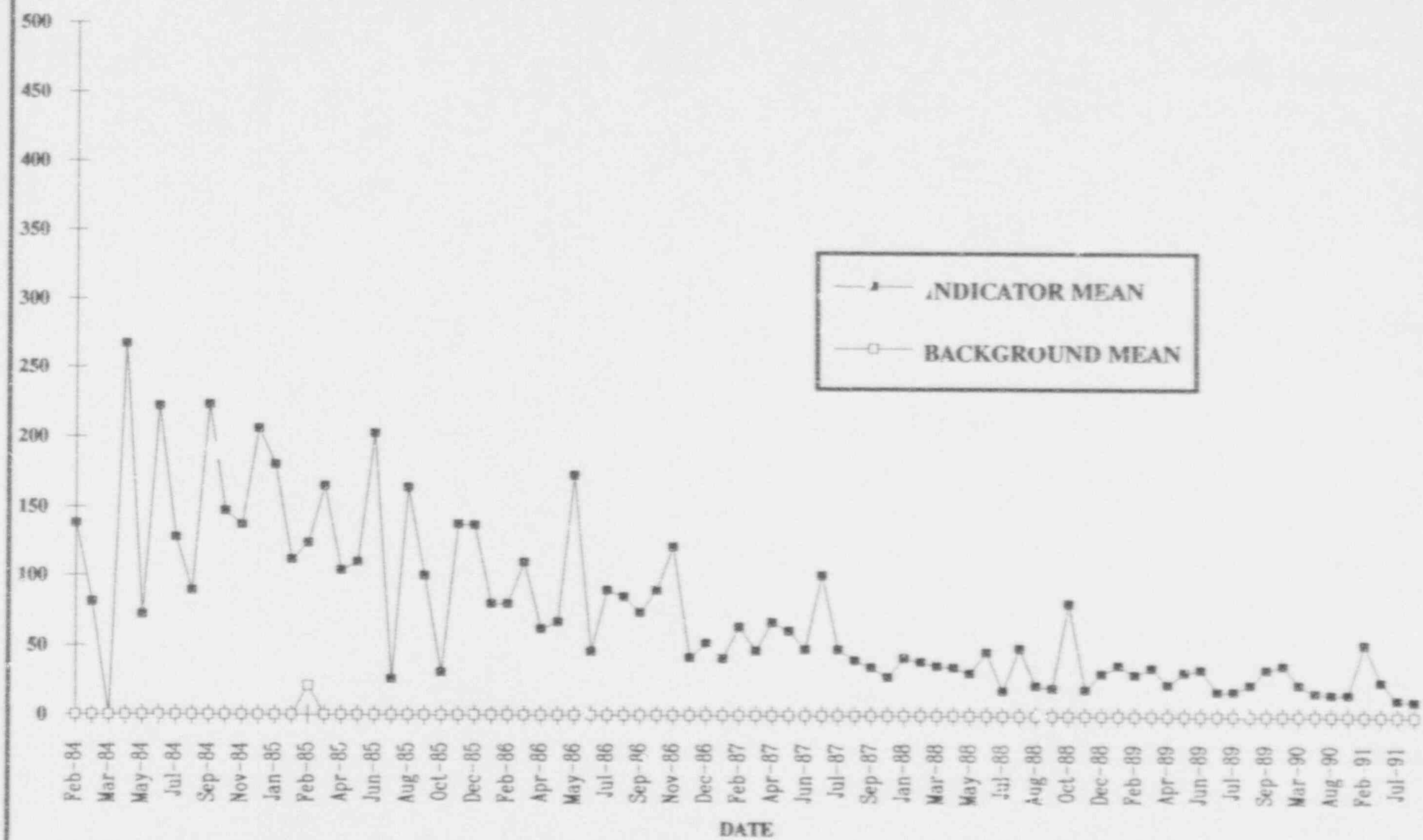
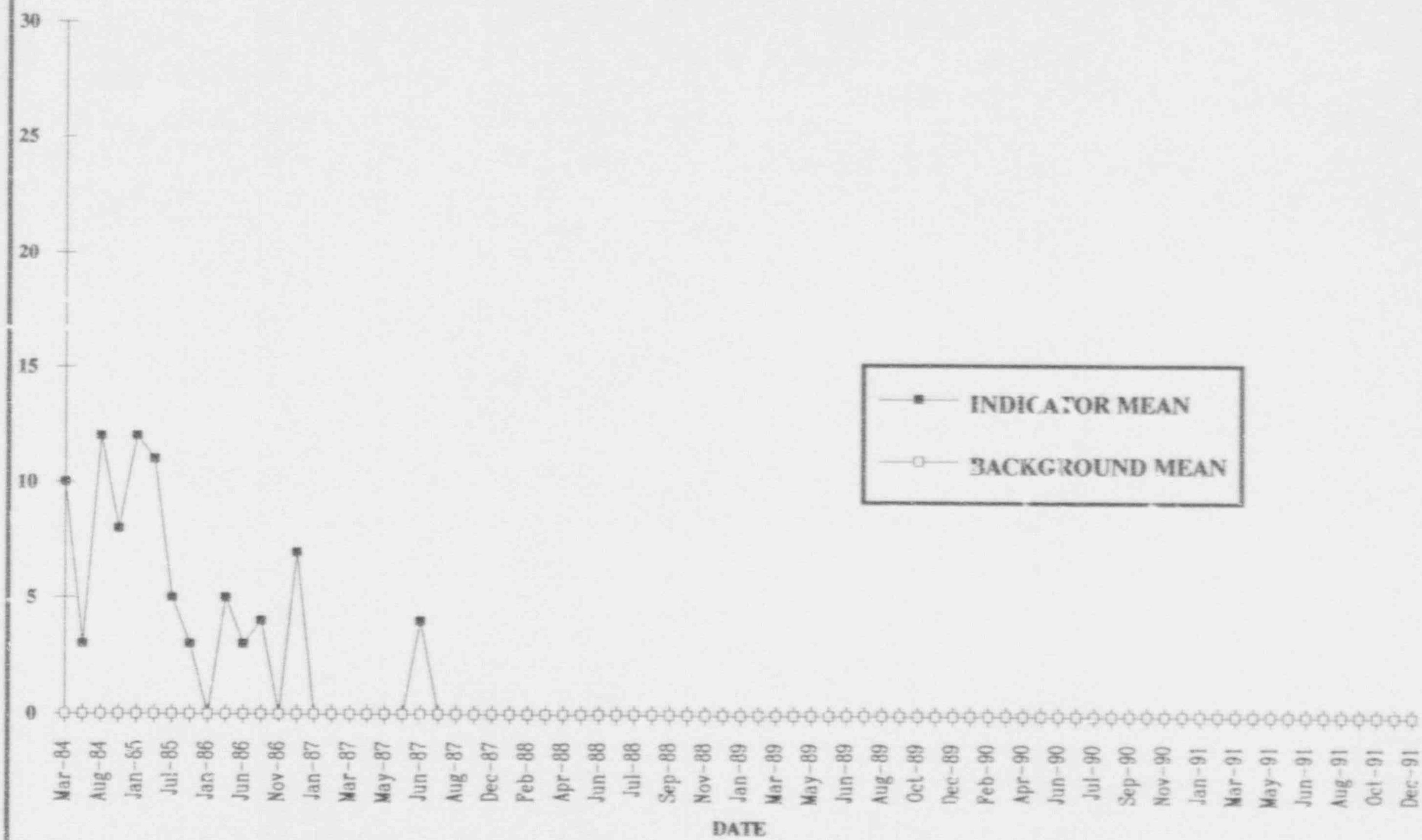



FIGURE 12

FIGURE 13

**MEAN COBALT-60 CONCENTRATION IN CLAMS - 1984 THROUGH 1991**
**OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**
**RESULTS IN PICOCURIES PER KILOGRAM (WET)**



make it susceptible to cobalt-60 uptake. However, no detectable Co-60 activity has been observed in blue crab samples since routine collection began in 1985 (Fig. 14).

Thirty-nine fish samples, yielding 9 species, were collected from 3 sampling locations during 1991. The species and number of samples collected are listed below:

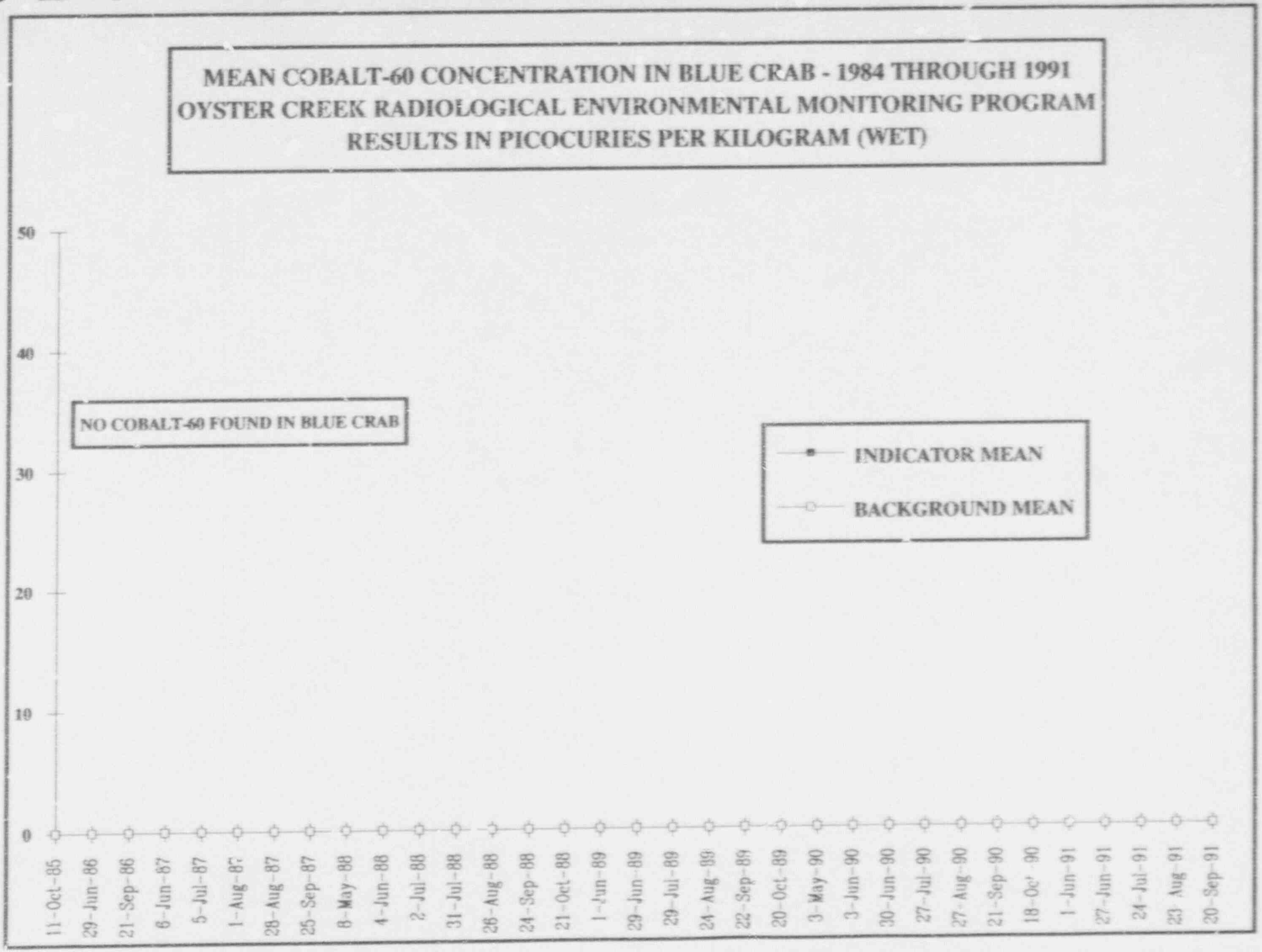
TABLE 5

SPECIES OF FISH CAUGHT AS PART OF THE OCNGS REMP IN 1991

| Fish | Number of Samples |
|---|---|
| summer flounder | 8 |
| tautog | 8 |
| weakfish | 7 |
| bluefish | 6 |
| winter flounder | 3 |
| American eel | 2 |
| striped bass | 2 |
| white perch | 2 |
| blowfish | 1 |

Naturally occurring potassium-40 was detected in each of the 39 fish samples (Table 3). A detectable quantity of cesium-137 activity was observed in 2 of 6 weakfish, 1 of 5 bluefish, and 1 of 2 white perch samples, all collected from indicator station 93 (Table 3). The results ranged from a maximum of 19 pCi/kg (wet) to a minimum of 8 pCi/kg (wet). As discussed above, Cs-137 is a ubiquitous fission fallout product and has been detected in considerable abundance following atmospheric weapons tests and the Chernobyl nuclear accident. It was also discharged in very small quantities (Table 2) from the OCNGS during 1991. The maximum level of Cs-137 activity (19 pCi/kg (wet)) was only 13 percent of the lower limit of detection and

FIGURE 14


MEAN COBALT-60 CONCENTRATION IN BLUE CRAB - 1984 THROUGH 1991
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PICOCURIES PER KILOGRAM (WET)
NO COBALT-60 FOUND IN BLUE CRAB
INDICATOR MEAN
BACKGROUND MEAN
50
40
30
20
10
0
11-Oct-85
29-Jun-86
21-Sep-86
6-Jun-87
5-Jul-87
1-Aug-87
28-Aug-87
25-Sep-87
8-May-88
4-Jun-88
2-Jul-88
31-Jul-88
26-Aug-88
24-Sep-88
21-Oct-88
1-Jun-89
29-Jun-89
29-Jul-89
24-Aug-89
22-Sep-89
20-Oct-89
3-May-90
3-Jun-90
30-Jun-90
27-Jul-90
27-Aug-90
21-Sep-90
18-Oct-90
1-Jun-91
27-Jun-91
24-Jul-91
23-Aug-91
20-Sep-91

0.95 percent of the reporting level specified by the OCNGS Technical Specifications. Similar low levels of this radionuclide are found in fish throughout the world as a result of fallout (Ref. 17).

## TERRESTRIAL MONITORING

Radionuclides released to the atmosphere may be deposited on soil and vegetation and may be incorporated into milk, vegetables, and/or other food products. To assess the impact of dose to humans from the ingestion pathway, food product samples such as green leafy vegetables were collected and analyzed during 1991. Surface soil samples were also collected and analyzed for the purpose of monitoring the potential buildup of atmospherically deposited radionuclides.

The contribution of radionuclides from the OCNGS operation was assessed by comparing the results of samples collected in prevalent downwind locations, primarily to the southeast of the site, with background samples collected from distant and generally upwind directions.

A dairy census was conducted to determine the locations of commercial dairy operations and milk producing animals in each of the 16 meteorological sectors out to a distance of five miles from the OCNGS. The census showed that there were no commercial dairy operations and no dairy animals producing milk for human consumption within a 5 mile radius of the plant (Appendix F).

GPUN Oyster Creek Environmental Controls established and maintained two gardens near the site boundary in the two sectors with the highest potential for radioactive deposition in lieu of performing an annual garden census. Both gardens are greater than 50 square meters in size and produce green leafy vegetables. A commercial farm located approximately 24 miles northwest of the site was used as a background station.

## Sample Collection and Analysis

Broadleaf vegetables, specifically cabbage, collards, and Swiss chard, were collected on a monthly basis beginning in June and ending in December 1991. A gamma isotopic analysis was performed on each sample.

Surface soil samples from the gardens were collected during July and October. Each soil sample was subjected to a gamma isotopic analysis.

## Results

The results of the terrestrial monitoring during 1991 demonstrated that the radioactive effluents associated with the OCNGS did not have any measurable effects on vegetation or soil.

Naturally occurring radionuclides accounted for the only radioactivity identified in vegetable samples (Table 3). Potassium-40 was detected in 100 percent of the cabbage, collard, and Swiss chard samples collected from both indicator and background stations. Beryllium-7 was identified in 3 of 10 cabbage samples collected from indicator gardens and in 1 of 3 cabbage samples collected from the background location. Beryllium-7 was also identified in 6 of 10 collard samples obtained from the indicator stations and in 3 of 4 samples collected from the background garden. Swiss chard, which was only collected at the background station, had naturally occurring Be-7 activity in 2 of 3 samples. Actinium-228 was detected in 1 of 10 cabbage samples collected from the indicator gardens and radium-226 was identified in 1 of 3 Swiss chard samples harvested from the background station. No other radionuclides were identified. Of the radionuclides detected, none are associated with OCNGS operation.

Cesium-137 activity was detected in all indicator and background soil samples collected from the gardens in which vegetables were grown (Table 3). The mean concentration of Cs-137 at the background station was 122 pCi/Kg(dry) while the mean concentration found at the indicator stations was 83.5 pCi/Kg(dry). This trend, in which the background mean has been slightly higher than the indicator mean, has continued since 1989 (References 24 and 25). Gaseous cesium-137 was released in OCNGS effluents in 1991 and 1990, (0.43% and 0.026% of total particulate activity released, respectively). None was released in 1989. Even though a slightly larger quantity of gaseous cesium-137 was released in 1991 (44.4 microcuries - Table 2) than in 1990 (4.56 microcuries - Reference 25), the indicator mean (83.5 pCi/Kg(dry)) for soil in 1991 was less than the indicator mean for 1990 (142 pCi/Kg(dry)) and 1989 (128 pCi/Kg(dry)). These results indicate that the minute concentrations of cesium-137 detected in soil samples were a result of previous weapons testing and the Chernobyl nuclear accident and not the result of deposition of effluents from the OCNGS.

In addition to cesium-137, naturally occurring radionuclides, beryllium-7, potassium-40, radium-226, and actinium-228 were detected in soil samples (Table 3).

## GROUNDWATER MONITORING

The Oyster Creek Nuclear Generating Station is located on the Atlantic Coastal Plain Physiographic Province. This Province extends southeastward from the Fall Zone, a topographic break that marks the boundary between the Atlantic Coastal Plain and the more rugged topography of the Piedmont Province. The Fall Zone is also where the crystalline and sedimentary rocks of the Piedmont and the unconsolidated coastal plain sediments meet.

At least five distinct bodies of fresh groundwater or aquifers exist in the vicinity of the OCNGS. From the surface downward, they are:

1. Unconfined, Recent and Upper Cape May Formation
2. Confined, Lower Cape May Formation
3. Confined, Cohansey Sand
4. Confined, Upper Zone in the Kirkwood Formation
5. Confined, Lower Zone in the Kirkwood Formation

The unconfined Recent and Cape May Formations are replenished directly by local precipitation. The recharge to the confined aquifers occurs primarily from direct rainfall penetration on the outcrop areas, which are generally to the west of the site at higher elevations.

### Sample Collection and Analysis

As part of the routine REMP, five wells were sampled on a monthly basis. Grab samples were obtained from four local residences and one OCNGS well. The depths of the residential wells are unknown but most local domestic wells draw upon the Cohansey aquifer; the OCNGS well is approximately 380 feet deep, in the Kirkwood formation. Each sample was subjected to a tritium and gamma isotopic analysis.

In addition, a well network (17 wells) was installed around the OCNGS in 1983 to serve as an early detection and monitoring system for spills, separate from routine REMP sampling. During 1991, fourteen of these wells located in the Cape May, Cohansey and Kirkwood aquifers, were sampled using grab sample methodology. The samples were analyzed for tritium and gamma emitting nuclides.

Results

The results of the groundwater monitoring during 1991 demonstrated that, as in previous years, the radioactive effluents associated with the OCNGS did not have any measurable effects on offsite groundwater quality.

Sixty-four routine REMP well water samples were collected during 1991 (Table 3). Naturally occurring potassium-40 and radium-226 were the only gamma-emitting radionuclides identified. Potassium-40 was detected in only one of 51 indicator samples and radium-226 was identified in two of 51 samples. Neither of these radionuclides can be attributed to effluents from the OCNGS. Another naturally occurring radionuclide, tritium, was detected in 2 of 51 indicator samples. These results were not considered significant because the maximum tritium concentration (170 pCi/liter) was less than one percent of the EPA drinking water limit and only 8.5 percent of the lower limit of detection required by the OCNGS Technical Specifications.

The results of the analyses of 26 samples from the onsite spill monitoring well network were similar (Appendix H). No gamma-emitting nuclides were detected and tritium was detected in only seven samples. The maximum tritium level was 220 pCi/liter, which is only 1.1 percent of the EPA drinking water limit. Considering the very large environmental inventory of tritium due to cosmic ray interactions and nuclear weapons testing, it is highly unlikely that the relatively minute amounts of tritium in the OCNGS's effluents could have a measurable effect on existing environmental concentrations.

## RADIOLOGICAL IMPACT OF OCNGS OPERATIONS

An assessment of potential radiological impact indicated that radiation doses to the public from 1991 operations at OCNGS were well below all applicable regulatory limits and were significantly less than do[illegible]ceived from common sources of radiation. The 1991 whole [illegible] dose potentially received by an assumed maximum exposed individual from OCNGS liquid and airborne effluents was conservatively calculated to be about 7.08 E-3 millirem total or only 2.83 E-2 percent of the OCNGS Technical Specification limit. The 1991 whole body dose to the surrounding population from OCNGS liquid and airborne effluents was calculated to be 2.41 E-3 person-rem and 2.20 E-1 person-rem respectively. This is approximately 4.5 million times lower than the doses to the total population within a 50-mile radius of the OCNGS resulting from natural background sources.

### Determination of Radiation Doses to the Public

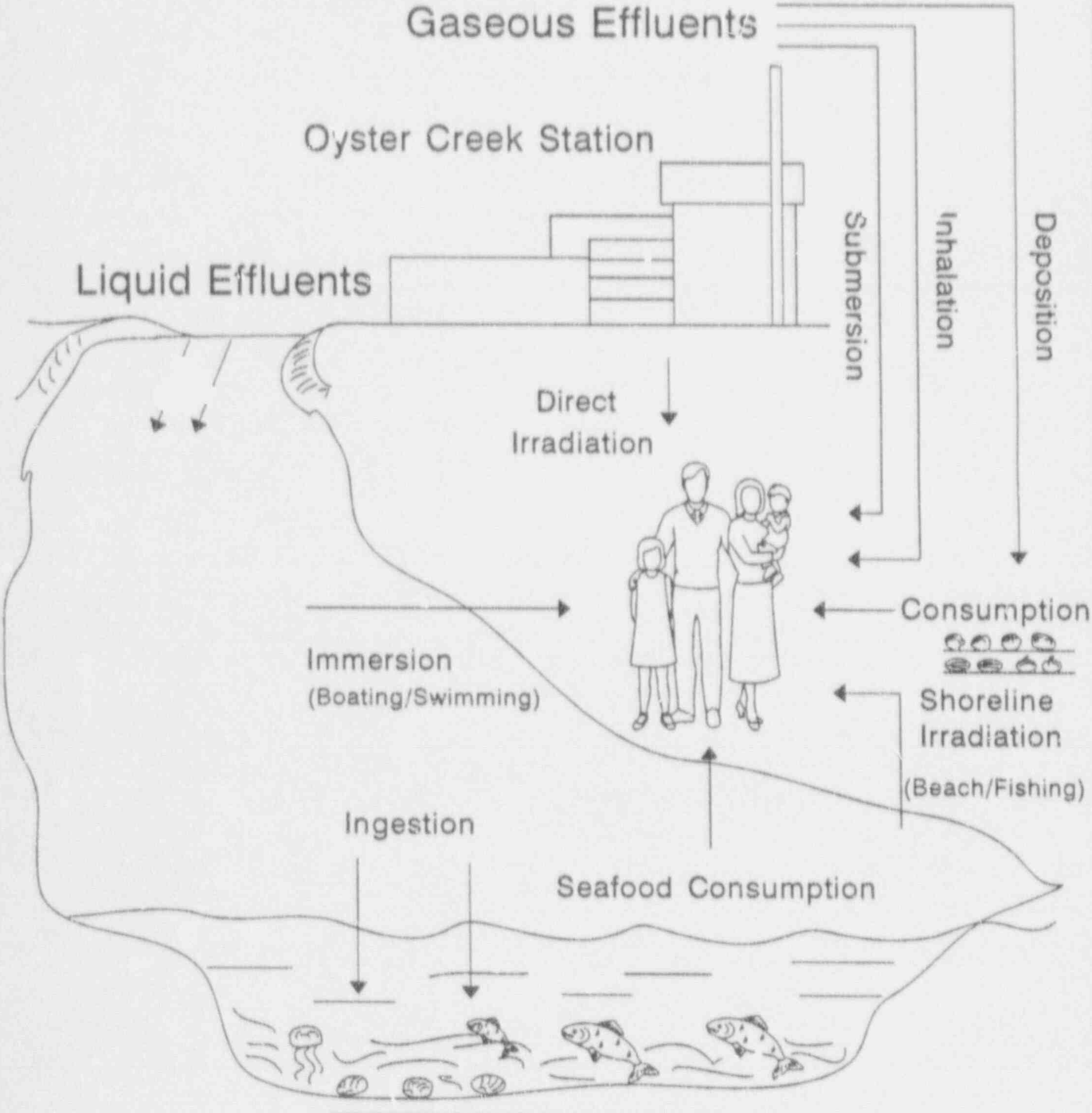
To the extent possible, doses to the public are based on direct measurement of dose rates from external sources and measurements of radionuclide concentrations in the environment which may contribute to an internal dose of radiation. Thermoluminescent dosimeters (TLDs) positioned in the environment around Oyster Creek provide measurements to determine external radiation doses to humans. Samples of air, water, food products, etc. are used to determine internal doses.

During normal plant operations the quantities of radionuclide releases are typically too small to be measured once distributed in the offsite environment. As a result, the potential offsite doses are calculated using a computerized model that predicts concentrations of radioactive materials in the environment and subsequent radiation doses on the basis of radionuclides released to the environment. GPUN calculates doses using an advanced dispersion model called SEEDS (Simplified Effluent Environmental Dosimetry System). This model incorporates the guidelines and methodology set forth by the USNRC in Regulatory Guide 1.109. Due to the conservative assumptions that are used in the model, the calculated doses are considerably higher than the actual doses to people.

The type and amount of radioactivity released from the OCNGS is calculated using measurements from effluent radiation monitoring instruments and effluent sample analysis. Once released, the dispersion of radionuclides in the environment is readily determined by computer modelling. Airborne releases are diluted and carried away from the site by atmospheric diffusion which continuously acts to disperse radioactivity. Variables which affect atmospheric dispersion include wind speed and direction, temperature at different elevations, and terrain. A meteorological monitoring station northwest of the reactor site is linked to a computer terminal which permanently records all necessary meteorological data. Computer models also are used to predict the downstream dilution and travel times for liquid releases into the Barnegat Bay estuary and Atlantic Ocean.

The pathways to human exposure also are included in the model. These pathways are depicted in Figure 15. The exposure pathways considered for the discharge of the station's liquid effluent are fish and shellfish consumption and shoreline exposure. The exposure pathways considered for airborne effluents include plume exposure, inhalation, vegetable consumption (during growing season) and land deposition. SEEDS employs numerous data files which describe the area around the OCNGS in terms of demography and foodstuffs

## FIGURE 15
## EXPOSURE PATHWAYS FOR ROUTINELY RELEASED RADIONUCLIDES FROM THE OCNGS




### PREDOMINANT RADIONUCLIDES

NOBLE GASES (Xe, Kr)
Plume Exposure

RADIOIODINES (I-131, I-133)
Inhalation and Consumption of Water and Vegetables

ACTIVATION PRODUCTS (Co-60, Mn-54)
Shoreline Exposure and Consumption of Seafood

RADIOCESIUMS (Cs-134, Cs-137)
Shoreline Exposure and Consumption of Water, Seafood and Vegetables

TRITIUM (H-3)
Inhalation and Consumption of Water, Seafood and Vegetables

proc tion. Data files include such information as the dis ance from the plant stack to the site boundary in each mpass sector (sixteen in all), the population groupings, gardens of more than 500 square feet, meat animals, and crop yields.

determining the dose to humans, it is cessary to all pathways and all exposed tissues, summing the se om each to provide the total dose for each organ as as the whole body from a given radionuclide in the nment. Dose calculations involve determining the energy ed per unit mass in the various tissues. Thus, for radionuclides taken into the body, the metabolism of the radionuclide in the body must be known along with the physical characteristics of the nuclide such as energies, types of radiations emitted and half-life. SEEDS also contains dose conversion factors for over 75 radionuclides for each of four age groups (adults, teenagers, children and infants) and eight organs (total body, thyroid, liver, skin, kidney, lung, bone and gastro-intestinal tract).

Doses are lculated for what is termed the "maximum hypothetical individual." This individual is assumed to be affected by the combined maximum environmental concentrations wherever they occur. For liquid releases, the maximum hypothetical individual would be one who stands at the U.S. Route 9-discharge canal shoreline for 67 hours per year while eating 43 pounds of fish and shellfish. For airborne releases, the maximum hypothetical individual would live at the location of highest radionuclide concentration for inhalation and direct plume exposure while eating 1,389 pounds of vegetables per year. This location is 522 meters to the southeast based on the meteorological conditions at the time of releases. The conservative usage factors and other assumptions used in the model result in a conservative overestimation of dose. Doses are calculated for the population within 50 miles of the OCNGS for airborne effluents and the entire population using the Barnegat Bay estuary and Atlantic Ocean for liquid effluents. Appendix G contains a more detailed discussion of the dose calculation methodology.

Results of Dose Calculations

Doses from natural background radiation provide a baseline for assessing the potential public health significance of radioactive effluents. The average person in the United States receives about 300 millirem (mR) per year from natural background radiation sources. Natural background radiation from cosmic, terrestrial and natural radionuclides in the human body (not including radon), averages about 100 mR/yr. The natural background radiation from cosmic and terrestrial sources varies with geographic location, ranging from a low of about 65 mR/yr on the Atlantic and Gulf coastal plains to as much as 350 mR/yr on the Colorado plateau (Ref. 3). The National Council on Radiation Protection and Measurements (NCRP) now estimates that the average individual in the United States receives an annual dose of about 2,400 millirems to the lung from natural radon gas. This lung dose is considered to be equivalent to a whole body dose of 200 millirems (Ref. 2). Effluent releases from the OCNGS and other nuclear power plants contribute but a very small percentage to the natural radioactivity which has always been present in the air, water, soil and even in our bodies. In general, the annual population doses from natural background radiation (excluding radon) are 1,000 to 1,000,000 times larger than the doses to the same population resulting from nuclear power plant operations (Ref. 17).

Results of the dose calculations are summarized in Tables 6 and 7. Table 6 compares the calculated maximum dose to an individual of the public to the OCNGS Technical Specifications, 40CFR190, and 10CFR50 Appendix I dose limits. Table 7 presents the maximum total body radiation doses to the population within 50 miles of the plant from airborne releases, and to the entire population using Barnegat Bay and the Atlantic Ocean, for liquid releases.

These conservative calculations of the doses to members of the public from the OCNGS ranged from 0.00068 percent to a maximum of only 0.508 percent of the applicable regulatory limits. They are also considerably lower than the doses from natural background and fallout from prior nuclear weapon tests.

TABLE 6

CALCULATED MAXIMUM HYPOTHETICAL DOSES TO AN INDIVIDUAL FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCNGS FOR 1991

| EFFLUENT RELEASED | REGULATORY LIMITS mRem/YEAR | REGULATORY LIMITS SOURCE | CALCULATED DOSE mRem/YEAR | PERCENT OF REGULATORY LIMIT |
|---|---|---|---|---|
| LIQUID | 3 - TOTAL BODY | TECH SPEC 3.6.J.1 | 2.04 E-5 | 6.80 E-4 |
| LIQUID | 10 - ANY ORGAN | TECH SPEC 3.6.J.1 | 8.65 E-5 | 8.65 E-4 |
| AIRBORNE (NOBLE GAS) | 5 - TOTAL BODY | 10 CFR 50 APP. I | 6.19 E-3 | 1.24 E-1 |
| AIRBORNE (NOBLE GAS) | 15 - SKIN | 10 CFR 50 APP. I | 7.64 E-3 | 5.09 E-2 |
| AIRBORNE (IODINE AND PARTICULATE) | 15 - ANY ORGAN | TECH SPEC 3.6.M.1 | 7.62 E-2 | 5.08 E-1 |
| TOTAL-LIQUID AND AIRBORNE | 25 - TOTAL BODY | TECH SPEC 3.6.N.1* | 7.08 E-3 | 2.83 E-2 |
| TOTAL-LIQUID AND AIRBORNE | 75 - THYROID | TECH SPEC 3.6.N.1* | 7.62 E-2 | 1.02 E-1 |
| TOTAL-LIQUID AND AIRBORNE | 25 - ANY OTHER ORGAN | TECH SPEC 3.6.N.1* | 7.63 E-2 | 3.05 E-1 |

* 40 CFR 190

TABLE 7

CALCULATED MAXIMUM TOTAL RADIATION DOSES TO THE POPULATION FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCNGS FOR 1991

| | Calculated Population Total Body Dose Person-Rem/Year OCNGS |
|---|---|
| From Radionuclides in Liquid Releases (Barnegat Bay and Atlantic Ocean Users) | 2.41 E-3 |
| From Radionuclides in Airborne Releases (Within 50-Mile Radius of OCNGS) | 2.20 E-1 |

DOSE DUE TO NATURAL BACKGROUND RADIATION

Approximately 990,000 Person-Rem Per Year

## REFERENCES

(1) Jersey Central Power and Light Company. "Oyster Creek Nuclear Generating Station Operating License and Technical Specifications," Appendix A, DPR-16, April 1969.

(2) National Council on Radiation Protection and Measurements, Report No. 93, "Ionizing Radiation Exposure of the Population of the United States," 1987.

(3) CRC Handbook, "Radioecology: Nuclear Energy and the Environment," F. Ward Whicker and Vincent Schultz, Volume I, 1982.

(4) GPU Nuclear Corporation. "Oyster Creek Nuclear Generating Station Emergency Plan," Document Number 2000-PLN-1300.1, Revision 8, January 1983.

(5) National Council on Radiation Protection and Measurements, Report No. 22, "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure," (Published as National Bureau of Standards Handbook 69, Issued June 1959, superseding Handbook 52).

(6) International Commission on Radiological Protection, Publication 2, "Report of Committee II on Permissible Dose for Internal Radiation (1959)," with 1962 Supplement Issued in ICRP Publication 6; Publication 9, "Recommendations on Radiation Exposure," (1965); ICRP Publication 7 (1965), amplifying specific recommendations of Publication 9 concerning environmental monitoring; and ICRP Publication 26 (1977).

(7) Federal Radiation Council Report No. 1, "Background Material for the Development of Radiation Protection Standards," May 13, 1960.

(8) National Council on Radiation Protection and Measurements, Report No. 39, "Basic Radiation Protection Criteria," January 1971.

(9) National Council on Radiation Protection and Measurements, Report No. 62, "Tritium in the Environment," March 1979.

(10) National Council on Radiation Protection and Measurements, Report No. 81, "Carbon-14 in the Environment," May 1985.

(11) United States Nuclear Regulatory Commission. Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in The Environs of Nuclear Power Plants," Revision 1, April 1975.

(12) United States Nuclear Regulatory Commission Branch Technical Position. "An Acceptable Radiological Environmental Monitoring Program," Revision 1, November 1979.

(13) Teledyne Isotopes. "Procedures and Quality Assurance Handbook." IWL-00320365, 1975.

(14) Radiation Management Corporation. "Analytical and Quality Control Program." RMC-TM-75-3, 1975.

(15) Teledyne Isotopes. "Environmental Radiation Analysis Quality Control Manual." IWL-00320361, 1975.

(16) United States Nuclear Regulatory Commission. Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment," Revision 1, February 1979.

(17) NUREG/CR-4068 "Summary of Historical Experience with Releases of Radioactive Materials from Commercial Nuclear Power Plants in the United States", 1985.

(18) Eisenbud, Merril, 1987. "Environmental Radioactivity." Academic Press.

(19) Weinstein, Roy, 1964. "Nuclear Physics." McGraw-Hill Book Company.

(20) GPU Nuclear Corporation. "Final Safety Analysis Report, Oyster Creek Nuclear Generating Station," December 1991.

(21) GPU Nuclear Corporation. "1986 Radiological Environmental Monitoring Report for Oyster Creek Nuclear Generating Station." May 1987.

(22) GPU Nuclear Corporation. "1987 Radiological Environmental Monitoring Report for Oyster Creek Nuclear Generating Station." May 1988.

(23) GPU Nuclear Corporation. "1988 Radiological Environmental Monitoring Report for Oyster Creek Nuclear Generating Station." May 1989.

(24) GPU Nuclear Corporation. "1989 Radiological Environmental Monitoring Report for Oyster Creek Nuclear Generating Station." May 1990.

(25) GPU Nuclear Corporation. "1990 Radiological Environmental Monitoring Report for Oyster Creek Nuclear Generating Station." May 1991.

APPENDIX A

1991 REMP Sampling Locations and Descriptions,

Synopsis of REMP, and Sampling

and Analysis Exceptions

TABLE A-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| APT, AIO, RWA, TLD | 1 | 0.2 miles | 228° | SW of site, at Oyster Creek Fire Pond, Forked River, NJ |
| WWA | 1 | 0.1 | 227 | On site, at Oyster Creek Pretreatment Building Lab, Forked River, NJ |
| APT, AIO, RWA, TLD | 3 | 6.1 | 94 | E of site, near Coast Guard Station Island Beach State Park |
| APT, AIO, RWA, TLD | 4 | 4.5 | 215 | SW of site, where Route 554 and the Garden State Parkway meet, Barnegat |
| APT, AIO, RWA, TLD | 5 | 4.2 | 355 | N of site, Garden State Parkway Service Area, Forked River, NJ |
| TLD | 6 | 2.2 | 14 | NNE of site, Lane Place, behind St. Pius Church, Forked River, NJ |
| TLD | 7 | 1.8 | 111 | ESE of site, Bay Parkway, Sands Point Harbor, Waretown, NJ |
| TLD | 8 | 2.3 | 180 | S of site, Route 9 at the Waretown Substation, Waretown, NJ |
| TLD | 9 | 2.0 | 230 | SW of site, where Route 532 and the Garden State Parkway meet, Waretown, NJ |
| APT, AIO, RWA, TLD | A | 31.1 | 25 | NNE of site, JCP&L office parking lot, next to substation, Allenhurst, NJ |
| APT, AIO, RWA, TLD | C | 35.1 | 309 | NW of site, JCP&L office rear parking lot, Cookstown, NJ |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| APT, AIO, RWA, TLD | H | 35 miles | 248° | WSW of site, Atlantic Electric office storage yard, Hammonton, NJ |
| TLD | 10 | 10.2 | 21 | NNE of site, Route 37 and Gilford Avenue, Toms River, NJ |
| TLD | 11 | 8.3 | 156 | SSE of site, 80th and Anchor Streets at Water Tower, Harvey Cedars, NJ |
| TLD | 12 | 9.4 | 192 | SSW of site, Atlantic Electric substation access road, Cedar Run, NJ |
| TLD | 13 | 8.3 | 345 | NNW of site, Dover Road, next to last pole traveling west, South Toms River, NJ |
| APT, AIO, RWA, TLD | 14 | 18 | 1 | N of site, Larrabee Substation on Randolph Road, Lakewood, NJ |
| TLD | 15 | 19 | 309 | NW of site, Route 539, last pole on south side across from Bomarc Site, New Egypt, NJ |
| TLD | 16 | 18 | 271 | W of site, two poles south of the intersection of Routes 563 and 72. |
| TLD | 17 | 19 | 214 | SW of site, Route 563, 2 miles north at high voltage line, New Gretna, NJ |
| WWA | 18 | 1.7 | 42 | NE of site, Townsend's Marina, Lacey Road, Forked River, NJ |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| WWA | 19 | 1.6 | 73° | ENE of site, 1015 Inland Road, Forked River Beach, Forked River, NJ |
| APT, AIO, RWA, TLD | 20 | 0.7 miles | 93 | E of site, on Finninger Farm on south side of access road, Pole BT17, Forked River, NJ |
| WWA | 21 | 1.0 | 115 | ESE of site at 215 Dock Avenue, Waretown, NJ |
| TLD, WWA | 22 | 1.6 | 146 | SE of site, at 27 Long John Silver Way, Skipper's Cove, Pole #BT152 ON, Waretown, NJ |
| SWA, CLAM, AQS | 23 | 4.0 | 63 | ENE of site, Barnegat Bay off Stouts Creek 400 yards SE of FL"1" |
| SWA, CLAM, AQS | 24 | 2.0 | 104 | ESE of site, Barnegat Bay, 250 yards SE of FL"3" |
| SWA, CLAM, AQS | 25 | 1.6 | 127 | SE of site, Barnegat Bay off Holiday Harbor, 200 yards SE of lagoon mouth |
| SWA, CLAM, AQS | 31 | 10.5 | 183 | S of site, Manahawkin Bay 25 yards SE of C "23" and N "24" |
| SWA, AQS | 32 | 1.9 | 98 | E of site, mouth of Oyster Creek discharge canal |
| SWA, AQS, FISH, CRAB | 33 | 0.7 | 104 | ESE of site, 1200 yards east of Route 9 Bridge in Oyster Creek Discharge Canal |
| VEG, SOIL | 35 | 0.4 | 110 | ESE of site, east of Route 9 and North of the Discharge Canal, Forked River, NJ |

TABLE A-1 (continued)

OLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| VGTN, SOIL | 36 | 24 miles | 315° | NW of site, at DeWolf's U-Pick Farm, New Egypt, NJ |
| TLD | 51 | 0.4 | 358 | N of site, on the access road to Forked River site, Forked River, NJ |
| TLD | 52 | 0.4 | 340 | NNW of site, on the access road to Forked River site, Forked River, NJ |
| TLD | 53 | 0.3 | 310 | NW of site, at the JCP&L Visitor's Center, Forked River, NJ |
| TLD | 54 | 0.3 | 294 | WNW of site, on the access road to Forked River site, Forked River, NJ |
| TLD | 55 | 1.5 | 273 | W of site, next to Basin #1 on the Forked River site, Forked River, NJ |
| TLD | 56 | 1.1 | 258 | WSW of site, on the siren pole of the Building 12 parking lot, Forked River site, Forked River, NJ |
| TLD | 57 | 0.2 | 203 | SSW of site, on Southern Area Stores access road, Pole BT 375, L, Forked River, NJ |
| TLD | 58 | 0.4 | 180 | S of site, on Southern Area Stores access road, Pole JC-7-L, Forked River, NJ |
| TLD | 59 | 0.3 | 163 | SSE of site, on Southern Area Stores access road, on gray post, Waretown, NJ |
| TLD | 60 | 0.4 | 136 | SE of site, on Southern Area Stores access road entrance, Waretown, NJ |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| TLD | 61 | 0.3 miles | 116° | ESE of site, on Route 9 south of Oyster Creek Main Entrance, Pole BT1458, Forked River, NJ |
| TLD | 62 | 0.2 | 99 | E of site, on Route 9 at access road to Main Gate, Pole BT-61, Forked River, NJ |
| TLD | 63 | 0.2 | 70 | ENE of site, on Route 9 at North Gate access road, Pole BT 14D63, Forked River, NJ |
| TLD | 64 | 0.3 | 48 | NE of site, on Route 9 north of North Gate access road on Pole JC407X, Forked River, NJ |
| TLD | 65 | 0.4 | 22 | NNE of site, on Route 9 at Intake Canal Bridge on Pole JC406L, Forked River, NJ |
| APT, AIO, RWA, TLD, VEG, SOIL | 66 | 0.5 | 127 | SE of site, east of Route 9 and south of the Discharge Canal, inside fence, Waretown, NJ |
| TLD | 67 | 1.0 | 161 | SSE of site, on Route 9 at Waretown Plaza, Waretown, NJ |
| TLD | 69 | 1.3 | 70 | ENE of site, at the intersection of Chesapeake Drive and Buena Vista Road on Pole JC1347L, Forked River, NJ |
| TLD | 70 | 1.6 | 183 | S of site, on Route 532, 3/4 mile west of Route 9, in front of Martin residence, Waretown, NJ |
| APT, AIO, RWA, TLD | 71 | 1.7 | 165 | SSE of site, on Route 532 at the Waretown Municipal Building, Waretown, NJ |
| APT, AIO, RWA | 72 | 1.9 | 27 | NNE of site, at Community Hall, Forked River, NJ |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| APT, AIO RWA, TLD | 73 | 1.8 miles | 111° | ESE of site, on Bay Parkway, Sands Point Harbor, Waretown, NJ |
| TLD | 74 | 2.0 | 90 | E of site, Orlando Drive and Penguin Court, Pole JC6472L, Forked River, NJ |
| TLD | 75 | 2.0 | 69 | ENE of site, 1225 Beach Blvd. and Maui Drive, Forked River, NJ |
| TLD | 76 | 1.7 | 51 | NE of site, on Lacey Road across from Captain's Inn Restaurant, Forked River, NJ |
| TLD | 77 | 1.5 | 26 | NNE of site, NJ State Marina parking lot, Forked River, NJ |
| TLD | 78 | 1.8 | 2 | N of site, 1514 Arient Road, Forked River, NJ |
| TLD | 79 | 2.9 | 162 | SSE of site, Hightide Drive and Bonita Drive Pole JC124 ON |
| TLD | 80 | 3.1 | 38 | NE of site, Riviera Drive and Dewey Drive, Pole BT787, Lanoka Harbor, NJ |
| TLD | 81 | 4.6 | 192 | SSW of site, east of Route 9 at Brook and School Streets, Pole JC257BGT, Barnegat, NJ |
| TLD | 82 | 4.4 | 38 | NE of site, Bay Way and Clairmore Avenue, Pole JC1273L, Lanoka Harbor, NJ |
| TLD | 83 | 5.8 | 29 | NNE of site, Route 9 and Harbor Inn Road, Pole BT666B, Berkeley, NJ |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| TLD | 84 | 4.9 miles | 339° | NNW of site, on Lacey Road, 1.3 miles west of the Garden State Parkway on JCP&L siren pole, Forked River, NJ |
| TLD | 85 | 3.8 | 254 | WSW of site, on Route 532 West, just prior to landfill, Pole BT354, Waretown, NJ |
| TLD | 86 | 4.8 | 226 | SW of site, on Route 554, 1 mile west of the Garden State Parkway, Barnegat, NJ |
| TLD | 87 | 7.2 | 143 | SE of site, north of Seaview Drive on siren pole, Loveladies, NJ |
| TLD | 88 | 6.6 | 127 | SE of site, eastern end of 3rd Street, Barnegat Light, NJ |
| TLD | 89 | 6.2 | 110 | ESE of site, Job Francis residence, Island Beach State Park |
| TLD | 90 | 6.6 | 74 | ENE of site, parking lot A-5, Pole JC181, Island Beach State Park |
| TLD | 91 | 9.5 | 4 | N of site, on Robins Parkway, near Lobster Shanty Restaurant, Toms River, NJ |
| TLD | 92 | 9.2 | 48 | NE of site, at Guard Shack/Toll Booth, Island Beach State Park |
| SWA, AQS | 93 | 0.25 | 150 | SSE of site, Oyster Creek Discharge Canal, west of the confluence of freshwater Oyster Creek |

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

| Sample Medium | Station Code | Distance | Azimuth | Description |
|---|---|---|---|---|
| FISH, CRAB | 93 | 0.1 to 0.3 Miles | 128° to 250° | SE to WSW of site, Oyster Creek Discharge Canal between pump discharge and Route 9 |
| SWA, AQS, CLAM, FISH | 94 | 21.8 | 201 | SSW of site, in Great Bay, mouth of Jimmies Creek west of channel marker 1 |
| CRAB | 94 | 21.8 | 201 | SSW of site, in Great Bay, adjacent to docks of Cape Horn Marina |
| TLD | 95 | 2.5 | 243 | WSW of site, at Ocean County VoTech School on JCP&L siren pole, Waretown, NJ |
| TLD | 96 | 1.1 | 15 | NNE of site, at sewage pumping station across from Oyster Bay Restaurant, Forked River, NJ |
| TLD | 97 | 1.3 | 43 | NE of site, at Twin Rivers sewage pumping station, Forked River, NJ |
| TLD | T1 | 0.2 | 228 | SW of site, at Oyster Creek Fire Pond, Forked River, NJ |

SAMPLE MEDIUM IDENTIFICATION KEY

| | | |
|---|---|---|
| APT = Air Particulate | SWA = Surface Water | SOIL = Soil |
| AIO = Air Iodine | AQS = Aquatic Sediment | FISH = Fish |
| RWA = Precipitation | CLAM = Clams | CRAB = Crab |
| WWA = Well Water | VEG = Vegetables | TLD = Thermoluminescent Dosimeter |

TABLE A-2

SYNOPSIS OF THE OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
CONDUCTED BY
GPUN ENVIRONMENTAL CONTROLS FOR
OYSTER CREEK NUCLEAR GENERATING STATION
1991 (1)

| SAMPLE TYPE | NUMBER OF SAMPLING LOCATIONS | COLLECTION FREQUENCY | NUMBER OF SAMPLES COLLECTED | TYPE OF ANALYSIS | ANALYSIS FREQUENCY | NUMBER OF SAMPLES ANALYZED (2) |
|---|---|---|---|---|---|---|
| Air Particulate | 13 | weekly | 675 | GR-Beta<br>Gamma | weekly<br>4 week composite | 675<br>169 |
| Air Iodine | 13 | weekly | 675 | I-131 | weekly | 675 |
| Precipitation | 13 | 4-week combined for a 12-week composite | 52 | Gamma<br>H-3 | 12-week composite<br>12-week composite | 24 (3)<br>24 (3) |
| Well Water | 5 | 4-week | 64 | Gamma<br>H-3<br>I-131 | 4-week<br>4-week<br>4-week | 64<br>64<br>64 |
| Surface Water | 8 | 4-week | 104 | Gamma<br>H-3<br>I-131 | 4-week<br>4-week<br>4-week | 104<br>104<br>104 |
| Clam | 5 | 4-week | 65 | Gamma | 4-week | 65 |
| Sediment | 8 | 4-week | 32 | Gamma | 12-week composite | 32 |
| Vegetables | 3 | 4-week | 30 | Gamma | 4-week | 30 |
| Soil (4) | 3 | 12-week | 6 | Gamma | 12-week | 6 |
| Fish | 3 | 4-week | 39 | Gamma | 4-week | 39 |
| Crab | 3 | 4-week | 9 | Gamma | 4-week | 9 |
| TLD-Teledyne Isotopes | 63 | 12-week | 211 | Immersion Dose | 12-week | 211 |
| TLD-Panasonic | 63 | 12-week | 323 | Immersion Dose | 12-week | 323 |

(1) This table does not include Quality Control (QC) results.

(2) The number of samples analyzed does not include duplicate analyses, recounts or reanalyses.

(3) Only composites from stations A, C, H, 66, 72, and 73 were analyzed.

(4) Only collected when vegetables are collected.

TABLE A-3

SAMPLING AND ANALYSIS EXCEPTIONS 1991

More than the minimum number of samples and analyses required by the Technical Specifications were collected and performed during 1991. No sampling and or analysis exception occurred in 1991 that resulted in a deviation from or violation of the requirements of the Technical Specifications.

APPENDIX B

1991 Lower Limits of Detection (LLD) Exceptions

TABLE B-1

TECHNICAL SPECIFICATIONS ANALYTICAL RESULTS WHICH FAILED TO MEET THE REQUIRED LLD DURING 1991

| Sample Media | Analysis | Required LLD | No. of Samples Out of Compliance | Comments |
|---|---|---|---|---|
| Air Particulate | Gross Beta | 0.01 pCi/m$^3$ | 1 | Low Sample Volume |
| Air Iodine | I-131 | 0.07 pCi/m$^3$ | 1 | Low Sample Volume |

NOTE: More than the minimum number of samples and analyses required by the Technical Specifications were collected and performed so that none of the missed LLD values listed above resulted in any violations of the Technical Specifications.

APPENDIX C

Changes Effected in +he 1991 REMP

## TABLE C-1

## <u>CHANGES EFFECTED IN THE 1991 REMP</u>

April, 1991

TLD station #79, originally located at on Bonita Drive at Barnegat Bay was relocated due to recurring vandalism. The station was relocated at the intersection of Bonita and Hightide Drives, approximately 300 feet west of the original location. This station is a co-location with both NRC and NJDEPE TLDs. Both regulatory agencies were notified in writing prior to the relocation providing applicable data.

July, [illegible]1

The REMP TLD network surrounding the OCNGS consists of 63 field stations. Prior to this date, both GPUN Panasonic and Teledyne Isotopes (vendor supplied) TLDs were exposed at each location. Years of data and numerous comparison studies indicated that the Teledyne Isotopes network was redundant and unnecessary. Therefore, this TLD network was downgraded from 63 to 10 monitoring locations. Seven of these stations are located with NRC and/or NJDEPE dosimeters while the remaining three dosimeters are located at background stations. These 10 monitoring locations are quality control stations. The Panasonic TLD network was not altered in any way.

APPENDIX D

1991 Quality Assurance Results

The Oyster Creek Environmental Controls REMP Quality Assurance (QA) Program consists of three phases. Phase I consists of splitting samples collected at designated stations and having them analyzed by separate (independent) laboratories. Analysis results from the quality control (QC) laboratory are compared to those from the primary laboratory as set forth in OC Environmental Controls procedure 6635-ADM-4500.07. Agreement criteria are established in this procedure. If non-agreement of the data occurs, an investigation begins which may include recounting or reanalyzing the samples in question.

Phase II requires that laboratories analyzing REMP samples for Oyster Creek participate in the USEPA Cross-Check Program. This serves as independent verification of their ability to correctly perform sample analyses. Results of this interlaboratory comparison program are presented in Appendix E.

Phase III requires that the REMP analytical laboratories perform duplicate analyses on every twentieth sample. The number of duplicate analyses performed in 1991 is outlined in Table D-1. Results of the two analyses were reviewed per procedure 6635-ADM-4500.07. No non-agreements occurred during 1991 regarding duplicate analyses of OCNGS REMP samples.

Table D-2 outlines the split sample portion (Phase I) of the QA program for the media collected during 1991. Three non-agreements occurred between analyses in 1991. All of the non-agreements involved the naturally-occurring isotope K-40. Investigations were conducted in an attempt to resolve these non-agreements. The results of these investigations are summarized in Table D-3.

TABLE D-1

1991 QA SAMPLE PROGRAM
NUMBER OF DUPLICATE ANALYSES PERFORMED

| | ANALYSES | | | |
|---|---|---|---|---|
| SAMPLE MEDIUM | GROSS BETA | H-3 | I-131 | GAMMA ISOTOPIC |
| AIR PARTICULATE | 22 | | | 11 |
| AIR IODINE | | | 46 | |
| RAIN WATER | | 1 | | 1 |
| WELL WATER | | 5 | 5 | 1 |
| SURFACE WATER | | 5 | 4 | 8* |
| AQUATIC SEDIMENT | | | | 2* |
| CLAMS | | | | 5* |
| VEGETABLES | | | | 1 |
| SOIL | | | | 1 |
| FISH | | | | 1 |

* 1 DUPLICATE ON QC SAMPLE

TABLE D-2

1991 QA SAMPLE PROGRAM

SPLIT SAMPLES

| SAMPLE MEDIUM | NUMBER OF REGULAR STATIONS | COLLECTION FREQUENCY | NUMBER OF QA STATIONS | QA SAMPLE COLLECTION FREQUENCY |
|---|---|---|---|---|
| PRECIPITATION | 13 | MONTHLY | 1 | QUARTERLY COMPOSITE WHEN AVAILABLE |
| SURFACE WATER | 8 | MONTHLY | 1 | QUARTERLY |
| WELL WATER | 5 | MONTHLY | 1 | QUARTERLY |
| CLAMS | 5 | MONTHLY | 1 | QUARTERLY |
| SOIL | 3 | QUARTERLY WHEN VEGETABLES AVAILABLE | 1 | QUARTERLY WHEN VEGETABLES AVAILABLE |
| SEDIMENT | 5 | MONTHLY | 1 | QUARTERLY COMPOSITE |
| VEGETABLES | 3 | MONTHLY WHEN AVAILABLE | 1 | QUARTERLY WHEN AVAILABLE |
| TLD | 63 | QUARTERLY | 2 | QUARTERLY |

TABLE D-3

RESOLUTION OF OCNGS REMP SPLIT SAMPLE ANALYTICAL NON-AGREEMENTS

| SAMPLE MEDIUM | SAMPLE DATE | NUCLIDE | AGREEMENT AFTER RE-ANALYSIS | REASON FOR NON-AGREEMENT |
|---|---|---|---|---|
| SURFACE WATER | 2-04-91 | K-40 | YES | |
| SURFACE WATER | 4-29-91 | K-40 | SAMPLE DISCARDED - COULD NOT BE RE-ANALYZED | |
| AQUATIC SEDIMENT | 7-22-91 | K-40 | NO | NON-HOMOGENEOUS DISTRIBUTION OF RADIOACTIVITY IN SEDIMENT |

# APPENDIX E

## 1991 US EPA Cross-Check Results

TABLE E-1

OYSTER CREEK NUCLEAR GENERATING STATION
US EPA CROSS-CHECK PROGRAM 1991

| DATE | MEDIA | NUCLIDE | EPA RESULTS (A) | ERL RESULTS (B)* | TI RESULTS (B)** |
|---|---|---|---|---|---|
| JAN 1991 | WATER | Sr-89 | 5.0 ± 8.7 | NO DATA (C) | 5.0 ± 0.0 |
| | | Sr-90 | 5.0 ± 8.7 | NO DATA (C) | 5.0 ± 0.0 |
| | | Pu-239 | 3.3 ± 0.5 | NO DATA (C) | 3.6 ± 0.1 |
| | | Gross Alpha | 5.0 ± 8.7 | 6.3 ± 1.2 | 9.0 ± 1.0 |
| | | Gross Beta | 5.0 ± 8.7 | 5.7 ± 0.6 | 7.0 ± 1.5 |
| FEB 1991 | WATER | Ba-133 | 75.0 ± 13.9 | 79.7 ± 1.2 | 75.7 ± 5.5 |
| | | Co-60 | 40.0 ± 8.7 | 40.3 ± 0.6 | 39.3 ± 3.1 |
| | | Cs-134 | 8.0 ± 8.7 | 7.7 ± 2.1 | 7.3 ± 0.6 |
| | | Cs-137 | 8.0 ± 0.6 | 8.7 ± 0.6 | 7.7 ± 3.2 |
| | | Ru-106 | 186.0 ± 33.0 | 183.3 ± 11.6 | 176.7 ± 17.6 |
| | | Zn-65 | 149.0 ± 26.0 | 146.7 ± 5.8 | 147.0 ± 1.0 |
| | | H-3 | 4418.0 ± 766.8 | 4533.3 ± 57.7 | 4500.0 ± 173.2 |
| | | I-131 | 75.0 ± 13.9 | 77.7 ± 1.5 | 80.0 ± 5.3 |
| MAR 1991 | WATER | Ra-226 | 31.8 ± 1.3 | NO DATA (C) | 28.3 ± 4.7 |
| | | Ra-228 | 21.1 ± 9.2 | NO DATA (C) | 16.7 ± 2.1 |
| | | U (Nat.) | 7.6 ± 5.2 | NO DATA (C) | 7.3 ± 0.2 |
| MAR 1991 | AIR FILTER | Gross Alpha | 25.0 ± 10.4 | 33.3 ± 0.6 | 42.7 ± 0.6 (D) |
| | | Gross Beta | 124.0 ± 10.4 | 123.0 ± 2.7 | 126.7 ± 5.8 |
| | | Sr-90 | 40.0 ± 8.7 | NO DATA (C) | 37.0 ± 1.0 |
| | | Cs-137 | 40.0 ± 8.7 | 48.7 ± 1.2 | 43.0 ± 5.3 |
| APR 1991 | WATER | Gross Alpha | 54.0 ± 24.3 | 48.3 ± 1.5 | 59.7 ± 4.0 |
| | | Gross Beta | 115.0 ± 29.5 | 107.7 ± 0.6 | 110.0 ± 0.0 |
| | | Ra-226 | 8.0 ± 2.1 | NO DATA (C) | 7.3 ± 0.8 |
| | | Ra-228 | 15.2 ± 6.6 | NO DATA (C) | 10.0 ± 0.0 |
| | | U (Nat.) | 29.8 ± 5.2 | NO DATA (C) | 30.3 ± 0.6 |
| | | Sr-89 | 28.0 ± 8.7 | NO DATA (C) | 31.0 ± 1.0 |
| | | Sr-90 | 26.0 ± 8.7 | NO DATA (C) | 21.0 ± 0.0 |
| | | Cs-134 | 24.0 ± 8.7 | 23.7 ± 1.2 | 25.0 ± 1.0 |
| | | Cs-137 | 25.0 ± 8.7 | 26.3 ± 1.5 | 24.0 ± 1.7 |
| APR 1991 | MILK | Sr-89 | 32.0 ± 8.7 | NO DATA (C) | 24.0 ± 3.0 |
| | | Sr-90 | 32.0 ± 8.7 | NO DATA (C) | 26.3 ± 2.1 |
| | | I-131 | 49.0 ± 10.4 | 61.7 ± 0.6 | 53.3 ± 2.3 |
| | | Cs-137 | 49.0 ± 8.7 | 50.3 ± 1.5 | 52.7 ± 1.5 |
| | | K-40 (Nat.) | 1650.0 ± 144.0 | 1733.3 ± 35.1 | 1590.0 ± 81.9 |
| MAY 1991 | WATER | Sr-89 | 39.0 ± 8.7 | NO DATA (D) | 38.7 ± 4.5 |
| | | Sr-90 | 24.0 ± 8.7 | NO DATA (D) | 22.0 ± 1.7 |
| | | Gross Alpha | 24.0 ± 10.4 | 33.7 ± 1.5 | 24.3 ± 2.5 |
| | | Gross Beta | 46.0 ± 8.7 | 47.3 ± 0.6 | 50.3 ± 1.5 |
| JUN 1991 | WATER | Ba-133 | 62.0 ± 10.4 | 65.0 ± 1.7 | 56.3 ± 1.5 |
| | | Co-60 | 10.0 ± 8.7 | 10.3 ± 0.6 | 10.3 ± 0.6 |
| | | Cs-134 | 15.0 ± 8.7 | 13.7 ± 1.5 | 13.7 ± 1.5 |
| | | Cs-137 | 14.0 ± 8.7 | 15.7 ± 1.2 | 13.7 ± 1.5 |
| | | H-3 | 12480.0 ± 2165.2 | 13000.0 ± 0.0 | 12833.3 ± 115.5 |
| | | Ru-106 | 149.0 ± 26.0 | 150.0 ± 10.0 | 156.7 ± 3.8 |
| | | Zn-65 | 108.0 ± 19.1 | 110.0 ± 0.0 | 106.0 ± 2.7 |
| JUL 1991 | WATER | Ra-226 | 15.9 ± 4.2 | NO DATA (C) | 15.0 ± 1.0 |
| | | Ra-228 | 16.7 ± 8.7 | NO DATA (C) | 14.3 ± 2.3 |
| | | U (Nat.) | 14.2 ± 5.2 | NO DATA (C) | 13.3 ± 0.6 |
| AUG 1991 | WATER | I-131 | 20.0 ± 10.4 | 20.3 ± 1.5 | 19.3 ± 0.6 |
| | | Pu-239 | 19.4 ± 3.3 | NO DATA (C) | 20.3 ± 0.6 |
| AUG 1991 | AIR FILTER | Gross Alpha | 25.0 ± 10.4 | 32.7 ± 0.6 | 27.0 ± 2.0 |
| | | Gross Beta | 92.0 ± 17.3 | 93.7 ± 2.1 | 100.0 ± 0.0 |
| | | Sr-90 | 30.0 ± 8.7 | NO DATA (C) | 27.7 ± 2.9 |
| | | Cs-137 | 30.0 ± 8.7 | 35.3 ± 1.5 | 33.3 ± 3.2 |

TABLE E-1

OYSTER CREEK NUCLEAR GENERATING STATION
US EPA CROSS-CHECK PROGRAM 1991

| DATE | MEDIA | NUCLIDE | EPA RESULTS (A) | ERL RESULTS (B)* | TI RESULTS (B)** |
|---|---|---|---|---|---|
| SEP 1991 | WATER | Sr-89 | 49.9 ± 8.7 | NO DATA (C) | 50.7 ± 2.9 |
| | | Sr-90 | 25.0 ± 8.7 | NO DATA (C) | 26.0 ± 1.0 |
| | | Gross Alpha | 10.0 ± 8.7 | 14.7 ± 2.3 | 11.7 ± 0.6 |
| | | Gross Beta | 20.0 ± 8.7 | 21.0 ± 0.0 | 21.0 ± 0.0 |
| SEP 1991 | MILK | Sr-89 | 25.0 ± 8.7 | NO DATA (C) | 21.0 ± 2.7 |
| | | Sr-90 | 25.0 ± 8.7 | NO DATA (C) | 19.9 ± 0.0 |
| | | I-131 | 108.0 ± 19.1 | 98.7 ± 2.3 | 113.3 ± 5.8 |
| | | Cs-137 | 30.0 ± 8.7 | 31.3 ± 0.6 | 29.0 ± 3.6 |
| | | K-40 (Nat.) | 1740.0 ± 150.9 | 1700.0 ± 0.0 | 1503.3 ± 75.1 (E) |
| OCT 1991 | WATER | Co-60 | 29.0 ± 8.7 | 30.7 ± 2.5 | 30.3 ± 2.1 |
| | | Zn-65 | 73.0 ± 12.1 | 74.3 ± 3.1 | 72.7 ± 7.1 |
| | | Ru-106 | 199.0 ± 34.7 | 199.0 ± 11.1 | 197.7 ± 7.5 |
| | | Cs-134 | 10.0 ± 8.7 | 10.0 ± 1.0 | 10.3 ± 0.6 |
| | | Cs-137 | 10.0 ± 8.7 | 11.0 ± 0.0 | [illegible] ± 0.6 |
| | | Ba-133 | 98.0 ± 17.3 | 101.7 ± 1.5 | [illegible] ± 8.7 |
| | | H-3 | 2454.0 ± 610.7 | 2333.3 ± 115.5 | [illegible] ± 57.7 |
| | | Gross Alpha | 82.0 ± 36.4 | 66.7 ± 2.3 | 55.0 ± 4.4 |
| | | Gross Beta | 65.0 ± 17.3 | 53.7 ± 1.5 | 56.0 ± 1.0 |
| | | Ra-226 | 22.0 ± 5.7 | NO DATA (C) | 21.0 ± 2.7 |
| | | Ra-228 | 22.2 ± 9.7 | NO DATA (C) | 18.0 ± 1.0 |
| | | U (Nat.) | 13.5 ± 5.2 | NO DATA (C) | 12.7 ± 0.6 |
| | | Sr-89 | 10.0 ± 8.7 | NO DATA (C) | 10.7 ± 2.1 |
| | | Sr-90 | 10.0 ± 8.7 | NO DATA (C) | 9.3 ± 0.6 |
| | | Co-60 | 20.0 ± 8.7 | 19.3 ± 2.1 | 19.7 ± 0.6 |
| | | Cs-134 | 10.0 ± 8.7 | 10.0 ± 1.0 | 10.3 ± 2.1 |
| | | Cs-137 | 11.0 ± 8.7 | 12.0 ± 1.0 | 13.7 ± 0.6 |
| NOV 1991 | WATER | Ra-226 | 6.5 ± 1.7 | NO DATA (C) | 5.4 ± 0.3 |
| | | Ra-228 | 8.1 ± 3.5 | NO DATA (C) | 7.9 ± 1.2 |
| | | U (Nat.) | 24.9 ± 5.2 | NO DATA (C) | 24.3 ± 0.6 |

* GPUN-ERL - The Environmental Radioactivity Laboratory located in Middletown, PA.

** TI - Teledyne Isotopes Westwood Laboratory located in Westwood, NJ

A. EPA Results - Expected Laboratory precision (± 3 sigma, n=3 control limit). Units are pCi/L for water and milk except K-NAT is in mg/L. Units are total pCi for air particulate filters. Units for food are pCi/kg.

B. Results - Average ± one standard deviation. Units are pCi/L for water and milk except K-NAT is in mg/L. Units are total pCi for air particulate filters. Units for food are pCi/kg.

C. No data available. Analysis not performed by laboratory.

D. The sample presents a different counting geometry. The EPA deposits activity in a 3/4 inch diameter circle, on a plastic disk approximately 3/32 inch thick. A special calibration for EPA filters will be performed. The laboratory has obtained blank filters from the Las Vegas facility, and will simulate their deposits.

E. There is no apparent cause for the low K-40 results. Two other isotopes spiked in the sample were in good agreement with EPA values. Unit conversions were reviewed and found to be correctly applied. Possible background errors in geometry were investigated and found to have an insignificant effect.

APPENDIX F

1991 Annual Dairy Census

## Annual Dairy Census - 1991

Ocean County Agricultural Agent, Ms. Deborah Smith-Fiola, was contacted regarding the occurrence of dairy animals within a five mile radius of the OCNGS. According to her records for 1991, there are neither any commercial dairy operations nor any dairy animals producing milk for human consumption within a five mile radius of OCNGS.

APPENDIX G

Dose Calculation Methodology

To the extent possible, radiological impacts were evaluated based on the direct measurement of dose rates or of radionuclide concentrations in the environment. However, the quantities of radionuclide releases associated with 1991 OCNGS operations were often too small to be measured once dispersed in the offsite environment. As a result, the potential offsite doses could only be estimated by using computerized models that predict concentrations of radioactive materials in the environment and subsequent radiation doses on the basis of radionuclides released to the environment. GPUN calculates doses using an advanced class "A" dispersion model called SEEDS (Simplified Effluent Environmental Dosimetry System). This model incorporates the guidelines and methodology set forth in USNRC Regulatory Guide 1.109. SEEDS uses hourly meteorological information matched to the time of releases to assess the dispersion of effluents in the discharge canal/estuary system and the atmosphere. Combining this assessment of dispersion and dilution with effluent data, postulated maximum hypothetical doses to the public from the OCNGS effluents are calculated. The maximum individual dose is calculated as well as the dose to the total population within 50 miles of OCNGS for gaseous effluents and the entire population downstream of the OCNGS around Barnegat Bay and the Atlantic Ocean for liquid effluents. Values of environmental parameters and radionuclide concentration factors have been chosen to provide conservative results. As a result, the doses calculated using this model are conservative estimates (i.e., overestimates) of the actual exposures.

The dose summary table, Table G-1, presents the maximum hypothetical doses to an individual, as well as the population doses, resulting from effluents from OCNGS during the 1991 reporting period.

Individual Doses From Liquid Effluents

As recommended in USNRC Regulatory Guide 1.109, dose calculations are performed on four age groups and eight organs (Table G-1). The pathways considered are consumption of fish, consumption of shellfish, and shoreline exposure. All pathways are considered to be primary recreational activities associated with Barnegat Bay and the Atlantic Ocean in the vicinity of the OCNGS. The "receptor" would be that individual who eats fish and shellfish that reside in the station discharge, and stands on the shoreline influenced by the station discharge. Table G-1 presents the maximum total body dose and critical organ dose for the age group most affected.

For the 1991 reporting period, the calculated maximum hypothetical total body dose received by anyone from liquid effluents would have been 2.04 E-5 mrem to a teenager. This represents 6.80 E-4 percent of the OCNGS Technical Specification annual dose limit. Similarly, the maximum hypothetical organ dose from liquid effluents would have been 8.65 E-5 mrem to the GI-LLI of an adult. This represents 8.65 E-4 percent of the OCNGS Technical Specification annual dose limits.

Individual Doses From Gaseous Effluents

There are seven major pathways considered in the dose calculation for gaseous effluents. These are: (1) plume exposure, (2) inhalation, (3) consumption of cow milk, (4) goat milk, (5) vegetables, (6) meat, and (7) standing on contaminated ground.

The maximum plume exposure reported in lines 3 and 4 of Table G-1 generally occurs at, or near, the site boundary. These "air doses" are not to an individual but are considered to be the maximum dose at a location. The location is not necessarily a receptor. It should be noted that real-time meteorology was used in all dose calculations for gaseous effluents.

With respect to airborne noble gaseous releases for the 1991 reporting period, the maximum plume exposure (air dose) would have been 1.48 E-2 and 1.12 E-2 mrad for OCNGS gamma and beta radiation, respectively. These doses are equal to 1.48 E-1 percent and 5.60 E-2 percent of the OCNGS Technical Specification annual dose limits, respectively.

The calculated airborne doses to the closest individual was at a distance of 1208 meters in the maximally affected sector (NE). These data are presented in lines 5 and 6 of Table G-1. Plume exposures to an individual, regardless of age, from gaseous effluents during the 1991 reporting period were 6.19 E-3 mrem to the total body and 7.64 E-3 mrem to the skin. These doses are equivalent to [illegible] 4 E-1 percent and 5.09 E-2 percent of the 10CFR50, Appendix I annual dose limits, respectively.

The dose to the maximum exposed organ due to radioactive airborne iodine and particulates is presented in line 7, Table G-1. This does not include the whole body plume exposure which was separated out on line 5. The dose presented in this section reflects the maximum exposure to an organ for the appropriate age group. During 1991, gaseous iodines and particulates from OCNGS would have resulted in a maximum dose of 7.62 E-2 mrem to the thyroid of an infant. This dose is only 5.08 E-1 percent of the OCNGS Technical Specification annual dose limit.

## Population Doses From Liquid and Gaseous Effluents

The population doses resulting from liquid and gaseous effluents are summed over all pathways and the affected population (Table C-1, lines 8-11). Liquid population dose is based upon the population located within the region from the OCNGS outfall extending out to the Atlantic Ocean. The population dose due to gaseous effluents is based upon the 1980 population projections of the Final Safety Analysis Report (FSAR) and considers the population out to a distance of 50 miles around the OCNGS as well as the much larger total population which can be fed by food stuffs grown in the 50 mile radius. Population doses are summed over all distances and sectors to give an aggregate dose.

Total OCNGS liquid and gaseous effluents resulted in a population dose of 2.22 E-1 person-rem total body for the 1991 reporting period. This is approximately 4.5 million times lower than the doses to the same population resulting from natural background sources.

TABLE G-1

SUMMARY OF MAXIMUM HYPOTHETICAL INDIVIDUAL AND POPULATION DOSES FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCNGS FOR 1991

Individual Doses

| | | Regulatory Limits | | | | Location | | |
|---|---|---|---|---|---|---|---|---|
| | Effluent Released | mRem/Year | Source | Calculated Dose mRem/year | Age Group | Dist (m) | Dir (toward) | Percent Regulatory Limit |
| 1. | LIQUID | 3 mRem Total Body | Tech. Spec. 3.6.J.1 | 2.04 E-5 | Teen | 610* | SE* | 6.80 E-4 |
| 2. | LIQUID | 10 mRem Any Organ | Tech. Spec. 3.6.J.1 | 8.65 E-5 | Adult | 610* | SE* | 8.65 E-4 |
| 3. | AIRBORNE (Noble Gas) | 10 mRad Gamma Radiation | Tech. Spec. 3.6.L.1 | 1.48 E-2 | - | 500 | NE | 1.48 E-1 |
| 4. | AIRBORNE (Noble Gas) | 20 mRad Beta Radiation | Tech. Spec. 3.6.L.1 | 1.12 E-2 | - | 400 | ENE | 5.6[illegible]2 |
| 5. | AIRBORNE (Noble Gas) | 5 mRem Total Body | 10CFR50 App. I | 6.19 E-3 | All | 1208 | NE | 1.24 E-1 |
| 6. | AIRBORNE (Noble Gas) | 15 mRem Skin | 10CFR50 App. I | 7.64 E-3 | All | 1208 | NE | 5.09 E-2 |
| 7. | AIRBORNE (Iodine and Particulate) | 15 mRem Any Organ | Tech. Spec. 3.6.M.1 | 7.62 E-2 | Infant | 1006 | ESE | 5.08 E-1 |

Population Doses

| | Effluent Released | Applicable Organ | Calculated Dose (Person-rem) |
|---|---|---|---|
| 8. | LIQUID | Total Body | 2.41 E-3 |
| 9. | LIQUID | GI-LLI | 1.30 E-2 |
| 10. | GASEOUS | Total Body | 2.20 E-1 |
| 11. | GASEOUS | Thyroid | 5.80 E-1 |

*U.S. Route 9 Bridge - OCNGS Discharge Canal

APPENDIX H

1991 Groundwater Monitoring Results

TABLE H-1

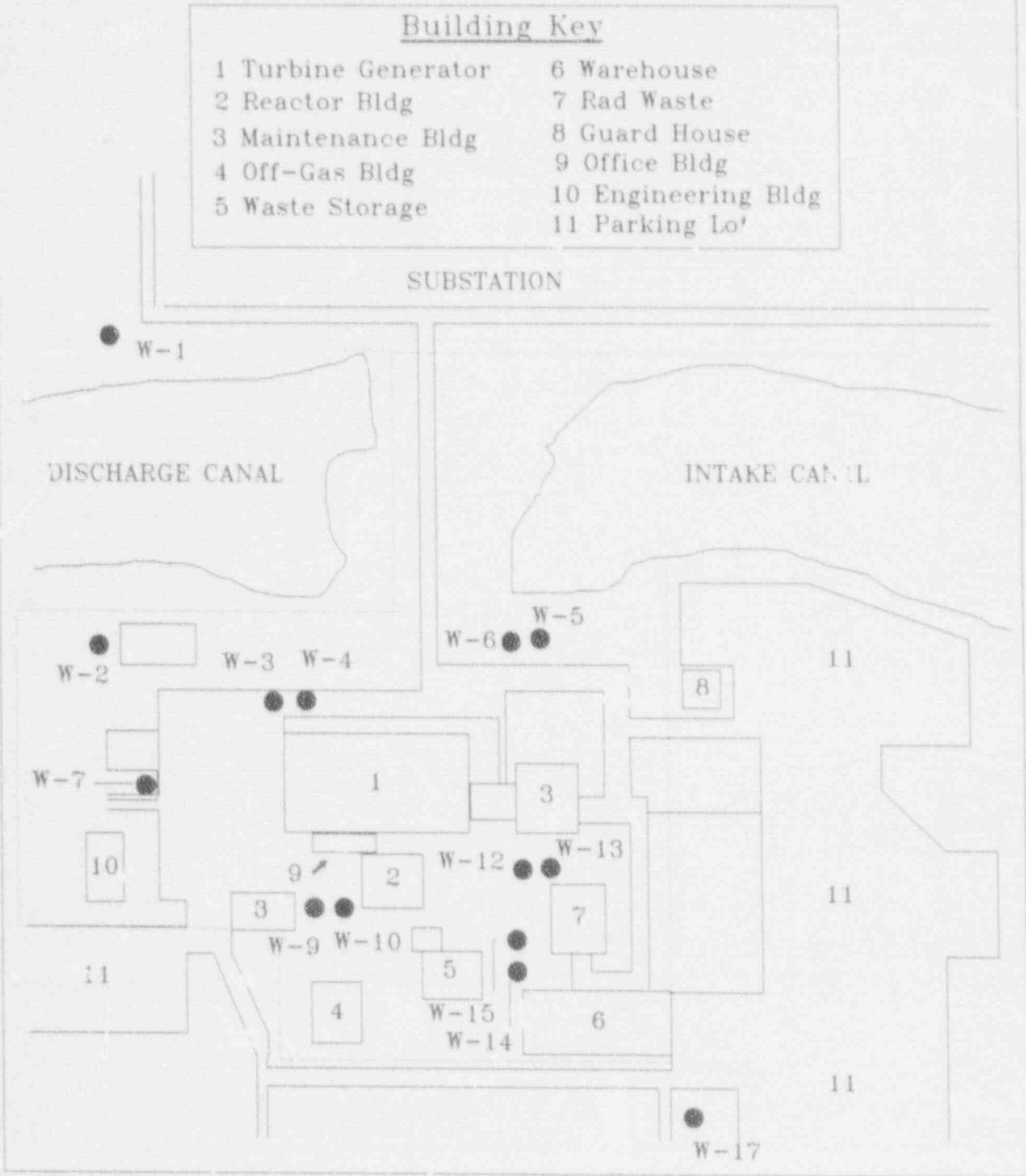
OCNGS - GROUNDWATER RESULTS

CONCENTRATION IN pCi/LITER +/- 2 STANDARD DEVIATION

| MARCH 1991 | | |
|---|---|---|
| STATION | TRITIUM RESULTS | GAMMA ISOTOPIC RESULTS |
| OC-WW-1 | < 190 | ALL NUCLIDES < LLD |
| OC-WW-2 | < 170 | ALL NUCLIDES < LLD |
| OC-WW-3 | < 190 | ALL NUCLIDES < LLD |
| OC-WW-4 | < 190 | ALL NUCLIDES < LLD |
| OC-WW-5 | < 190 | ALL NUCLIDES < LLD |
| OC-WW-6 | < 190 | ALL NUCLIDES < LLD |
| OC-WW-7 | 210 +/- 110 | ALL NUCLIDES < LLD |
| OC-WW-9 | < 170 | ALL NUCLIDES < LLD |
| OC-WW-10 | 210 +/- 110 | ALL NUCLIDES < LLD |
| OC-WW-14 | 210 +/- 110 | ALL NUCLIDES < LLD |
| OC-WW-15 | 190 +/- 110 | ALL NUCLIDES < LLD |
| OC-WW-16 | 220 +/- 120 | ALL NUCLIDES < LLD |
| OC-WW-17 | < 170 | ALL NUCLIDES < LLD |

| SEPTEMBER 1991 | | |
|---|---|---|
| STATION | TRITIUM RESULTS | GAMMA ISOTOPIC RESULTS |
| OC-WW-1 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-2 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-3 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-4 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-5 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-6 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-9 | 150 +/- 100 | ALL NUCLIDES < LLD |
| OC-WW-10 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-12 | 160 +/- 100 | ALL NUCLIDES < LLD |
| OC-WW-14 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-16 | < 150 | ALL NUCLIDES < LLD |
| OC-WW-17 | < 150 | ALL NUCLIDES < LLD |

# Figure H-1
## Locations Of On-Site Wells



APPENDIX I

1991 REMP Sample Collection and Analysis Methods

TABLE I-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1991

| Analysis | Sample Medium | Sampling Method | Collection Procedure Number | Approximate Sample Size Collected | Analysis Procedure Number | Procedure Abstract |
|---|---|---|---|---|---|---|
| Gr-Beta | APT | Continuous weekly or more frequent air sampling through filter paper | OC-EC 6635-IMP-4522.05 | 1 filter (approximately 600 cubic meters weekly) | TMI-EC 6615-IMP-4592.05 | Low background gas flow proportional counting |
| Gamma Spectro-scopy | APT | Four week composite of each station | OC-EC 6635-IMP-4522.05 | 4 filters (approximately 2400 cubic meters) | TMI-EC 6615-IMP-4592.05 | Gamma isotopic analysis |
| Gamma Spectro-scopy | AIO | Continuous weekly or more frequent air sampling through charcoal cartridges | OC-EC 6635-IMP-4522.05 | 1 cartridge (approximately 600 cubic meters weekly) | TMI-EC 6615-OPS-4591.04 | Gamma isotopic analysis |
| Gamma Spectro-scopy | SWA | Four week grab sample | OC-EC 6635-IMP-4522.06 | 7.5 liters | TMI-EC 6615-IMP-4592.06 6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood PRO-042-5 | Gamma Isotopic analysis |
| Gamma Spectro-scopy | RWA | Twelve week composite | OC-EC 6635-IMP-4522.07 | Minimum of 0.5 liters | TMI-EC 6615-IMP-4592.06 6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood PRO-042-5 | Gamma Isotopic analysis |
| Gamma Spectro-scopy | WWA | Four week grab sample | OC-EC 6635-IMP-4522.10 | 7.5 liters | TMI-EC 6615-IMP-4592.06 6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood PRO-042-5 | Gamma Isotopic analysis |
| Gamma Spectro-scopy | CLAM FISH CRAB | Four week grab sample Semiannual grab sample Semiannual grab sample | OC-EC 6635-IMP-4522.14 6635-IMP-4522.16 | 1 kg (if possible) | TMI-EC 6615-IMP-4592.03 6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood PRO-042-5 | Gamma Isotopic analysis |

TABLE I-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1991

| Analysis | Sample Medium | Sampling Method | Collection Procedure Number | Approximate Sample Size Collected | Analysis Procedure Number | Procedure Abstract |
|---|---|---|---|---|---|---|
| Gamma Spectro-scopy | AQS | Twelve week composite of each station | OC-EC | 3.8 liters | TMI-EC | Gamma isotopic analysis |
| | SOIL | Twelve week grab sample (when vegetables are available) | 6635-IMP-4522.03<br>6635-IMP-4522.08 | (if possible) | 6615-IMP-4592.04<br>6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood<br>PRO-042-5 | Gamma Isotopic analysis |
| Gamma Spectro-scopy | VEG | Four week grab sample | OC-EC<br>6635-IMP-4522.04 | 1 kg or more (if possible) | TMI-EC<br>6615-IMP-4592.03<br>6615-OPS-4591.04 | Gamma isotopic analysis |
| | | | | | TI-Westwood<br>PRO-042-5 | Gamma Isotopic analysis |
| Tritium | SWA | Four week grab sample | OC-EC<br>6635-IMP-4522.06 | 7.5 liters | TMI-EC<br>6615-IMP-4592.02<br>6615-OPS-4591.05 | Sample mixed with scintillation fluid for scintillation counting. |
| | | | | | TI-Westwood<br>PRO-052-2 | Water converted to hydrogen, methane added for gas counting. |
| Tritium | RWA | Twelve week composite sample | OC-EC<br>6635-IMP-4522.07 | Minimum of 0.5 liters | TMI-EC<br>6615-IMP-4592.02<br>6615-OPS-4591.05 | Sample mixed with scintillation fluid for scintillation counting. |
| | | | | | TI-Westwood<br>PRO-052-2 | Water converted to hydrogen, methane added for gas counting. |

TABLE 1-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1991

| Analysis | Sample Medium | Sampling Method | Collection Procedure Number | Approximate Sample Size Collected | Analysis Procedure Number | Procedure Abstract |
|---|---|---|---|---|---|---|
| Tritium | WWA | Four week grab sample | OC-EC 6635-IMP-4522.10 | 7.5 liters | TMI-EC 6615-IMP-4592.02 6615-OPS-4591.05 | Sample mixed with scintillation fluid for scintillation counting. |
| | | | | | TI-Westwood PRO-052-2 | Water converted to hydrogen, methane added for gas counting. |
| TLD (Panasonic) | Immersion Dose | Dosimeters exchanged quarterly | OC-EC 6635-IMP-4522.02 | Four Badges | TMI-Dosimetry 9100-OPS-4243.01 | Thermoluminescent dosimetry |
| TLD (Teledyne Isotopes) | Immersion Dose | Dosimeters exchanged quarterly | OC-EC 6635-IMP-4522.02 | One Badge | TI-Westwood Pro-342-17 | Thermoluminescent dosimetry |

APPENDIX J

1991 TLD Quarterly Data

TABLE J-1
OYSTER CREEK NUCLEAR GENERATING STATION - ENVIRONMENTAL CONTROLS
1991 QUARTERLY ENVIRONMENTAL TLD REPORT - TELEDYNE ISOTOPES
RUNNING TABLE - MILLIREM PER STANDARD MONTH AND 2-STANDARD DEVIATIONS

| | First Period 1991 | | Second Period 1991 | | Third Period 1991 | | Fourth Period 1991 | | Fifth Period 1991 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev |
| A | 3.7 | 0.4 | 3.3 | 0.5 | 4.5 | 0.3 | 3.7 | 0.2 | 5.3 | 0.3 |
| C | 3.6 | 0.2 | 3.6 | 0.2 | 3.7 | 0.4 | 3.4 | 0.2 | 4.1 | 0.1 |
| H | 3.4 | 0.2 | 2.8 | 0.2 | 5.2 | 0.3 | 3.3 | 0.2 | 3.8 | 0.1 |
| 1 | 4.3 | 0.3 | 3.3 | 0.5 | 4.2 | 0.7 | * | * | * | * |
| 3 | 4.6 | 0.3 | 3.5 | 0.3 | 3.9 | 0.2 | * | * | * | * |
| 4 | 4.0 | 0.2 | 2.6 | 0.1 | 4.3 | 1.1 | * | * | * | * |
| 5 | 3.4 | 0.2 | 3.3 | 0.4 | 4.1 | 0.2 | * | * | * | * |
| 6 | 4.4 | 0.1 | 3.5 | 0.3 | 5.1 | 0.4 | * | * | * | * |
| 7 | 3.2 | 0.7 | 2.6 | 0.3 | 3.8 | 0.2 | * | * | * | * |
| 8 | 3.5 | 0.2 | 2.9 | 0.3 | 4.1 | 0.1 | 3.3 | 0.3 | 5.[illegible] | 0.1 |
| 9 | 3.5 | 0.3 | 2.9 | 0.2 | 4.2 | 0.3 | * | * | * | * |
| 11 | 4.7 | 0.4 | 3.7 | 0.5 | 4.6 | 0.2 | * | * | * | * |
| 10 | 4.9 | 0.5 | 3.5 | 0.2 | 3.9 | 0.3 | * | * | * | * |
| 11 | 3.1 | 0.2 | 3.3 | 0.2 | 3.8 | 0.1 | * | * | * | * |
| 12 | 3.6 | 0.2 | 3.7 | 0.2 | 5.3 | 0.4 | * | * | * | * |
| 13 | 3.3 | 0.3 | 2.6 | 0.3 | 5.2 | 0.3 | * | | * | * |
| 14 | 4.3 | 0.3 | 2.9 | 0.3 | 3.5 | 0.2 | 4.1 | 0.4 | 5.6 | 0.6 |
| 15 | 3.5 | 0.2 | 3.7 | 0.4 | 4.2 | 0.2 | * | * | * | * |
| [illegible] | 4.0 | 0.3 | 3.5 | 0.3 | 3.8 | 0.2 | * | * | * | * |
| 17 | 4.0 | 0.3 | 2.8 | 0.2 | 3.9 | 0.2 | * | * | * | * |
| 20 | 3.3 | 0.1 | 2.7 | 0.2 | 3.8 | 0.3 | * | * | * | * |
| 22 | 3.3 | 0.3 | 3.5 | 0.2 | 3.9 | 0.1 | * | * | * | * |
| 51 | 4.1 | 0.2 | 4.3 | 0.3 | 4.7 | 0.4 | * | * | * | * |
| 52 | 4.7 | 0.3 | 3.9 | 0.4 | 5.2 | 0.3 | * | * | * | * |
| 53 | 4.0 | 0.2 | 3.7 | 0.4 | 6.2 | 0.5 | * | * | * | * |
| 54 | 3.4 | 0.3 | 2.7 | 0.2 | 3.9 | 0.4 | * | * | * | * |
| 55 | 3.5 | 0.2 | 3.2 | 0.2 | 5.4 | 0.2 | * | * | * | * |
| 56 | 4.0 | 0.3 | 3.5 | 0.2 | 6.1 | 0.4 | * | * | * | * |
| 57 | 5.5 | 0.6 | 3.9 | 0.4 | 5.6 | 0.8 | * | * | * | * |
| 58 | 5.3 | 0.5 | 3.2 | 0.2 | 4.1 | 0.2 | * | * | * | * |
| 59 | 4.4 | 0.2 | 4.4 | 0.1 | 4.9 | 0.4 | * | * | * | * |
| 60 | 3.4 | 0.1 | 3.1 | 0.1 | 5.0 | 0.2 | * | * | * | * |

NOTE: Teledyne Isotopes TLD Secondary network reduced to ten (10) stations after the third reporting period.

TABLE J-1
OYSTER CREEK NUCLEAR GENERATING STATION - ENVIRONMENTAL CONTROLS
1991 QUARTERLY ENVIRONMENTAL TLD REPORT - TELEDYNE ISOTOPES
RUNNING TABLE - MILLIREM PER STANDARD MONTH AND 2-STANDARD DEVIATIONS

| | First Period 1991 | | Second Period 1991 | | Third Period 1991 | | Fourth Period 1991 | | Fifth Period 1991 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev |
| 61 | 3.4 | 0.2 | 3.0 | 0.2 | 5.8 | 0.2 | * | * | * | * |
| 62 | 3.5 | 0.2 | 3.8 | 0.3 | 5.9 | 0.1 | * | * | * | * |
| 63 | 3.6 | 0.4 | 3.2 | 0.2 | 6.0 | 0.6 | * | * | * | * |
| 64 | 4.6 | 0.9 | 3.0 | 0.1 | 4.2 | 0.3 | * | * | * | * |
| 65 | 3.5 | 0.2 | 3.2 | 0.4 | 4.1 | 0.3 | * | * | * | * |
| 66 | 3.4 | 0.2 | 4.1 | 0.6 | 4.2 | 0.2 | 3.1 | 0.2 | 4.8 | 0.2 |
| 67 | 3.6 | 0.6 | 4.0 | 0.2 | 4.4 | 0.2 | * | * | * | * |
| 69 | 3.3 | 0.1 | 3.8 | 0.2 | 4.1 | 0.2 | * | * | * | * |
| 70 | 3.2 | 0.4 | 3.0 | 0.1 | 4.0 | 0.2 | * | * | * | * |
| 71 | 3.4 | 0.3 | 3.4 | 0.4 | 4.2 | 0.2 | * | * | * | * |
| 73 | 3.2 | 0.2 | 3.9 | 0.2 | 4.1 | 0.1 | TLD LOST | | TLD LOST | |
| 74 | 3.2 | 0.2 | 3.1 | 0.2 | 5.6 | 0.9 | * | * | * | * |
| 75 | 3.6 | 0.2 | 4.1 | 0.4 | 5.6 | 0.2 | * | * | * | * |
| 76 | 3.2 | 0.1 | 3.0 | 0.2 | 4.2 | 0.2 | * | * | * | * |
| 77 | 3.2 | 0.3 | 3.1 | 0.3 | 5.6 | 0.5 | * | * | * | * |
| 78 | 3.3 | 0.3 | 3.2 | 0.2 | 4.2 | 0.1 | * | * | * | * |
| 79 | TLD LOST | | 2.9 | 0.1 | 4.3 | 0.3 | 3.0 | 0.1 | 3.7 | 0.2 |
| 80 | 3.3 | 0.3 | 3.6 | 0.3 | 4.2 | 0.1 | * | * | * | * |
| 81 | 3.6 | 0.2 | 3.6 | 0.3 | 4.6 | 0.1 | * | * | * | * |
| 82 | 4.7 | 0.5 | TLD LOST | | 4.7 | 0.3 | * | * | * | * |
| 83 | 3.4 | 0.6 | 3.3 | 0.2 | 4.7 | 0.8 | * | * | * | * |
| 84 | 4.3 | 0.4 | 3.4 | 0.2 | 4.6 | 0.1 | * | * | * | * |
| 85 | 4.7 | 0.2 | 3.2 | 0.2 | 5.0 | 0.1 | * | * | * | * |
| 86 | 4.4 | 0.3 | 3.2 | 0.3 | 4.6 | 0.4 | * | * | * | * |
| 87 | 4.2 | 0.3 | 4.4 | 0.3 | 4.3 | 0.2 | * | * | * | * |
| 88 | 3.5 | 0.7 | 3.0 | 0.1 | 3.7 | 0.1 | * | * | * | * |
| 89 | 4.3 | 0.3 | 3.1 | 0.3 | 3.7 | 0.1 | * | * | * | * |
| 90 | 4.5 | 0.3 | 3.0 | 0.1 | 3.8 | 0.1 | 2.9 | 0.1 | 3.5 | 0.1 |
| 91 | 4.6 | 0.3 | 3.3 | 0.2 | 4.0 | 0.1 | * | * | * | * |
| 92 | 5.5 | 0.2 | 4.0 | 0.3 | 4.8 | 0.2 | * | * | * | * |
| 95 | 3.6 | 0.3 | 3.1 | 0.3 | 4.1 | 0.2 | * | * | * | * |
| 96 | 4.0 | 1.0 | 3.5 | 0.4 | 4.3 | 0.1 | 3.5 | 0.3 | 4.1 | 0.1 |
| 97 | 3.9 | 0.8 | 3.3 | 0.2 | 4.1 | 0.2 | * | * | * | * |

NOTE: Teledyne Isotopes TLD Secondary network reduced to ten (10) stations after the third reporting period.

TABLE J-2
OYSTER CREEK N[illegible]R GENERATING STATION - ENVIRONMENTAL CONTROLS
1991 QUARTERLY ENVIRONMENTAL TLD REPORT - PANASONIC
RUNNING TABLE - MILLIREM PER STANDARD QUARTER AND 2-STANDARD DEVIATIONS

| | First Period 1991 | | Second Period 1991 | | Third Period 1991 | | Fourth Period 1991 | | Fifth Period 1991 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev |
| A | 11.20 | 0.89 | 12.09 | 1.04 | 11.57 | 0.79 | 10.85 | 0.85 | 12.88 | 0.87 |
| C | 10.40 | 0.75 | 10.82 | 1.06 | 11.29 | 0.44 | 10.86 | 1.00 | 12.00 | 1.19 |
| H | 9.50 | 0.62 | 9.36 | 0.73 | 10.36 | 0.79 | 9.94 | 0.70 | 11.83 | 0.34 |
| 1 | 11.60 | 0.48 | 10.39 | 0.39 | 10.35 | 0.74 | 10.82 | 1.03 | 13.47 | 0.48 |
| 3 | 9.39 | 0.52 | 9.74 | 0.16 | 10.63 | 0.82 | 9.85 | 0.83 | 11.91 | 1.27 |
| 4 | 8.99 | 0.32 | 9.43 | 0.71 | 8.57 | 0.73 | 9.03 | 1.01 | 10.88 | 0.71 |
| 5 | 10.50 | 0.87 | 12.20 | 0.46 | 10.77 | 0.87 | 10.08 | 0.94 | 12.34 | 0.33 |
| 6 | 9.56 | 0.74 | 9.48 | 0.60 | 10.36 | 0.81 | 9.62 | 0.66 | 11.42 | 0.77 |
| 7 | 9.57 | 0.92 | 8.85 | 0.64 | 9.37 | 0.43 | 8.93 | 1.07 | 10.27 | 0.64 |
| 8 | 9.45 | 0.52 | 10.22 | [illegible] | 10.49 | 0.86 | 9.21 | 0.83 | 11.25 | 0.67 |
| 9 | 10.60 | 0.41 | 10.99 | 0.80 | 10.98 | 0.68 | 9.91 | 0.44 | 12.65 | 0.72 |
| T1 | 10.90 | 0.31 | 10.18 | 0.94 | 10.34 | 0.63 | 10.61 | 0.83 | 12.44 | 0.75 |
| 10 | 9.66 | 0.74 | 10.68 | 0.43 | 10.26 | 0.70 | 9.70 | 0.36 | 12.44 | 0.78 |
| 11 | 9.08 | 0.77 | 9.72 | 0.69 | 9.57 | 0.50 | 9.37 | 0.76 | 11.00 | 0.58 |
| 12 | 10.30 | 0.58 | 9.77 | 0.28 | 11.16 | 0.62 | 9.89 | 0.86 | 13.20 | 1.68 |
| 13 | 8.38 | 0.65 | 9.02 | 0.61 | 9.67 | 0.29 | 9.29 | 0.82 | 10.99 | 1.10 |
| 14 | 12.10 | 0.76 | 10.65 | 0.95 | 12.86 | 0.74 | 12.65 | 0.77 | 14.69 | 1.63 |
| 15 | 10.30 | 0.38 | 10.50 | 0.46 | 11.22 | 0.96 | 9.71 | 0.80 | 10.71 | 1.07 |
| 16 | 8.93 | 0.33 | 9.10 | 0.51 | 9.45 | 0.60 | 8.80 | 9.07 | 11.73 | 1.11 |
| 17 | 9.69 | 0.58 | 9.74 | 0.66 | 10.05 | 0.29 | 9.43 | 1.10 | 11.47 | 1.35 |
| 20 | 9.52 | 0.67 | 9.13 | 0.76 | 9.75 | 0.65 | 8.75 | 0.48 | 11.14 | 0.83 |
| 22 | 9.14 | 0.45 | 8.61 | 1.35 | 9.13 | 0.37 | 8.84 | 0.27 | 10.40 | 1.05 |
| 51 | 12.80 | 0.44 | 11.21 | 0.43 | 11.55 | 0.40 | 12.02 | 0.73 | 13.65 | 1.04 |
| 52 | 14.20 | 0.73 | 12.85 | 0.82 | 13.07 | 0.53 | 12.97 | 0.86 | 15.73 | 0.31 |
| 53 | 12.00 | 0.65 | 10.66 | 0.51 | 10.74 | 0.67 | 11.37 | 0.71 | 13.61 | 0.67 |
| 54 | 10.50 | 0.63 | 9.94 | 0.60 | 9.42 | 0.65 | 9.62 | 0.83 | 12.57 | 1.44 |
| 55 | 10.30 | 0.79 | 10.27 | 10.70 | 10.52 | 0.83 | 10.44 | 0.79 | 11.32 | 0.96 |
| 56 | 11.70 | 0.69 | TLD LOST | | 9.71 | 1.38 | 10.37 | 0.59 | 13.00 | 0.48 |
| 57 | 14.10 | 2.61 | 11.48 | 0.57 | 11.56 | 0.43 | 14.31 | 1.54 | 15.83 | 2.49 |
| 58 | 12.00 | 1.36 | 10.22 | 0.56 | 9.15 | 0.55 | 11.84 | 0.88 | 14.17 | 0.64 |
| 59 | 12.90 | 1.32 | 11.03 | 0.69 | 11.17 | 0.64 | 11.32 | 0.59 | 14.15 | 0.66 |
| 60 | 10.30 | 0.69 | 9.45 | 0.62 | 10.05 | 1.00 | 9.08 | 0.74 | 12.32 | 1.21 |

TABLE J-2
OYSTER CREEK NUCLEAR GENERATING STATION - ENVIRONMENTAL CONTROLS
1991 QUARTERLY ENVIRONMENTAL TLD REPORT - PANASONIC
RUNNING TABLE - MILLIREM PER STANDARD QUARTER AND 2-STANDARD DEVIATIONS

| | First Period 1991 | | Second Period 1991 | | Third Period 1991 | | Fourth Period 1991 | | Fifth Period 1991 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Station | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev | Reading | Std. Dev |
| 61 | 10.90 | 0.90 | 9.35 | 0.43 | 10.46 | 0.89 | [illegible].44 | 0.78 | 11.47 | 1.55 |
| 62 | 10.80 | 1.33 | 9.98 | 0.30 | 10.31 | 0.33 | 9.36 | 0.80 | 11.09 | 0.71 |
| 63 | 11.50 | 0.89 | 10.23 | 0.66 | 10.97 | 0.51 | 10.08 | 0.99 | 12.78 | 0.94 |
| 64 | 10.50 | 0.55 | 9.32 | 0.42 | 9.93 | 0.67 | 9.67 | 0.90 | 11.84 | 0.80 |
| 65 | 10.70 | 0.72 | 9.58 | 0.65 | 10.11 | 0.24 | 10.03 | 0.67 | 12.11 | 0.97 |
| 66 | 10.40 | 1.03 | 9.82 | 0.68 | 10.38 | 0.63 | 8.76 | 1.10 | 11.53 | 0.98 |
| 67 | 10.30 | 0.95 | 10.09 | 0.44 | 10.88 | 0.63 | 9.79 | 0.23 | 14.04 | 1.42 |
| 69 | 10.00 | 0.47 | 9.12 | 0.67 | 11.10 | 0.75 | 9.01 | 0.61 | 11.24 | 0.61 |
| 70 | 9.59 | 0.54 | 8.69 | 0.80 | 9.32 | 0.84 | 8.81 | 0.70 | 10.79 | 0.90 |
| 71 | 10.00 | 0.87 | 9.32 | 0.79 | 10.84 | 0.47 | 9.70 | 0.75 | 10.76 | 1.19 |
| 73 | 9.15 | 0.97 | 9.18 | 0.34 | 9.96 | 0.45 | 8.93 | 0.65 | 10.60 | 0.99 |
| 74 | 11.10 | 0.89 | 9.36 | 0.38 | 10.83 | 0.59 | 9.63 | 0.92 | 11.73 | 0.77 |
| 75 | 11.70 | 0.64 | 11.03 | 0.53 | 11.78 | 0.84 | 10.99 | 1.08 | 12.96 | 0.85 |
| 76 | 9.35 | 1.10 | 8.47 | 0.64 | 9.78 | 0.53 | 9.24 | 0.55 | 10.41 | 1.10 |
| 77 | 10.90 | 1.07 | 8.82 | 0.94 | 10.36 | 0.7[illegible] | 10.44 | 0.82 | 11.50 | 0.69 |
| 78 | 9.88 | 0.58 | 8.90 | 0.88 | 10.51 | 0.[illegible] | 9.32 | 0.67 | 11.52 | 0.49 |
| 79 | TLD | LOST | 8.35 | 0.31 | 10.00 | 0.99 | [illegible]41 | 0.54 | 11.33 | 0.62 |
| 80 | 11.30 | 1.14 | 9.36 | 0.46 | 10.31 | 0.59 | 8.91 | 1.10 | 10.94 | 0.81 |
| 81 | 11.30 | 1.23 | 10.04 | 0.41 | 11.46 | 0.84 | 9.36 | 0.93 | 12.67 | 0.84 |
| 82 | 10.40 | 1.17 | TLD | LOST | 11.32 | 0.63 | 10.26 | 0.29 | 12.26 | 1.70 |
| 83 | 9.80 | 0.70 | 10.21 | 0.59 | 11.27 | 1.08 | 9.65 | 0.30 | 12.59 | 1.60 |
| 84 | 12.10 | 1.92 | 10.34 | 0.53 | 11.48 | 0.54 | 10.08 | 0.75 | 12.13 | 1.26 |
| 85 | 10.50 | 0.98 | 9.49 | 0.48 | 10.16 | 0.76 | 10.03 | 0.99 | 11.76 | 1.18 |
| 86 | 10.40 | 0.26 | 9.27 | 0.82 | 9.68 | 1.13 | 9.62 | 0.27 | 11.34 | 0.87 |
| 87 | 11.00 | 1.45 | 12.02 | 1.03 | 11.90 | 0.55 | 11.98 | 0.82 | 13.79 | 1.43 |
| 88 | 9.46 | 0.62 | 9.39 | 0.42 | 10.17 | 0.66 | 8.99 | 0.57 | 10.86 | 0.75 |
| 89 | 10.20 | 1.12 | 10.02 | 0.94 | 10.14 | 1.07 | 8.81 | 0.49 | 11.25 | 0.59 |
| 90 | 9.61 | 1.00 | 9.43 | 0.78 | 9.56 | 0.62 | 9.11 | 0.44 | 11.01 | 0.69 |
| 91 | 10.60 | 0.55 | 9.65 | 0.51 | 11.13 | 0.59 | 9.51 | 1.04 | 11.04 | 0.87 |
| 92 | 11.50 | 1.60 | 11.46 | 0.53 | 11.93 | 1.22 | 11.06 | 0.72 | 13.75 | 1.27 |
| 95 | 9.95 | 0.48 | 8.90 | 0.68 | 10.10 | 0.26 | 8.81 | 0.83 | 11.11 | 0.91 |
| 96 | 11.00 | 1.12 | 9.92 | 0.80 | 11.77 | 1.06 | 10.24 | 0.66 | 11.93 | 1.27 |
| 97 | 10.40 | 0.58 | 9.15 | 0.25 | 10.91 | 0.59 | 9.26 | 0.75 | 12.23 | 1.13 |