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 29, 1991
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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

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 1990. This submittal is made in accordance with Technical Specification 6.9.1.e.

If there are any questions regarding this matter, please call Mr. Michael Heller, Licensing Engineer, at (609) 971-4680.

Very truly yours,

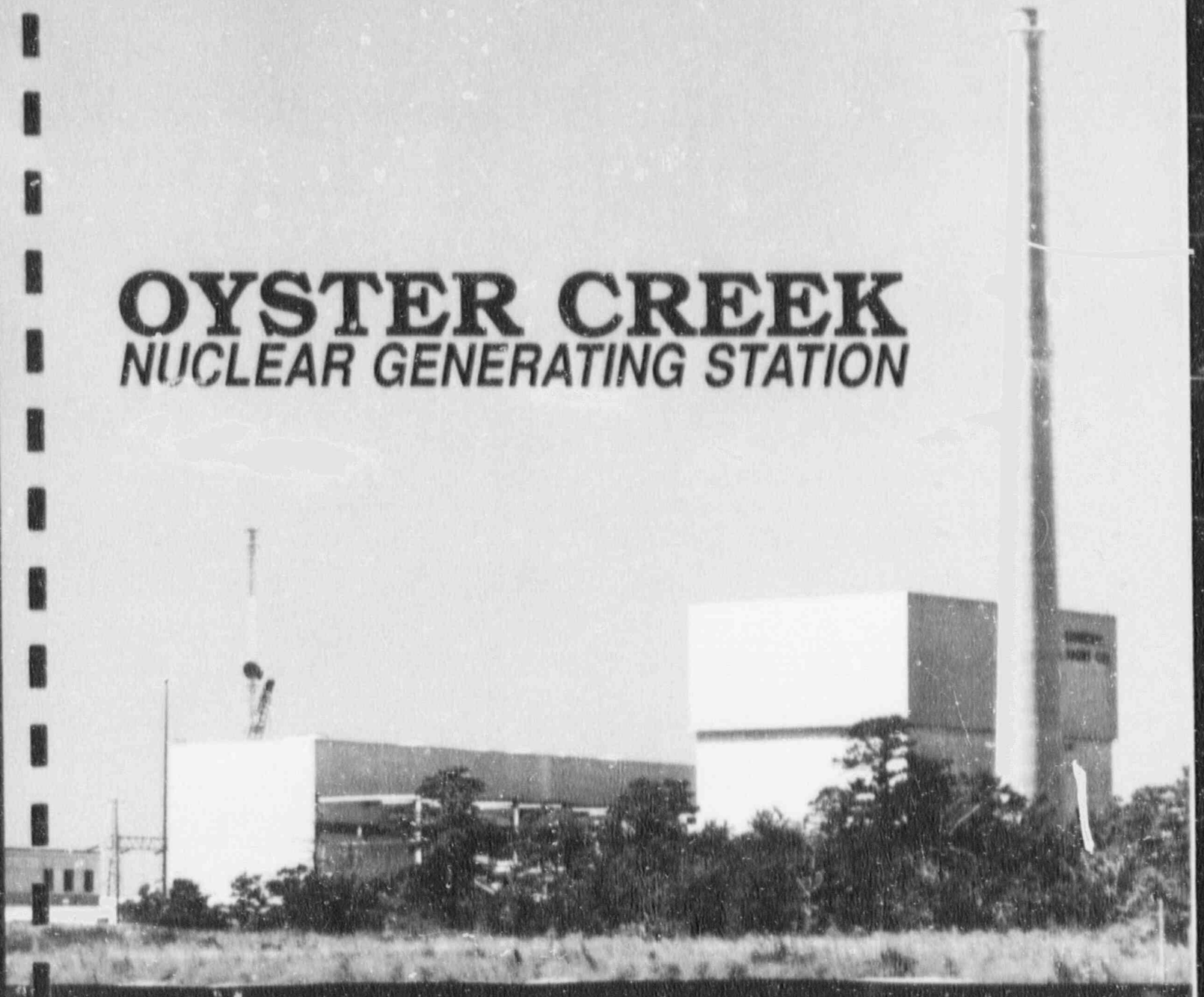
J.J. Barton
Director, Oyster Creek

JJB/MH:jc
Enclosure
cc: Chief
Bureau of Nuclear Engineering
NJ Department of Environmental Protection
CN 411
Trenton, NJ 08625

Administrator, Region 1
NRC Resident Inspector

IE25
1/1

OYSTER CREEK
NUCLEAR GENERATING STATION



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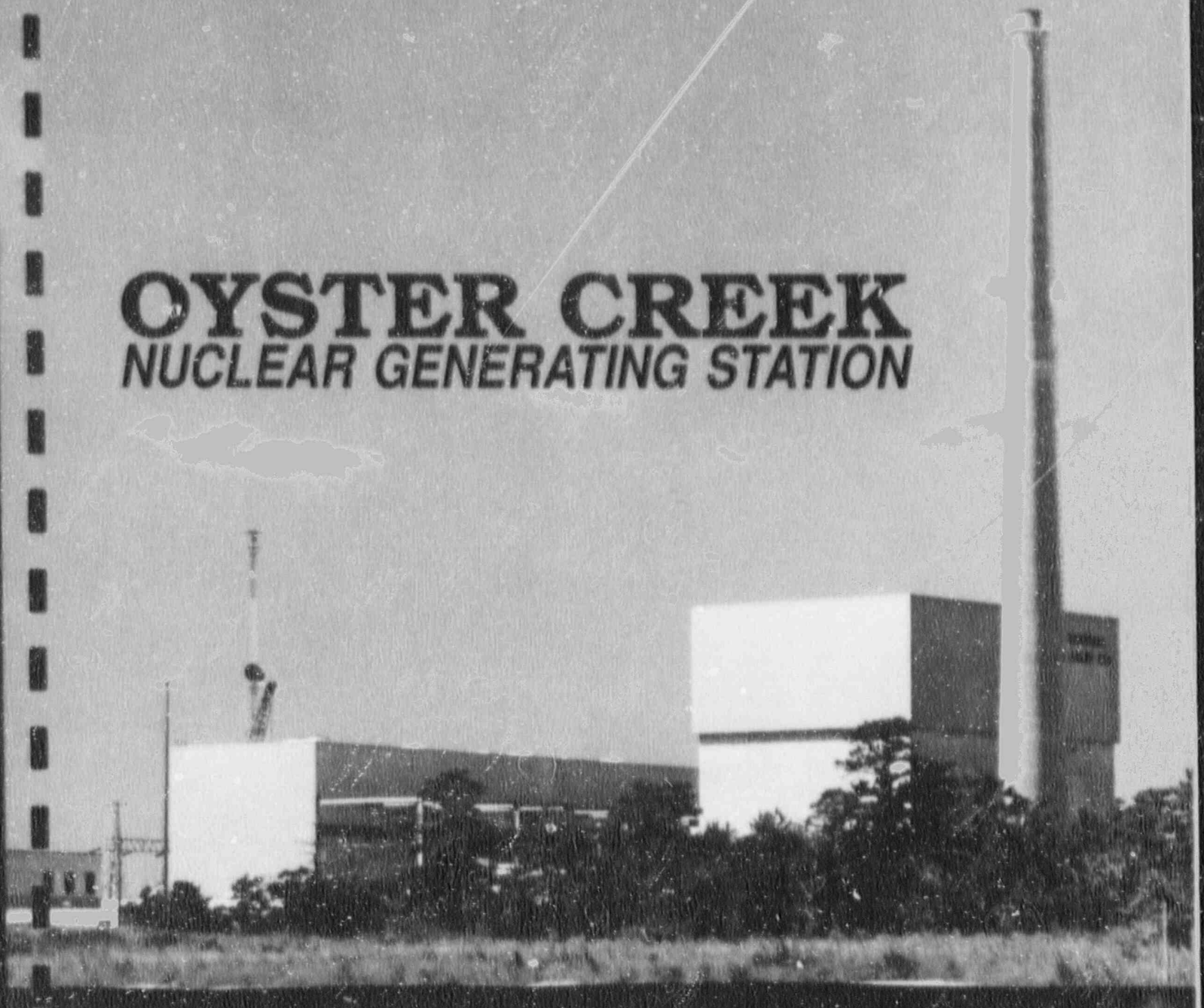

Radiological Environmental Monitoring Report
Prepared By
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OYSTER CREEK NUCLEAR GENERATING STATION
Forked River, New Jersey

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.

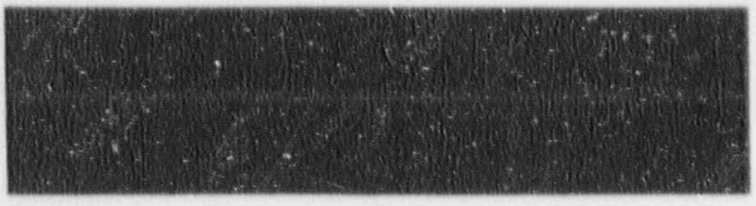
The Turbine Building houses the turbine-generator, control room, main condensers, power conversion equipment and auxiliary systems. The turbine-generator consists of one high-pressure turbine, three low-pressure turbines, a generator and an exciter. The turbines and generator turn at 1,800 revolutions 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.



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SUMMARY AND CONCLUSIONS

The radiological environmental monitoring performed during 1990 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 (References 19, 20, 21, and 22). 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 1990, 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 1990 operations at the OCNGS ranged from 0.0002 percent to a maximum of only 0.38 percent of the applicable regulatory limits. Furthermore, they were significantly less than doses received from common 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, fish, 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 (TLD's) 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 (reference 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.

- During 1990, over 1765 samples were taken from the aquatic, atmospheric, and terrestrial environments around OCNGS. More than 2290 analyses were performed on these samples. Five hundred nine (509) direct radiation dose measurements using TLDs also were made. Over sixty-three (63) groundwater samples, including local domestic water supplies, were collected and more than one hundred eighty-nine (189) 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 1990 and has not been detected since 1987.

- The predominant radionuclides released in station effluents were xenon-135 in gases and cesium-137 in liquids. Estimated radiation doses to the public, attributable to these effluents, ranged from 0.0002 percent to a maximum of only 0.38 percent of applicable regulatory limits.

- During 1990, the maximum whole body dose potentially received by an individual from liquid and airborne effluents combined was conservatively calculated to be about 0.0087 millirems total. The whole body dose to the surrounding population from liquid and airborne effluents was calculated to be 0.34 person-rem. This is approximately 2.9 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-rays	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.

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.

OYSTER CREEK NUCLEAR GENERATING STATION
SIMPLIFIED SCHEMATIC

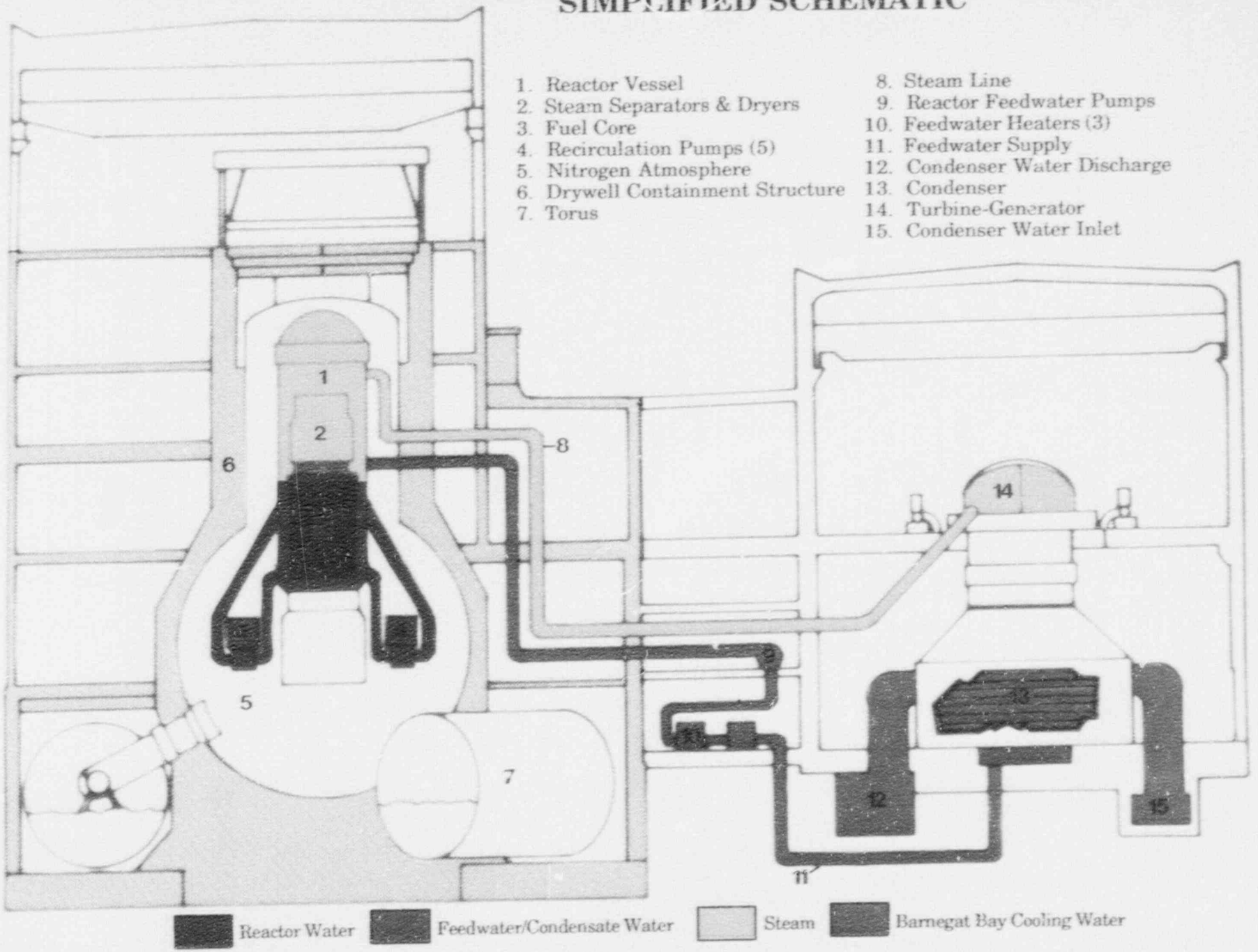


Figure 1

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 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 (Reference 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

The meteorology during 1990 could best be described as climatologically average. The monthly mean ambient temperature as recorded at the on-site

Oyster Creek meteorological tower, was closely comparable to data recorded at the Atlantic City National Weather Service Station (Pomona, New Jersey) for each of the twelve calendar months. The largest differences were during the winter months of January, February and December. Data comparisons for these three months show higher temperatures at Oyster Creek than at Atlantic City (Pomona). The difference in mean monthly temperature between Oyster Creek and Pomona averaged approximately 6 degrees F higher at Oyster Creek. This difference could be d e to the Atlantic City NWS monitoring location. Data are measured and recorded at Pomona, New Jersey, a site further inland, which is away from the moderating effects of the ocean. During the winter months, Pomona often experiences cooler nighttime temperatures due to radiational cooling, which means that heat from the surface is more readily lost. The ocean tends to keep winter temperatures higher along the coast than at inland locations due to the fact that the ocean temperature remains warmer than the adjacent air producing pronounced temperature modification. Conversely, during the spring, summer and early fall months, the Atlantic City (Pomona) monthly mean temperature exceeds the Oyster Creek monthly mean because the ocean water, which is cooler in the summer than the adjacent land, tends to keep the temperatures at coastal locations such as Oyster Creek lower than at inland stations (Pomona). The difference in mean monthly ambient temperature during these seasons is much smaller, never exceeding 3 degrees F. In summary, the winter weather of 1990 was warmer than normal at the OCNGS while the spring, summer and autumn were climatologically average for the area.

For the first half of the annual period (January through June), there were no predominant wind directions. Slightly elevated frequencies of winds from the south-southwest, as well as from the southwest clockwise through the northwest, reinforced the normal climatological tendencies for the area. Normally, northwest winds are expected to predominate during the winter months as the polar jet stream pushes southward and allows Canadian air masses to dominate the region. Although prevalent in other areas during 1990, no major arctic air usually associated with northwesterly winds enveloped the OCNGS region during the months of January through

March. A somewhat elevated frequency of east-northeast winds was present during the period. This was due to the influence of extratropical low pressure systems (northeast storms) which are common to the region during the winter months, along with airflow around large high pressure systems situated over the Canadian maritime. During such periods of onshore winds, site meteorology was characterized by low clouds, drizzle, and fog (i. e. stable atmospheres). Onshore winds decreased ambient temperatures along the shoreline during the spring (April through June) because the ocean temperature was lower than that of the adjacent land. Mean monthly temperatures during these months were consistently lower at Oyster Creek than at Atlantic City (Pomona) since the latter site is further from the cooler ocean waters. The period from April through June showed an increase in the percent frequency of occurrence of wind direction from the south-southwest. This typical summer-like pattern of increased southerly flow is the result of the polar jet stream's retreat northward.

During the early portion of the second half of 1990, the predominant winds remained from the south-southwest clockwise through the west. Normal summer winds at the site are from the south and the west, the latter direction due to modified continental polar air masses that follow cold frontal passages. The southerly winds are primarily due to the end result of the sea breeze phenomenon. At the height of this mesoscale effect (approximately 2:00 to 4:00 PM), the wind will parallel the coast - this result created due to uneven heating between the land and sea coupled with the natural rotation of the earth. The lack of many sea breeze events (southerly wind component) was mainly due to the strong westerly winds from the jet stream along with the northward shift of the subtropical high pressure center. These two features will increase southwest (offshore) flow and hinder this onshore wind phenomenon. During the late fall and winter months of 1990, the wind direction was mainly west-northwest and northwest as the polar jet stream once again moved south bringing cooler continental polar air from Canada.

A total of 38 inches of precipitation fell during 1990 at Oyster Creek. Although this was approximately 3.29 inches below the rainfall recorded at

Atlantic City/Pomona (41.29 inches), it was well within the range of annual precipitation totals previously recorded at the site. However, there were several interesting maxima and minima in monthly precipitation totals (Figure 2, page 18). For example, during February the total precipitation at Oyster Creek was a mere 0.99 inches, 2.21 inches below the Atlantic City NWS historical February average. This was due in part to the large dome of high pressure associated with cold air masses that swept through the eastern half of the country, a common occurrence during winter months. These large high pressure systems act to deflect the normal extratropical cyclones, found along the east coast in winter, to the south, thereby producing more copious amounts of precipitation in the mid-Atlantic region south of Oyster Creek. To a lesser extent, the November total precipitation (2.15 inches) was also lower than the historical monthly average, primarily due to similar circumstances. However, the precipitation during May was 2.48 inches higher than average. Most of the May precipitation was the result of numerous but uncharacteristic extratropical cyclones passing in close proximity to the coast. These extratropical cyclones are more common during the late autumn through early spring period. Precipitation during the summer months was primarily due to small-scale convective showers and thunderstorms. These are events of short duration but strong intensity. With this type of precipitation event, there will be increased particulate fallout (washout) from the atmosphere, which has implications for radionuclide deposition. During the summer, stable marine air will generally suppress these convective storms and decrease precipitation at most coastal locations. The sea breeze can produce the same result. The remainder of the site's rainfall during 1990 was due to extratropical storms of light to moderate intensity and long duration.

For additional site specific meteorological data, refer to the Semiannual Effluent Release Reports for 1990.

MONTHLY PRECIPITATION AT THE OYSTER CREEK NUCLEAR GENERATING STATION
DURING 1990 COMPARED WITH HISTORICAL (1946 – 1981)
ATLANTIC CITY NATIONAL WEATHER SERVICE PRECIPITATION DATA

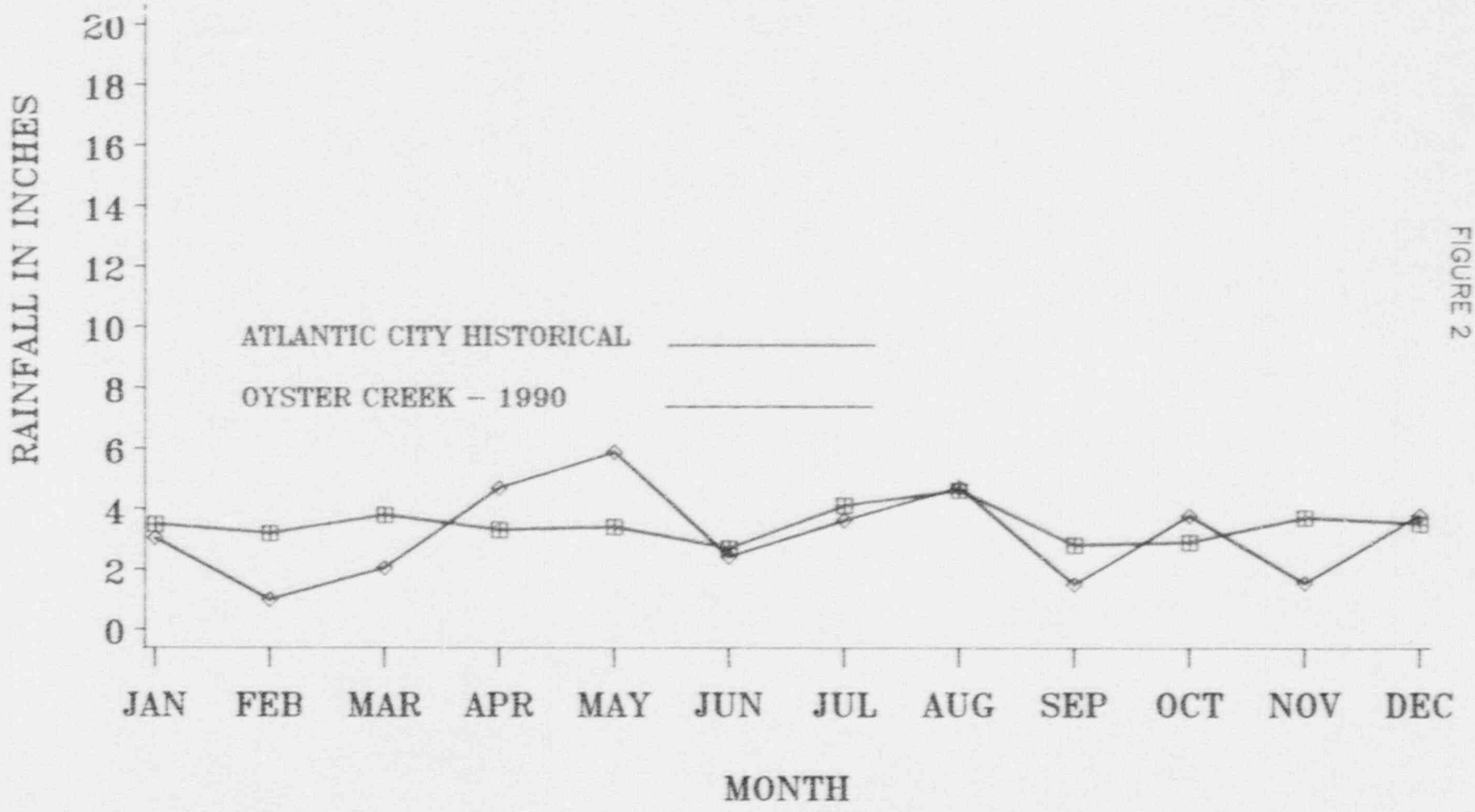


FIGURE 2

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 2×10^{-4} microcuries/milliliter.

- 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 upon 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 1990, the predominant radionuclides were Xe-135 in gases and Cs-137 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 well below one percent of the applicable regulatory limits (Tables 5 and 6). A summary of the OCNGS liquid and airborne effluents for 1990 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 xenon (Xe) and krypton (Kr). The total amounts of xenon and krypton released into the atmosphere in 1990 were 467 curies and 268 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.

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.

TABLE 2

RADIONUCLIDE COMPOSITION OF OCNGS EFFLUENTS FOR 1990

Radionuclide	Half-Life	Liquid Effluents (Ci) OCNGS	Gaseous Effluents (Ci) OCNGS
H-3	12.3 years	ND	1.15 E1
Mn-54	312 days	6.00 E-7	ND
Co-60	5.3 years	7.00 E-7	ND
Kr-85m	4.5 hours	ND	3.05 E1
Kr-87	76 minutes	ND	1.19 E2
Kr-88	2.8 hours	ND	1.18 E2
Sr-89	50.5 days	ND	7.89 E-3
Sr-90	28.8 years	ND	3.22 E-5
Tc-99m	6.0 hours	ND	9.14 E-3
I-131	8.0 days	ND	2.30 E-2
I-133	20.9 hours	ND	1.14 E-1
Xe-133	5.2 days	ND	8.93 E1
Cs-134	2.1 years	1.30 E-5	ND
I-135	6.7 hours	ND	4.04 E-2
Xe-135	9.1 hours	ND	3.78 E2
Cs-137	30.2 years	5.27 E-5	4.56 E-6
Ba-140	12.8 days	ND	4.10 E-4
Gross Alpha	-	ND	8.00 E-3

Note: All effluents expressed in scientific notation.

ND = No Activity Detected

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), technetium-99m (Tc-99m) and activation products, manganese-54 (Mn-54) and cobalt-60 (Co-60). The total amount of iodines and particulates released from the station in 1990 was 0.19 curies in airborne effluents and 0.0000670 curies in liquid effluents.

Tritium: Tritium was released in airborne effluents during 1990. None was released in liquid releases. Tritium is a radioactive isotope of hydrogen. It is produced 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 airborne effluents was 11.5 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 will be 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 both 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

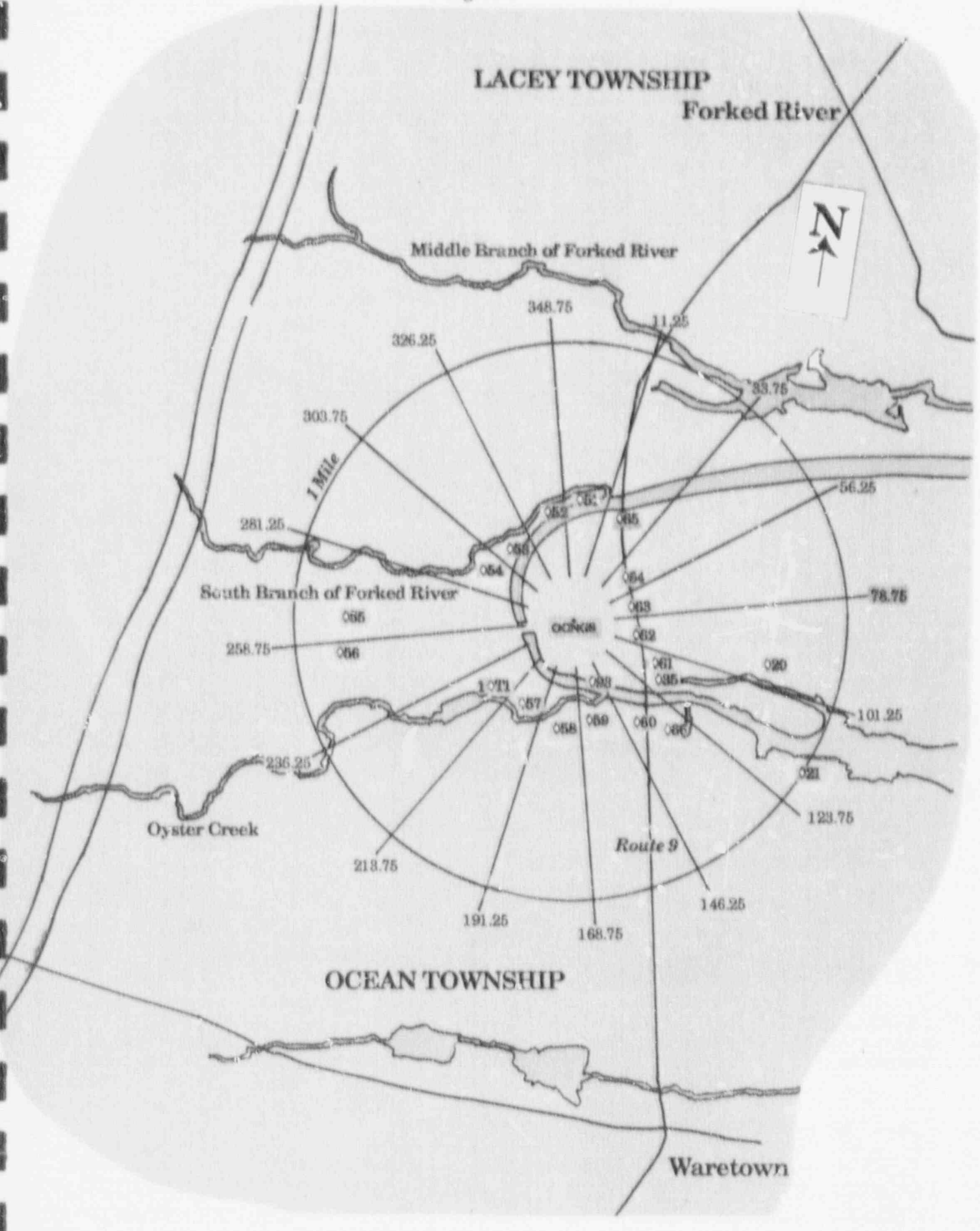
soil. Thermoluminescent dosimeters (TLDs) are placed in the environment to measure gamma radiation levels. The Technical Specifications and recommendations from the scientific staff of GPUN specify the sample types to be collected and analyses to be performed.

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

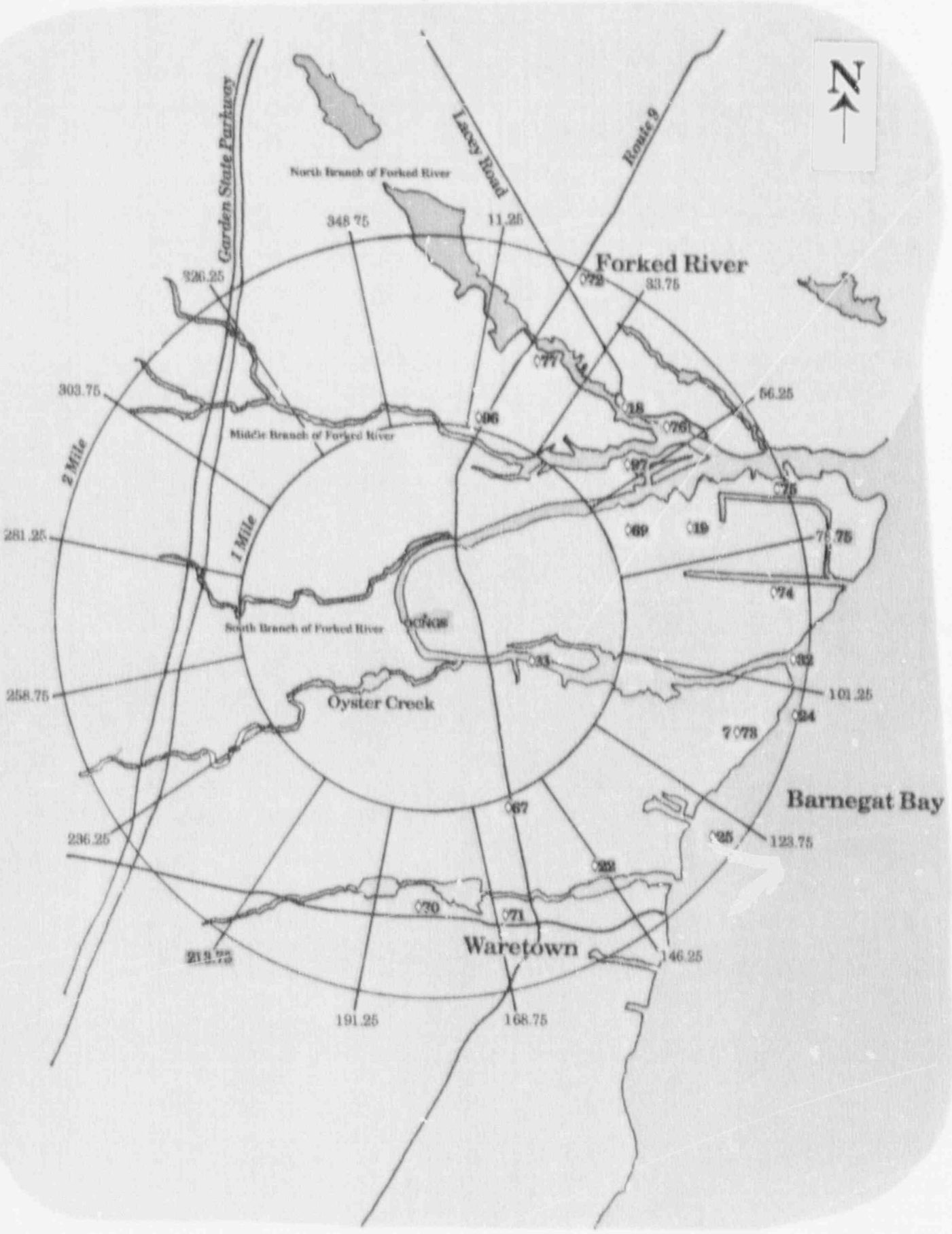
In addition to specifying the minimum media to be collected and the minimum number of sampling locations, the Technical Specifications also specify the frequency of sample collection and the types of analyses to be performed. Additionally, analytical sensitivities (detection limits) and reporting levels 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 1990 in sample collection and analysis. Sample analyses which did not meet the required analytical

Figure 3



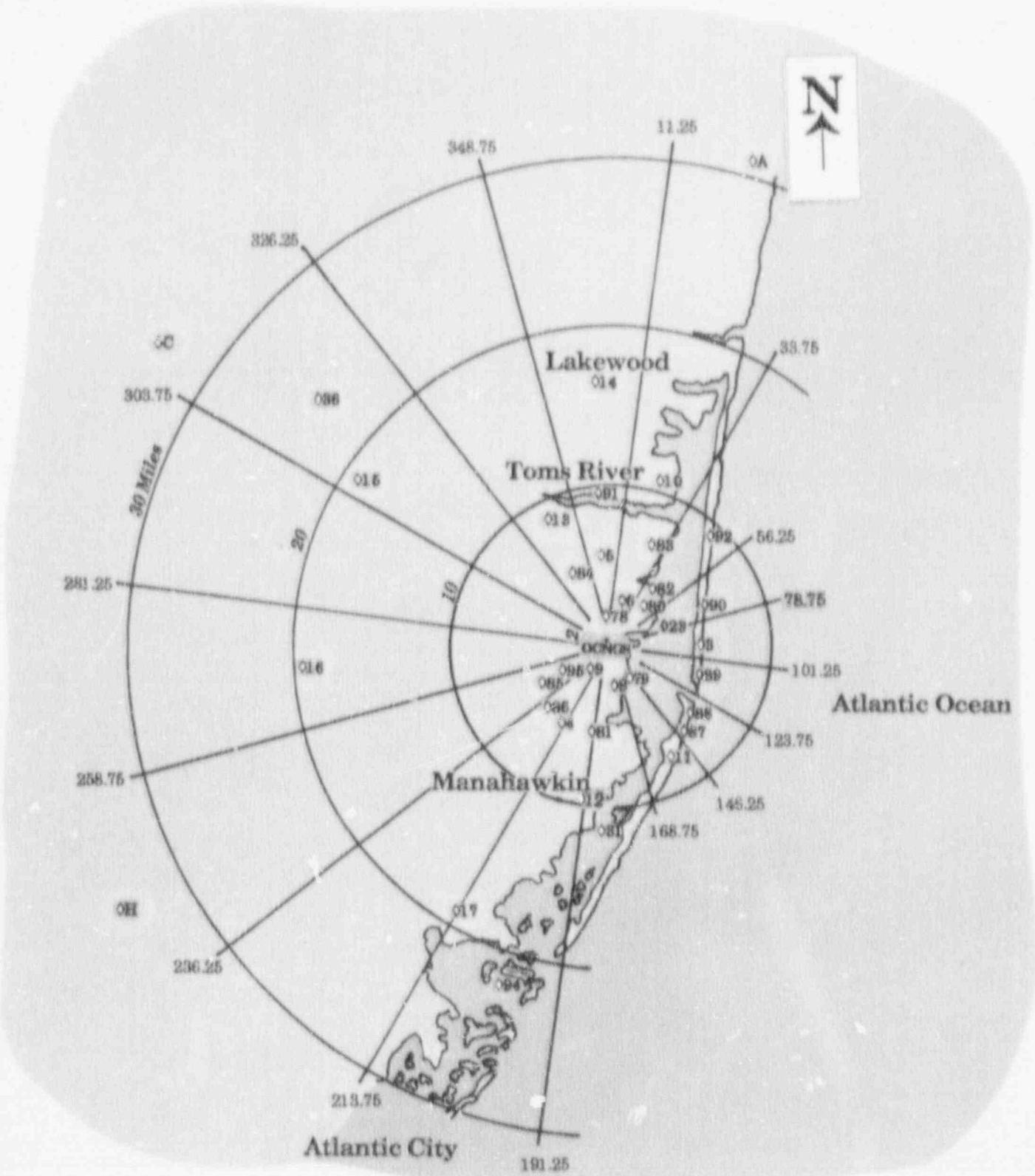
Oyster Creek Nuclear Generating Station (OCNGS)
Location of Radiological Environmental Monitoring Program (REMP)
Stations within 1 mile of the site

Figure 4



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

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.

Table 3 provides a summary of radionuclide concentrations in environmental samples from the OCNGS in 1990. The data are summarized in the format suggested 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 QC 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 1990 THROUGH DECEMBER 1990

THE FOLLOWING PAGES ARE A SUMMARY OF REMP DATA FOR THE SCHEDULED COLLECTION PERIOD JANUARY 1990 THROUGH DECEMBER 1990
DATA ARE SUMMARIZED ON AN ANNUAL BASIS, WHERE

1.) XXX=MEAN(N/TOTAL);MEAN AND RANGE BASED ON
RANGE DETECTABLE ACTIVITIES OF
ALL XXX STATIONS

2.) XXX=BACKGROUND OR INDICATOR STATIONS

3.) (N/TOTAL)=FRACTION OF DETECTABLE ACTIVITIES/
TOTAL NUMBER OF ANALYSES PERFORMED

4.) STATION=STATION WITH HIGHEST ANNUAL MEAN

5.) BACKGROUND STATIONS USED ARE:

STATION	A,C,H,14	31,94	18/36
SAMPLE TYPE	AIR PARTICULATE	SEDIMENT	WELL WATER/
	AIR IODINE	CLAMS	VEGETABLES
	PRECIPITATION	SURFACE WATER	SOIL
		FISH(**)	
		BLUE CRAB(**)	

6.) *=NO SAMPLE AVAILABLE; **=STATION 94 ONLY

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AIR PARTICULATE (pCi/m3)	GROSS BETA		635	No LLD Reported	1.51E-2 (2.70E-3 - 4.40E-2)	(473/473)		1.51E-2 (4.20E-3 - 4.60E-2)	(212/212)	1 3 4 5 20 66 71 72 73
							4	1.59E-2 (6.10E-3 - 4.40E-2)	(53/53)	
AIR PARTICULATE (pCi/m3)	GAMMA	AC-228	169	1.10E-2	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	BA-140	169	1.88E-2	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	BE-7	169	No LLD Reported	7.93E-2 (3.40E-2 - 1.30E-1)	(117/117)		7.76E-2 (5.10E-2 - 1.20E-1)	(52/52)	1 3 4 5 20 66 71 72 73
							72	8.80E-2 (6.70E-2 - 1.10E-1)	(13/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	CO-58	169	3.17E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	CO-60	169	3.81E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	CS-134	169	3.12E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AIR PARTICULATE (pCi/m3)	GAMMA	CS-137	169	2.75E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	FE-59	169	7.97E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	I-131	169	8.21E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	K-40	169	4.19E-2	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	LA-140	169	1.07E-2	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	MN-54	169	2.90E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	NB-95	169	3.17E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
								<LLD	(0/13)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOTAL)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AIR PARTICULATE (pCi/m3)	GAMMA	RA-226	169	3.64E-3	2.10E-3 (2.10E-3 - 2.10E-3)	(1/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	2.10E-3 (2.10E-3 - 2.10E-3)	(1/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	ZN-65	169	8.57E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
AIR PARTICULATE (pCi/m3)	GAMMA	ZR-95	169	5.57E-3	<LLD	(0/117)		<LLD	(0/52)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/13)	
PRECIPITATION (pCi/L)	GAMMA	AC-228	24	1.42E+1	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	BA-140	24	1.38E+1	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	BE-7	24	2.47E+1	<LLD	(0/12)		3.40E+1 (3.40E+1 - 3.40E+1)	(1/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	CO-58	24	3.58E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
PRECIPITATION (pCi/L)	GAMMA	CO-60	24	4.38E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	CS-134	24	4.50E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	CS-137	24	3.63E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	FE-59	24	7.75E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	I-131	24	4.21E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	K-40	24	4.87E+1	3.50E+1 (3.50E+1 - 3.50E+1)	(1/12)		<LLD	(0/12)	66 72 73
							66	3.50E+1 (3.50E+1 - 3.50E+1)	(1/4)	
PRECIPITATION (pCi/L)	GAMMA	LA-140	24	6.67E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
PRECIPITATION (pCi/L)	GAMMA	MN-54	24	3.54E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	NB-95	24	3.46E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	RA-226	24	7.46E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	ZN-65	24	9.96E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	GAMMA	ZR-95	24	6.21E+0	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
PRECIPITATION (pCi/L)	TRITIUM		24	1.45E+2	<LLD	(0/12)		<LLD	(0/12)	66 72 73
							73	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	AC-228	8	7.50E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
CABBAGE (pCi/kg(WET))	GAMMA	BA-140	8	6.88E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	BE-7	8	1.35E+2	1.25E+2 (1.00E+2 - 1.50E+2)	(2/8)		*	*	35 66
							66	1.50E+2 (1.50E+2 - 1.50+2)	(1/4)	
CABBAGE (pCi/kg(WET))	GAMMA	CO-58	8	1.71E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	CO-60	8	2.17E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	CS-134	8	2.05E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	CS-137	8	1.77E+1	1.10E+1 (1.10E+1 - 1.10E+1)	(1/8)		*	*	35 66
							66	1.10E+1 (1.10E+1 - 1.10E+1)	(1/4)	
CABBAGE (pCi/kg(WET))	GAMMA	FE-59	8	4.63E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
CABBAGE (pCi/kg(WET))	GAMMA	I-131	8	2.02E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	K-40	8	No LLD Reported	3.49E+3 (2.90E+3 - 5.00E+3)	(8/8)		*	*	35 66
							66	3.55E+3 (2.90E+3 - 5.00E+3)	(4/4)	
CABBAGE (pCi/kg(WET))	GAMMA	LA-140	8	2.88E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	MN-54	8	1.82E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	NB-95	8	1.79E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	RA-226	8	2.47E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
CABBAGE (pCi/kg(WET))	GAMMA	ZN-65	8	5.88E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE / STATION-MEAN RANGE	(N/TOTAL) / (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
CABBAGE (pCi/kg(WET))	GAMMA	ZR-95	8	3.00E+1	<LLD	(0/8)		*	*	35 66
							66	<LLD	(0/4)	
SURFACE WATER (pCi/L)	GAMMA	AC-228	104	1.36E+1	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	BA-140	104	1.42E+1	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	BE-7	104	2.54E+1	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	CO-58	104	3.50E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	CO-60	104	4.37E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	CS-134	104	3.93E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SURFACE WATER (pCi/L)	GAMMA	CS-137	104	3.42E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	FE-59	104	7.88E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	I-131	104	9.53E+1	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	K-40	104	No LLD Reported	2.37E+2 (7.70E+1 - 3.10E+2)	(78/78)		2.79E+2 (2.20E+2 - 3.90E+2)	(26/26)	23 24 25 32 33 93
							25	2.58E+2 (2.10E+2 - 3.10E+2)	(13/13)	
SURFACE WATER (pCi/L)	GAMMA	LA-140	104	6.66E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	MN-54	104	3.34E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	NB-95	104	3.41E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SURFACE WATER (pCi/L)	GAMMA	RA-226	104	7.24E+0	4.00E+0 (4.00E+0 - 4.00E+0)	(1/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	4.00E+0 (4.00E+0 - 4.00E+0)	(1/13)	
SURFACE WATER (pCi/L)	GAMMA	ZN-65	104	9.45E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	GAMMA	ZR-95	104	6.08E+0	<LLD	(0/78)		<LLD	(0/26)	23 24 25 32 33 93
							93	<LLD	(0/13)	
SURFACE WATER (pCi/L)	TRITIUM		104	1.47E+2	1.74E+2 (1.50E+2 - 2.30E+2)	(8/78)		1.85E+2 (1.50E+2 - 2.60E+2)	(4/26)	23 24 25 32 33 93
							93	2.30E+2 (2.30E+2 - 2.30E+2)	(1/13)	
COLLARD (pCi/kg(WET))	GAMMA	AC-228	18	7.78E+1	<LLD	(0/12)		<LLD	(0/16)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	BA-140	18	8.17E+1	<LLD	(0/12)		<LLD	(0/16)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	BE-7	18	1.46E+2	2.17E+2 (1.30E+2 - 2.80E+2)	(6/12)		1.85E+2 (1.80E+2 - 1.90E+2)	(2/6)	35 66
							66	2.43E+2 (1.90E+2 - 2.70E+2)	(3/6)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
COLLARD (pCi/kg(WET))	GAMMA	CO-58	18	2.02E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	CO-60	18	2.42E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	CS-134	18	2.02E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	CS-137	18	1.89E+1	1.90E+1 (1.90E+1 - 1.90E+1)	(1/12)		<LLD	(0/6)	35 66
							66	1.90E+1 (1.90E+1 - 1.90E+1)	(1/6)	
COLLARD (pCi/kg(WET))	GAMMA	FE-59	18	5.28E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	I-131	18	2.64E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	K-40	18	No LLD Reported	4.38E+3 (3.40E+3 - 5.10E+3)	(12/12)		3.67E+3 (2.60E+3 - 4.10E+3)	(6/6)	35 66
							35	4.72E+3 (3.70E+3 - 5.10E+3)	(6/6)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
COLLARD (pCi/kg(WET))	GAMMA	LA-140	18	3.29E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	MN-54	18	1.84E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	NB-95	18	1.91E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	RA-226	18	2.78E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	ZN-65	18	6.17E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
COLLARD (pCi/kg(WET))	GAMMA	ZR-95	18	3.39E+1	<LLD	(0/12)		<LLD	(0/6)	35 66
							66	<LLD	(0/6)	
WELL WATER (pCi/L)	GAMMA	AC-228	63	1.30E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

FOR CNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WELL WATER (pCi/L)	GAMMA	BA-140	63	1.38E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	BE-7	63	2.50E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	CO-58	63	3.50E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	CO-60	63	4.08E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	CS-134	63	4.71E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	CS-137	63	3.49E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	FE-59	63	7.54E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WELL WATER (pCi/L)	GAMMA	I-131	63	8.38E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	K-40	63	4.65E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	LA-140	63	6.63E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	MN-54	63	3.31E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	NB-95	63	3.46E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	GAMMA	RA-226	63	7.08E+0	3.80E+0 (3.80E+0 - 3.80E+0)	(1/50)		<LLD	(0/13)	1 19 21 22
							19	3.80E+0 (3.80E+0 - 3.80E+0)	(1/13)	
WELL WATER (pCi/L)	GAMMA	ZN-65	63	1.07E+1	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WELL WATER (pCi/L)	GAMMA	ZR-95	63	6.00E+0	<LLD	(0/50)		<LLD	(0/13)	1 19 21 22
							21	<LLD	(0/13)	
WELL WATER (pCi/L)	TRITIUM		63	1.47E+2	2.25E+2 (2.20E+2 - 2.30E+2)	(2/50)		1.70E+2 (1.70E+2 - 1.70E+2)	(1/13)	1 19 21 22
							1	2.30E+2 (2.30E+2 - 2.30E+2)	(1/13)	
BLUE CRAB (pCi/kg(WET))	GAMMA	AC-228	20	9.15E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	BA-140	20	9.40E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	BE-7	20	1.59E+2	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	CO-58	20	2.34E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	CO-60	20	2.88E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLUE CRAB (pCi/kg(WET))	GAMMA	CS-134	20	2.78E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	CS-137	20	2.30E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	FE-59	20	6.00E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	I-131	20	2.92E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	K-40	20	No LLD Reported	2.82E+3 (2.40E+3 - 3.70E+3)	(13/13)		2.80E+3 (2.40E+3 - 3.30E+3)	(7/7)	33 93
							33	2.95E+3 (2.40E+3 - 3.70E+3)	(6/6)	
BLUE CRAB (pCi/kg(WET))	GAMMA	LA-140	20	4.05E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	MN-54	20	2.28E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLUE CRAB (pCi/kg(WET))	GAMMA	NB-95	20	2.23E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	RA-226	20	3.55E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	ZN-65	20	7.25E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUE CRAB (pCi/kg(WET))	GAMMA	ZR-95	20	4.25E+1	<LLD	(0/13)		<LLD	(0/7)	33 93
							93	<LLD	(0/7)	
BLUEFISH (pCi/kg(WET))	GAMMA	AC-228	10	9.00E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	BA-140	10	9.90E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	BE-7	10	1.50E+2	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLUEFISH (pCi/kg(WET))	GAMMA	CO-58	10	2.39E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	CO-60	10	2.75E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	CS-134	10	2.62E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	CS-137	10	2.40E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	FE-59	10	5.90E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	I-131	10	3.15E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	K-40	10	No LLD Reported	3.69E+3 (3.00E+3 - 4.10E+3)	(8/8)		4.20E+3 (3.90E+3 - 4.50E+3)	(2/2)	33 93
							33	3.95E+3 (3.90E+3 - 4.00E+3)	(2/2)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLUEFISH (pCi/kg(WET))	GAMMA	LA-140	10	4.09E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	MN-54	10	2.22E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	NB-95	10	2.30E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	RA-226	10	3.30E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	ZN-65	10	7.30E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
BLUEFISH (pCi/kg(WET))	GAMMA	ZR-95	10	3.80E+1	<LLD	(0/8)		<LLD	(0/2)	33 93
							93	<LLD	(0/6)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	AC-228	4	9.50E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	BA-140	4	8.00E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	BE-7	4	1.45E+2	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	CO-58	4	2.15E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	CO-60	4	2.72E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	CS-134	4	2.35E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	CS-137	4	2.35E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	FE-59	4	6.00E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	I-131	4	2.75E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	K-40	4	No LLD Reported	3.45E+3 (3.40E+3 - 3.50E+3)	(2/2)		3.80E+3 (3.40E+3 - 4.20E+3)	(2/2)	93
							93	3.45E+3 (3.40E+3 - 3.50E+3)	(2/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	LA-140	4	4.00E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	MN-54	4	2.15E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	NB-95	4	2.07E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	RA-226	4	3.25E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	ZN-65	4	7.00E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SUMMER FLOUNDER (pCi/kg(WET))	GAMMA	ZR-95	4	4.00E+1	<LLD	(0/2)		<LLD	(0/2)	93
							93	<LLD	(0/2)	
CLAMS (pCi/kg(WET))	GAMMA	AC-228	65	6.72E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	BA-140	65	7.05E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	BE-7	65	1.24E+2	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	CO-58	65	1.74E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	CO-60	65	2.30E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	CS-134	65	2.38E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
CLAMS (pCi/kg(WET))	GAMMA	CS-137	65	1.73E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	FE-59	65	4.34E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	I-131	65	2.17E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	K-40	65	No LLD Reported	1.15E+3 (5.80E+2 - 1.[illegible]E+3)	(39/39)		1.33E+3 (7.60E+2 - 2.10E+3)	(26/26)	23 24 25
							24	1.18E+3 (6.00E+2 - 1.60E+3)	(13/13)	
CLAMS (pCi/kg(WET))	GAMMA	LA-140	65	3.33E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	MN-54	65	1.75E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	NB-95	65	1.82E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
CLAMS (pCi/kg(WET))	GAMMA	RA-226	65	2.60E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	ZN-65	65	5.95E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
CLAMS (pCi/kg(WET))	GAMMA	ZR-95	65	3.03E+1	<LLD	(0/39)		<LLD	(0/26)	23 24 25
							25	<LLD	(0/13)	
TAUTOG (pCi/kg(WET))	GAMMA	AC-228	6	1.08E+2	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	BA-140	6	1.32E+2	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	BE-7		2.03E+2	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	CO-58	6	2.97E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
TAUTOG (pCi/kg(WET))	GAMMA	CO-60	6	3.50E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	CS-134	6	3.32E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	CS-137	6	2.78E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	FE-59	6	7.67E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	I-131	6	4.83E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	K-40	6	No LLD Reported	4.12E+3 (4.00E+3 - 4.50E+3)	(5/5)		4.60E+3 (4.60E+3 - 4.60E+3)	(1/1)	33 93
							93	4.12E+3 (4.00E+3 - 4.50E+3)	(5/5)	
TAUTOG (pCi/kg(WET))	GAMMA	LA-140	6	6.00E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
TAUTOG (pCi/kg(WET))	GAMMA	MN-54	6	2.75E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	NB-95	6	2.93E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	RA-226	6	4.83E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	ZN-65	6	9.00E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
TAUTOG (pCi/kg(WET))	GAMMA	ZR-95	6	5.00E+1	<LLD	(0/5)		<LLD	(0/1)	33 93
							93	<LLD	(0/5)	
SOIL (pCi/kg(WET))	GAMMA	AC-228	6	No LLD Reported	3.38E+2 (2.60E+2 - 4.40E+2)	(4/4)		4.45E+2 (4.00E+2 - 4.90E+2)	(2/2)	35 66
							66	4.15E+2 (3.90E+2 - 4.40E+2)	(2/2)	
SOIL (pCi/kg(WET))	GAMMA	BA-140	6	7.83E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SOIL (pCi/kg(WET))	GAMMA	BE-7	6	1.55E+2	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(WET))	GAMMA	CO-58	6	2.03E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	CO-60	6	2.45E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	CS-134	6	3.67E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	CS-137	6	No LLD Reported	1.42E+2 (6.90E+1 - 1.80E+2)	(4/4)		1.90E+2 (1.90E+2 - 1.90E+2)	(2/2)	35 66
							35	1.60E+2 (1.60E+2 - 1.60E+2)	(2/2)	
SOIL (pCi/kg(DRY))	GAMMA	FE-59	6	4.33E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	I-131	6	2.30E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN RANGE	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SOIL (pCi/kg(DRY))	GAMMA	K-40	6	No LLD Reported	1.64E+3 (8.70E+2 - 2.60E+3)	(4/4)		2.40E+3 (2.30E+3 - 2.50E+3)	(2/2)	35 66
							66	2.25E+3 (1.90E+3 - 2.60E+3)	(2/2)	
SOIL (pCi/kg(DRY))	GAMMA	LA-140	6	5.83E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	MN-54	6	2.12E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	NB-95	6	2.10E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	RA-226	6	No LLD Reported	8.25E+1 (7.20E+1 - 1.10E+2)	(4/4)		1.04E+2 (9.90E+1 - 1.10E+2)	(2/2)	35 66
							66	9.10E+1 (7.20E+1 - 1.10E+2)	(2/2)	
SOIL (pCi/kg(DRY))	GAMMA	ZN-65	6	9.17E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	
SOIL (pCi/kg(DRY))	GAMMA	ZR-95	6	3.50E+1	<LLD	(0/4)		<LLD	(0/2)	35 66
							66	<LLD	(0/2)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	USED FOR INDICATOR MEAN
SWISS CHARD (pCi/kg(WET))	GAMMA	AC-228	3	7.67E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	BA-140	3	6.67E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	BE-7	3	1.30E+2	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	CO-58	3	1.80E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	CO-60	3	2.33E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	CS-134	3	2.07E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	CS-137	3	1.87E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOTAL)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SWISS CHARD (pCi/kg(WET))	GAMMA	FE-59	3	5.33E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	I-131	3	1.97E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	K-40	3	No LLD Reported	*	(*/*)		5.23E+3 (3.90E+3 - 6.70E+3)	(3/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	LA-140	3	3.67E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	MN-54	3	1.83E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	NB-95	3	1.87E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	RA-226	3	2.33E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
SWISS CHARD (pCi/kg(WET))	GAMMA	ZN-65	3	6.67E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
SWISS CHARD (pCi/kg(WET))	GAMMA	ZR-95	3	3.00E+1	*	(*/*)		<LLD	(0/3)	35 66
							*	*	(*/*)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	AC-228	7	1.03E+2	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	BA-140	7	1.24E+2	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	BE-7	7	1.96E+2	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	CO-58	7	2.77E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	CO-60	7	3.40E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	CS-134	7	3.39E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	CS-137	7	2.77E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	FE-59	7	7.00E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	I-131	7	4.51E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	K-40	7	No LLD Reported	4.30E+3 (4.00E+3 - 4.90E+3)	(6/6)		4.20E+3 (4.20E+3 - 4.20E+3)	(1/1)	93
							93	4.30E+3 (4.00E+3 - 4.90E+3)	(6/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	LA-140	7	5.81E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	MN-54	7	2.63E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	NB-95	7	2.73E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	RA-226	7	4.71E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	ZN-65	7	8.29E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
WINTER FLOUNDER (pCi/kg(WET))	GAMMA	ZR-95	7	5.00E+1	<LLD	(0/6)		<LLD	(0/1)	93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	AC-228	12	7.83E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	BA-140	12	8.50E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	BE-7	12	1.47E+2	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AMERICAN EEL (pCi/kg(WET))	GAMMA	CO-58	12	2.01E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	CO-60	12	2.66E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EFL (pCi/kg(WET))	GAMMA	CS-134	12	2.28E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	CS-137	12	1.92E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	FE-59	12	5.17E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	I-131	12	2.84E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	K-40	12	No LLD Reported	2.57E+3 (2.20E+3 - 3.20E+3)	(8/8)		3.05E+3 (2.60E+3 - 3.50E+3)	(4/4)	33 93
							33	2.80E+3 (2.40E+3 - 3.20E+3)	(2/2)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AMERICAN EEL (pCi/kg(WET))	GAMMA	LA-140	12	3.83E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	MN-54	12	1.92E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	NB-95	12	1.99E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	RA-226	12	2.91E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	ZN-65	12	6.17E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AMERICAN EEL (pCi/kg(WET))	GAMMA	ZR-95	12	3.42E+1	<LLD	(0/8)		<LLD	(0/4)	33 93
							93	<LLD	(0/6)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	AC-228	32	7.06E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	

TABLE 3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
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SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	BA-140	32	1.11E+2	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	BE-7	32	1.68E+2	3.92E+2 (1.80E+2 - 6.50E+2)	(5/24)		2.00E+2 (2.00E+2 - 2.00E+2)	(1/8)	23 24 25 32 33 93
							33	4.80E+2 (3.50E+2 - 6.50E+2)	(3/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	CO-58	32	2.41E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	CO-60	32	2.78E+1	8.05E+1 (4.50E+1 - 1.10E+2)	(6/24)		<LLD	(0/8)	23 24 25 32 33 93
							33	9.07E+1 (6.50E+1 - 1.10E+2)	(4/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	CS-134	32	3.53E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	CS-137	32	2.75E+1	7.87E+1 (1.10E+1 - 2.30E+2)	(18/24)		5.88E+1 (3.80E+1 - 7.10E+1)	(6/8)	23 24 25 32 33 93
							33	1.85E+2 (1.20E+2 - 2.30E+2)	(4/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	FE-59	32	5.78E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	

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SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	I-131	32	3.97E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	K-40	32	No LLD Reported	6.49E+3 (1.10E+3 - 1.40E+4)	(24/24)		1.47E+4 (1.10E+4 - 1.80E+4)	(8/8)	23 24 25 32 33 93
							33	1.17E+4 (6.90E+3 - 1.40E+4)	(4/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	LA-140	32	4.97E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	MN-54	32	2.16E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	NB-95	32	2.52E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	RA-226	32	No LLD Reported	9.55E+1 (4.50E+1 - 1.70E2)	(24/24)		1.28E+2 (7.40E+1 - 1.50E+2)	(8/8)	23 24 25 32 33 93
							33	1.19E+2 (8.70E+1 - 1.50E+2)	(4/4)	
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	ZN-65	32	8.94E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	

TABLE 3

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SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
AQUATIC SEDIMENT (pCi/kg(DRY))	GAMMA	ZR-95	32	4.15E+1	<LLD	(0/24)		<LLD	(0/8)	23 24 25 32 33 93
							93	<LLD	(0/4)	
AIR IODINE (pCi/m3)	IODINE-131		685	2.74E-2	<LLD	(0/473)		<LLD	(0/212)	1 3 4 5 20 66 71 72 73
							73	<LLD	(0/53)	
WHITE PERCH (pCi/kg (WET))	GAMMA	AC-228	2	6.00E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	BA-140	2	7.00E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	BE-7	2	1.05E+2	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	CO-58	2	1.55E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	CO-60	2	2.50E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	

TABLE 3
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OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WHITE PERCH (pCi/kg(WET))	GAMMA	CS-134	2	1.65E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg(WET))	GAMMA	CS-137	2	1.80E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	FE-59	2	4.50E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	I-131	2	1.95E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	K-40	2	No LLD Reported	3.25E+3 (3.10E+3 - 3.40E+3)	(2/2)		*	(*/*)	93
							93	3.25E+3 (3.10E+3 - 3.40E+3)	(2/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	LA-140	2	2.40E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	MN-54	2	1.55E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	

TABLE 3
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SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
WHITE PERCH (pCi/kg (WET))	GAMMA	NB-95	2	1.50E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	RA-226	2	2.00E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	ZN-65	2	4.50E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
WHITE PERCH (pCi/kg (WET))	GAMMA	ZR-95	2	3.00E+1	<LLD	(0/2)		*	(*/*)	93
							93	<LLD	(0/2)	
BLOWFISH (pCi/kg (WET))	GAMMA	AC-228	5	9.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	BA-140	5	9.00E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	BE-7	5	1.64E+2	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY
OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLOWFISH (pCi/kg (WET))	GAMMA	CO-58	5	2.36E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	CO-60	5	3.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	CS-134	5	2.40E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	CS-137	5	2.32E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	FE-59	5	6.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	I-131	5	2.60E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	K-40	5	No LLD Reported	3.63E+3 (3.30E+3 - 4.00E+3)	(3/3)		3.70E+3 (3.20E+3 - 4.20E+3)	(2/2)	93
							93	3.63E+3 (3.30E+3 - 4.00E+3)	(3/3)	

TABLE 3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

OCNGS - JANUARY 1990 THROUGH DECEMBER 1990

SAMPLE TYPE	ANALYSIS	ISOTOPE	# OF ANALYSES PERFORMED	LLD	INDICATOR-MEAN	(N/TOT)	STATION	BACKGROUND-MEAN RANGE STATION-MEAN RANGE	(N/TOTAL) (N/TOTAL)	STATIONS USED FOR INDICATOR MEAN
BLOWFISH (pCi/kg (WET))	GAMMA	LA-140	5	4.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	MN-54	5	2.36E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	NB-95	5	2.30E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	RA-226	5	3.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	ZN-65	5	7.60E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	
BLOWFISH (pCi/kg (WET))	GAMMA	ZR-95	5	4.20E+1	<LLD	(0/3)		<LLD	(0/2)	93
							93	<LLD	(0/3)	

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 TLD's 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. TLD's 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 TLD's 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 TLD's 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 1990, TLD's were collected every twelve weeks from locations ranging from less than 0.2 miles to 35.1 miles from the OCNGS. Four GPUN Panasonic

TLD's and one vendor supplied (Teledyne Isotopes) TLD are exposed at each of 63 monitoring locations. GPUN TLD's provide sixteen independent detectors at each station. Vendor supplied TLD's provide an additional four independent measurements. This provides twenty detectors at each station. In addition, two of the 63 monitoring locations are quality control (QC) stations at which 4 additional GPUN TLD's and one vendor supplied TLD are exposed for quality control purposes. Forty independent measurements are made at these locations.

Results

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

An underground natural gas pipeline was installed in Ocean County during 1990 in close proximity to some of the OCNGS REMP TLD stations. Pipeline construction included weld verification via radiography. Based upon construction location and time frame, it is highly probable that TLD's from stations 62, 64, 65, and 96 were exposed to gamma radiation from the radiography during the first three quarters of 1990, which resulted in comparatively higher doses relative to previous exposure periods.

In 1990, the dose rate measured at indicator stations using Teledyne TLD's averaged 4.19 mRem/standard month and ranged from 3.1 to 9.3 mRem/standard month, including data from four stations that were exposed to pipeline radiography. When these data are excluded, the mean drops two percent to 4.10 mRem/standard month and the range is from 3.1 to 7.2 mRem/standard month. The dose at background TLD stations, located greater than 30 miles from the OCNGS, averaged 4.15 mRem/standard month and ranged from 3.5 to 5.3 mRem/standard month. The mean dose rate from the background stations was higher than the mean dose rate from the indicator stations (excluding data influenced by construction radiography) 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 2.7 mRem/standard month and that the dose rates monitored at locations from 0 to 2 miles from the OCNGS were elevated due to radiography, the data indicate that the dose rates are not significantly higher close to the OCNGS (Fig. 7).

In the description above, indicator and background station assignment was based on distance from the OCNGS and with respect to downwind or upwind meteorology. A second method was developed to test and compare results. This method designated indicator stations as those located within the highest four air dispersion (X/Q) compass sectors based upon analysis of historical meteorological data. Background stations were those located in the remaining compass sectors. The results of this analysis (Fig. 8) closely agree with the above mentioned conclusion that operation of the OCNGS contributed little if any to off-site exposure.

Regarding Panasonic TLD data, the mean dose from indicator stations was 11.53 mRem/standard quarter with a range from 8.51 to 25.60 mRem/standard quarter. These data include doses influenced by construction radiography. With these data excluded, the mean dose for indicator stations drops 3.7 percent to 11.10 mRem/standard quarter with the maximum quarterly dose being 19.86 mRem/standard quarter. The background mean dose rate, from stations greater than 30 miles from the OCNGS, was 11.26 mRem/standard quarter with dose rates ranging from 9.95 to 12.7 mRem/standard quarter. The mean background dose exceeded the mean indicator dose again suggesting OCNGS operation had little if any affect on off-site exposure. The standard deviation of dose rates ranged from 0.24 to 14.20 mRem/standard quarter. Considering these data, no relationship between dose rate and distance from the OCNGS was observed during 1990 (Fig. 9).

A comparison of dose per affected compass sector between Teledyne and Panasonic TLD's was performed using 1990 data (Fig. 10). The results indicate good correlation between the dose per sector as recorded by the two independent TLD networks. In addition, the data indicates that the north-northwest sector had the highest 1990 dose. Based upon on-site meteorology for 1990, 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 exposures.

MEAN TELEDYNE TLD GAMMA DOSE – 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
INDICATOR AND BACKGROUND STATIONS BASED ON DISTANCE FROM OCNGS
DOSE IN MILLIREM PER STANDARD MONTH

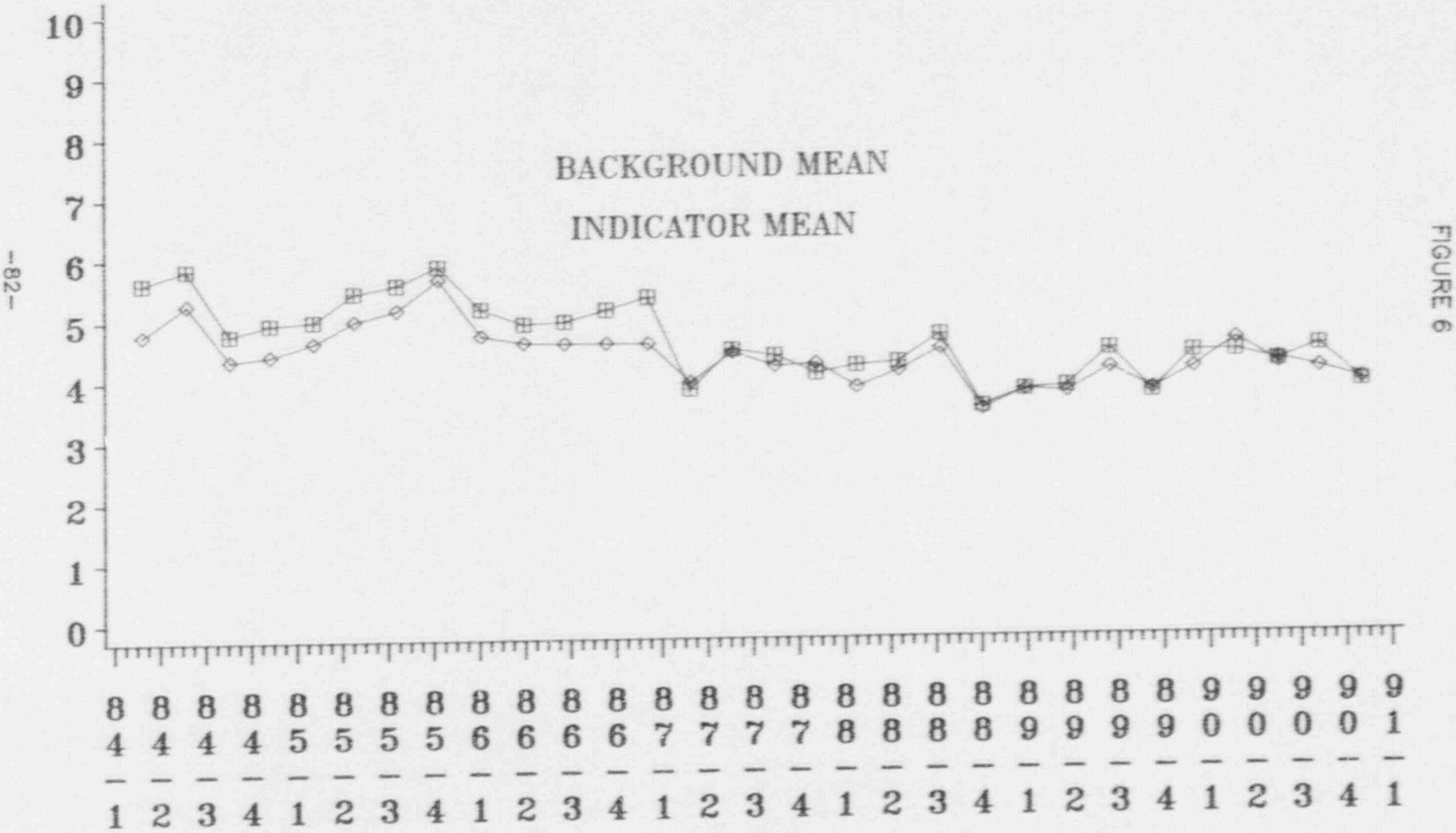


FIGURE 6

MEAN TELEDYNE TLD GAMMA DOSE FOR 1990 BASED ON DISTANCE FROM OCNGS
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
DOSE IN MILLIREM PER STANDARD MONTH

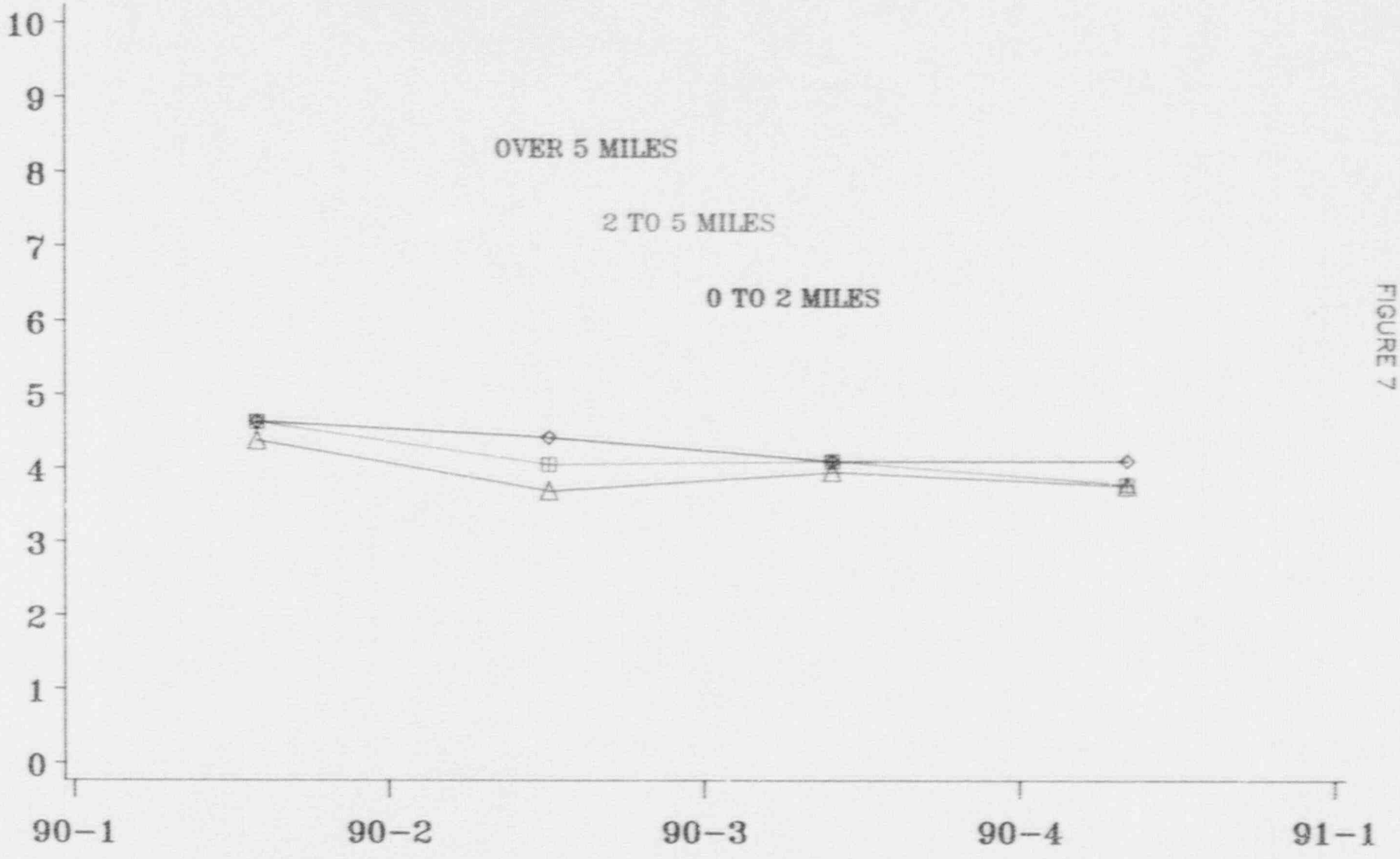


FIGURE 7

MEAN TELEDYNE TLD GAMMA DOSE – 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
INDICATOR AND BACKGROUND STATIONS BASED ON HISTORICAL METEOROLOGY
DOSE IN MILLIREM PER STANDARD MONTH

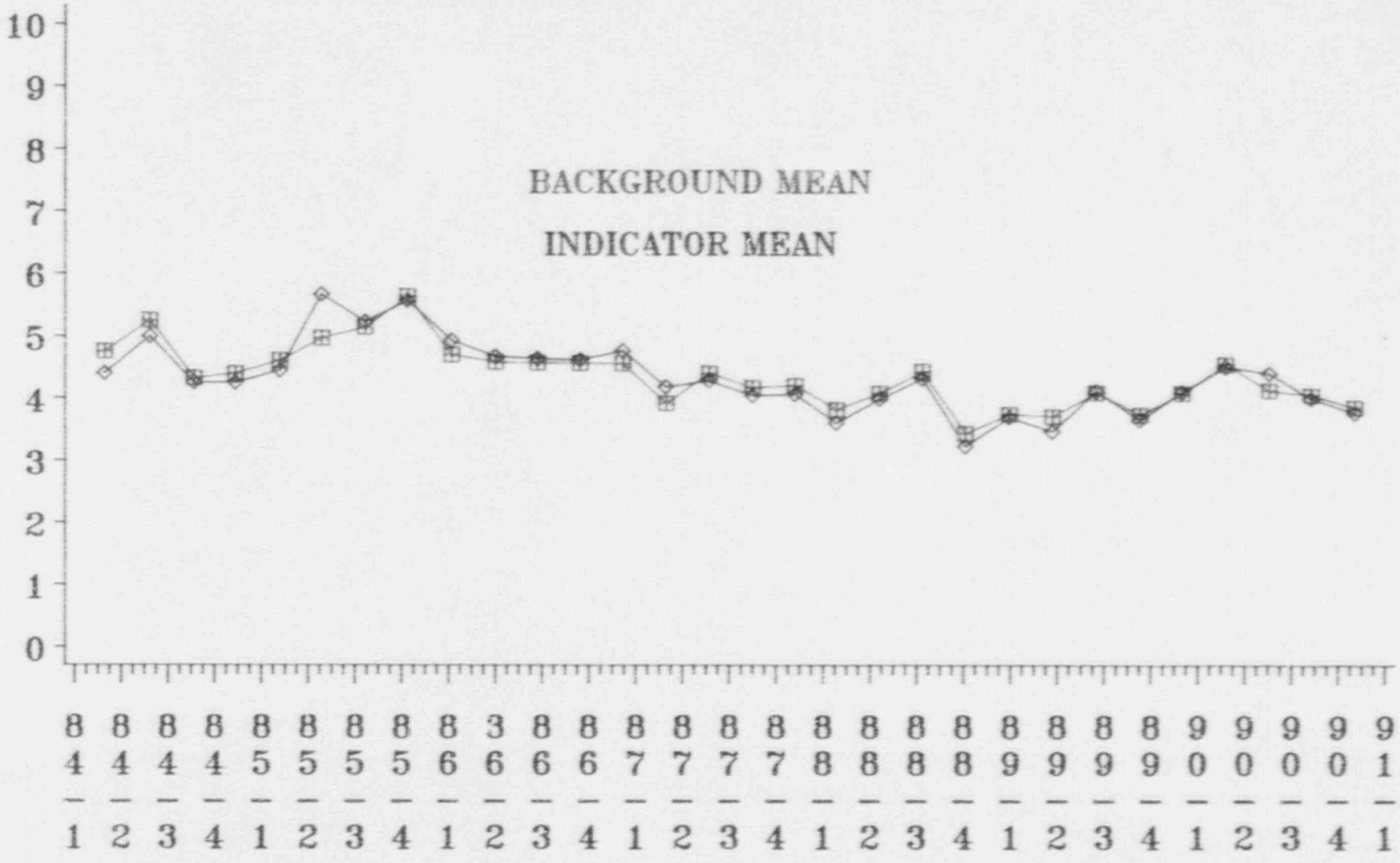


FIGURE 8

MEAN PANASONIC TLD GAMMA DOSE FOR 1990 BASED ON DISTANCE FROM OCNGS
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
DOSE IN MILLIREM PER STANDARD MONTH

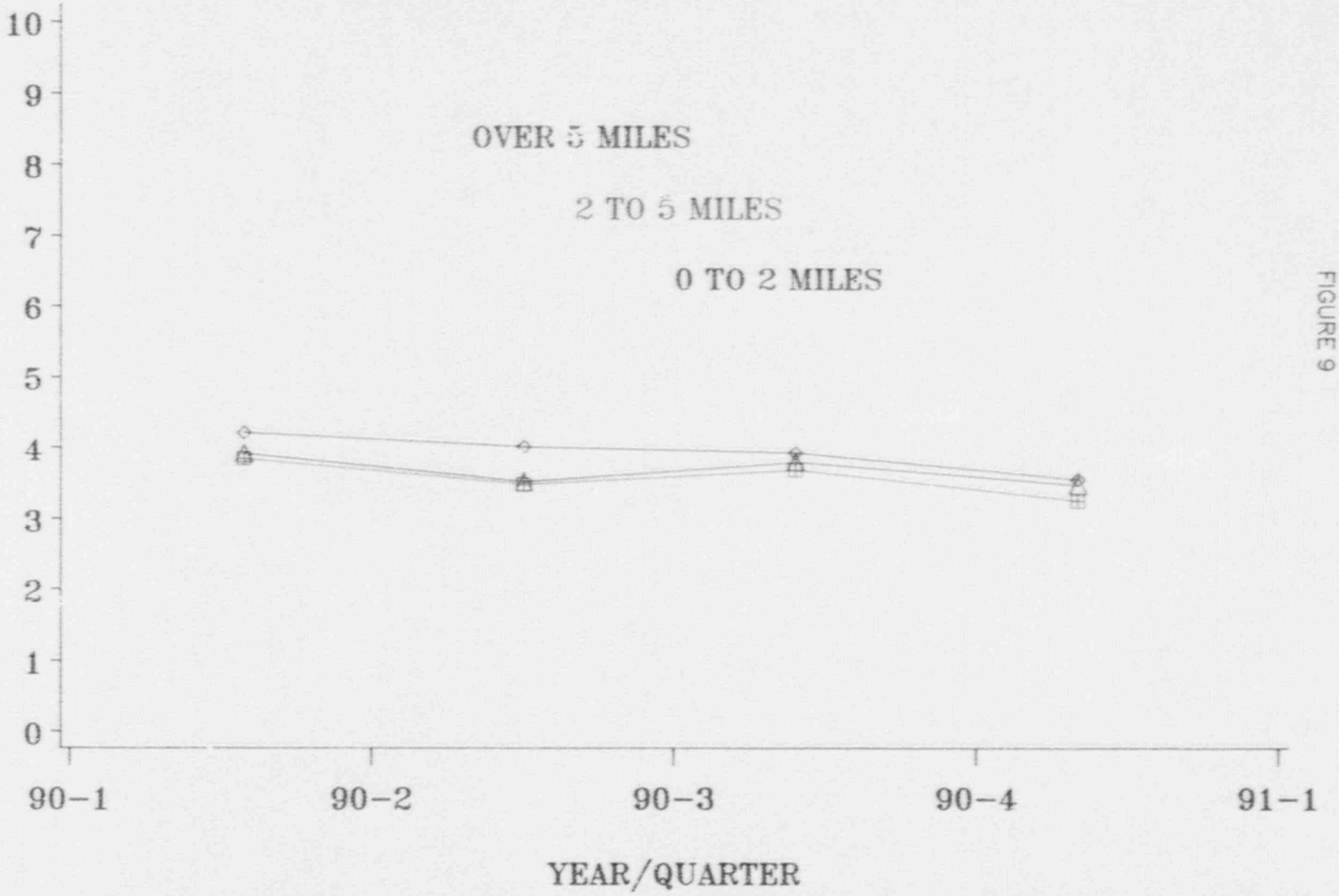


FIGURE 9

MEAN TELEDYNE AND PANASONIC TLD GAMMA DOSE FOR 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
MEAN DOSE IN AFFECTED COMPASS SECTOR
DOSE IN MILLIREM PER STANDARD QUARTER

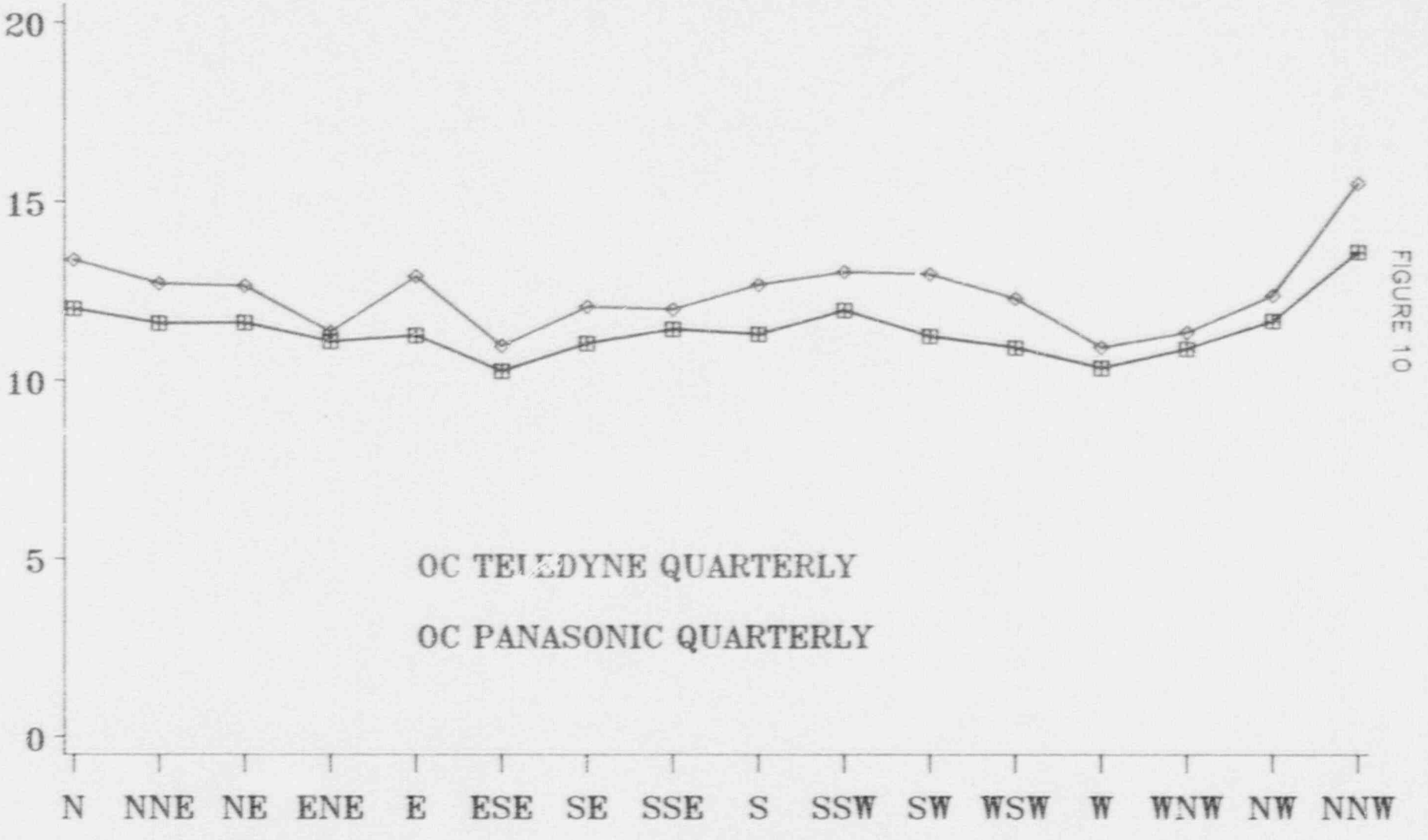


FIGURE 10

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 1990 demonstrated that, as in previous years, the radioactive airborne effluents associated with the OCNGS did not have any measurable effects on the environment.

During 1990, 689 gross beta analyses were performed on air particulate filters (Table 3). Four of these analysis could not meet the required LLD because in each case, 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 (0.0151 pCi/m3) was the same as the indicator mean (0.0151 pCi/m3). In addition, all gross beta analysis results were within two standard deviations of the historical mean.

As described above, indicator stations were located on the basis of general proximity to the OCNGS, in prevailing downwind directions. Background stations were located greater than 17 miles from the OCNGS in generally upwind directions. Comparison of the 1990 weekly mean air particulate gross beta concentrations for these indicator and background stations indicates that indicator and background concentrations were essentially identical (Fig. 11). In order to test the validity of these results, the air particulate gross beta concentrations were also analyzed using an alternate method of designating indicator and background stations. Using the alternate method, indicator stations were those located within the four highest air dispersion (X/Q) and deposition (D/Q) compass sectors, based upon meteorological data analysis, while background stations were located in the remaining compass sectors (Fig. 12). The results of this analysis also demonstrated that air particulate gross beta concentrations were essentially identical at indicator and background stations. These results were consistent with the results of gross beta analyses of air samples from previous years (Fig. 13).

Air charcoal cartridges (689) were analyzed for iodine-131 (I-131) and no radioiodine was detected in any of the samples (Table 3). Four iodine-131 results were considered outliers because air sampler malfunctions occurred during the collection periods. These data are not included in Table 3. Two of these iodine-131 results did not achieve the required sensitivity (Appendix B) due to very low total volumes.
Gamma isotopic analyses were performed on 169 air particulate filter composites (Table 3). The only radionuclides identified were naturally occurring beryllium-7 and radium-226 and neither can be attributed to effluents from the OCNGS.

With regard to precipitation sampling, 24 gamma isotopic and 24 tritium analyses were performed during 1990 (Table 3). The only radionuclide detected was naturally occurring beryllium-7 which was identified only once at a background station. No tritium activity was detected in any precipitation sample (Table 3).

WEEKLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS FOR 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
INDICATOR AND BACKGROUND STATIONS BASED ON DISTANCE FROM OCNGS
RESULTS IN PCI PER CUBIC METER

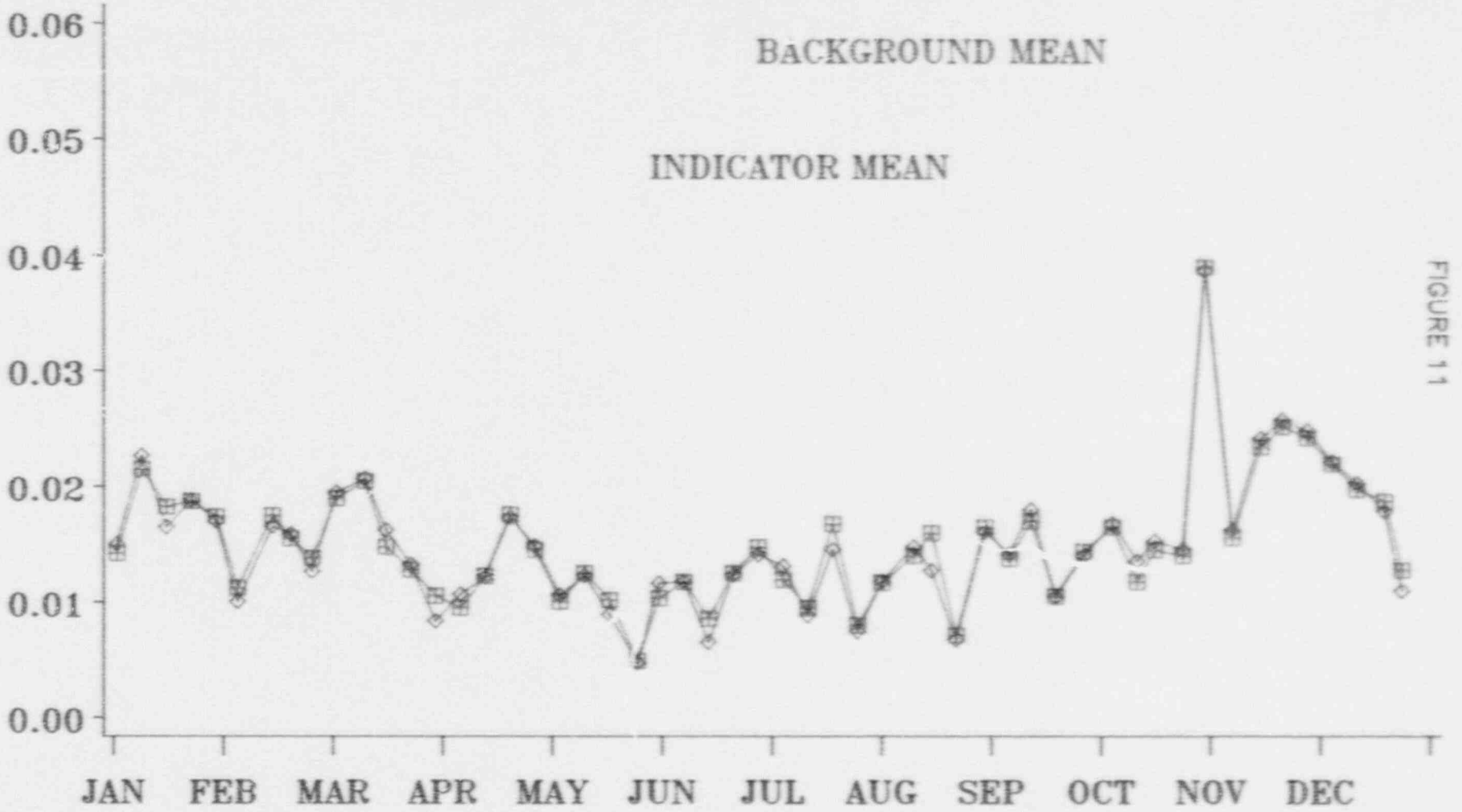


FIGURE 11

WEEKLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS FOR 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
INDICATOR AND BACKGROUND STATIONS BASED ON HISTORIC METEOROLOGY
RESULTS IN PCI PER CUBIC METER

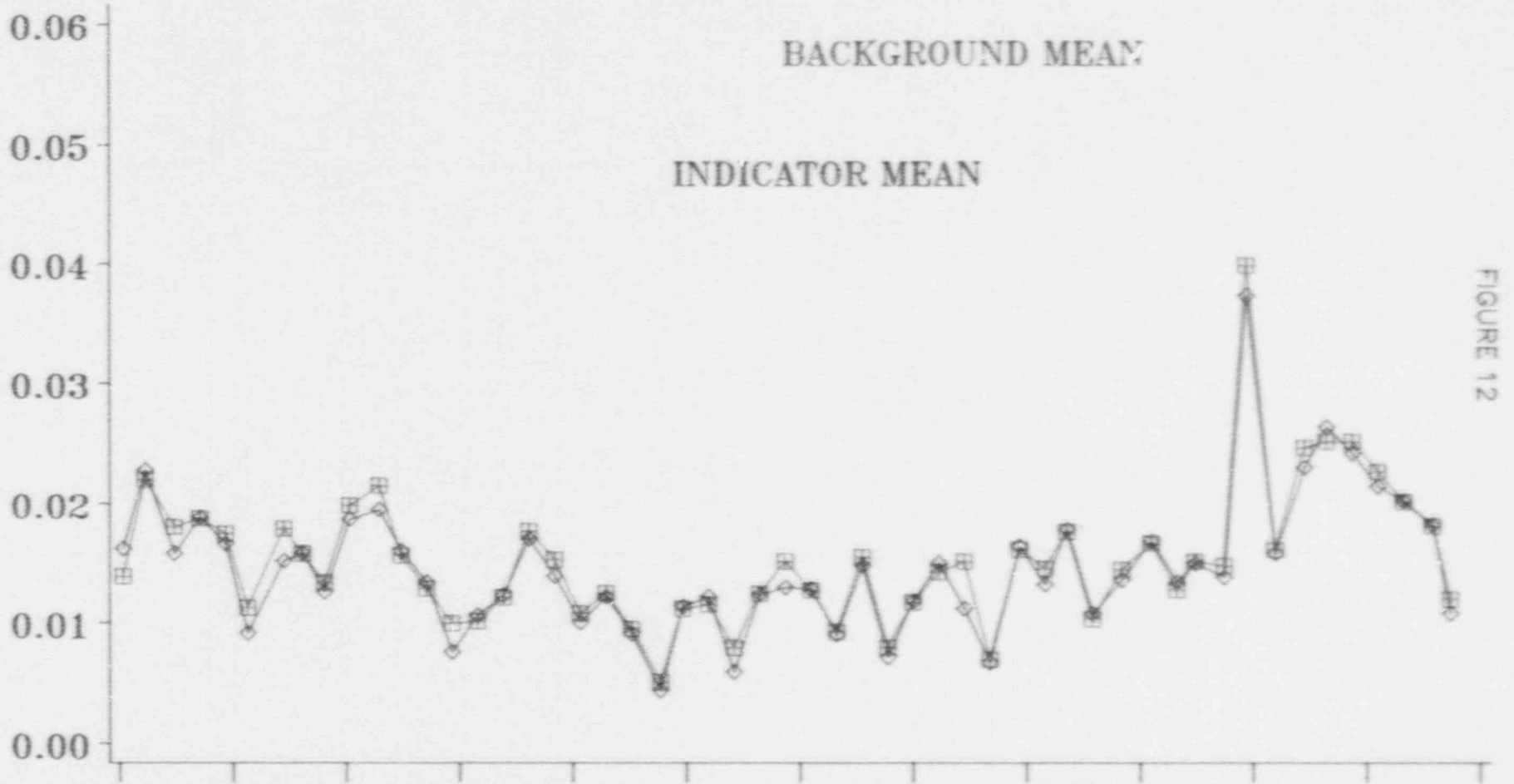


FIGURE 12

MONTHLY MEAN AIR PARTICULATE GROSS BETA CONCENTRATIONS – 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
INDICATOR AND BACKGROUND STATIONS BASED ON DISTANCE FROM OCNGS
RESULTS IN PICOCURIES PER CUBIC METER

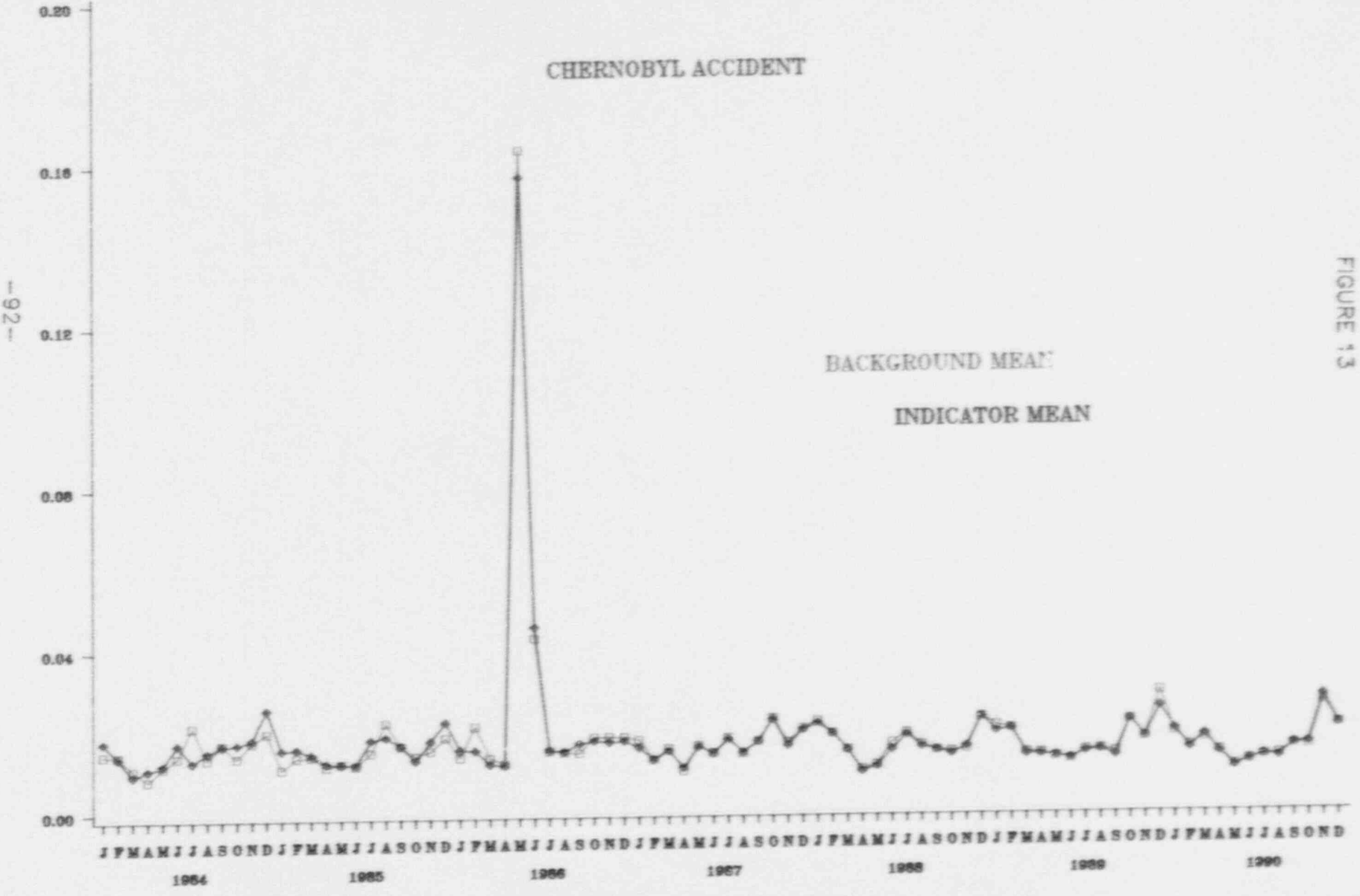


FIGURE 13

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. There was one liquid release (totalling 10 gallons) made from the OCNGS during 1990. 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 to be collected 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 1990. Two gamma-emitting nuclides, potassium-40 (K-40) and radium-226 (Ra-226) were detected (Table 3). Tritium (H-3) activity was also detected in 12 samples (Table 3). All three of these radionuclides are naturally occurring and commonly found in salt water at or above the observed concentrations.

Five gamma-emitting nuclides were detected in the 32 sediment samples collected during 1990 (Table 3). Three of these radionuclides, beryllium-7, potassium-40, and radium-226 are naturally occurring and were detected at both background and indicator stations. Cesium-137, which is a fission fallout product and also occurred in OCNGS effluents in small quantities during 1990 (Table 2), was also seen at both background and indicator stations. Cesium-137 has been detected in considerable abundance after weapons tests and the Chernobyl accident. The presence of this radionuclide in similar concentrations in 75 percent of both the background and indicator samples suggests that the cesium-137 activity in Barnegat Bay sediments originated from the latter two sources.

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 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 the radioactive decay of the existing inventory, has resulted in a gradual decline in the cobalt-60 concentration in sediment and clams (Figs. 14 and 15). The last detectable concentration of this radionuclide in clams was during the third quarter of 1987 (Fig. 14).

Sixty-five clam samples were collected from five different locations during 1990. 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).

Twenty blue crab samples were collected from three locations during 1990. 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 make it susceptible to cobalt-60 uptake. However no detectable cobalt-60 activity has been observed in blue crab samples since routine collection began in 1985 (Fig. 16).

Forty-six fish samples, yielding 7 species, were collected from 3 sampling locations during 1990. The species and number of samples collected are listed below:

TABLE 4

SPECIES OF FISH CAUGHT AS PART OF THE OCNGS REMP IN 1990

Fish	Number of Samples
American eel	12
bluefish	10
winter flounder	7
tautog	6
blowfish	5
summer flounder	4
white perch	2

MEAN COBALT-60 CONCENTRATION IN CLAMS - 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PCI PER KG (WET)

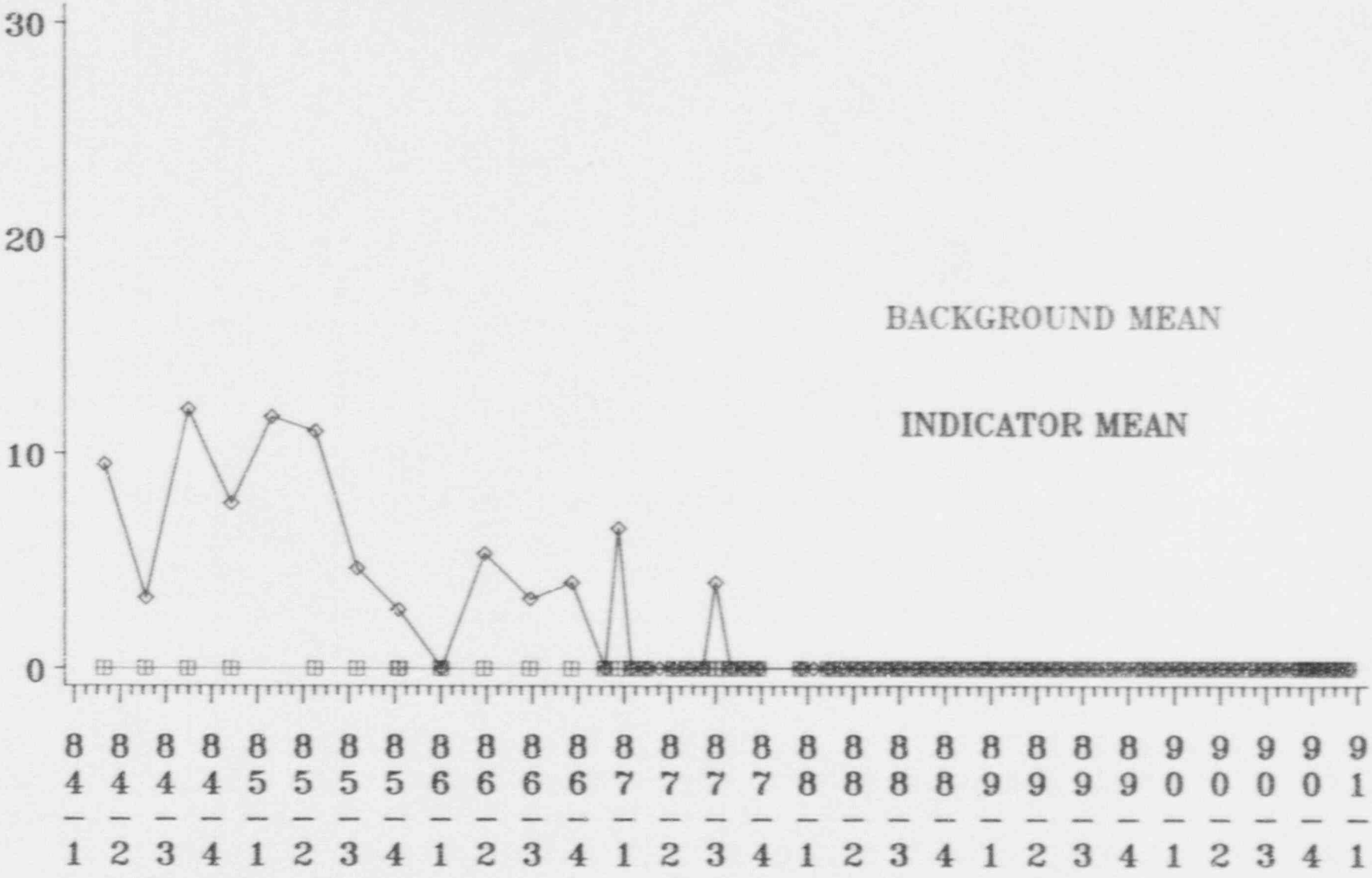


FIGURE 14

MEAN COBALT-60 CONCENTRATION IN AQUATIC SEDIMENT - 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PICOCURIES PER KILOGRAM (DRY)

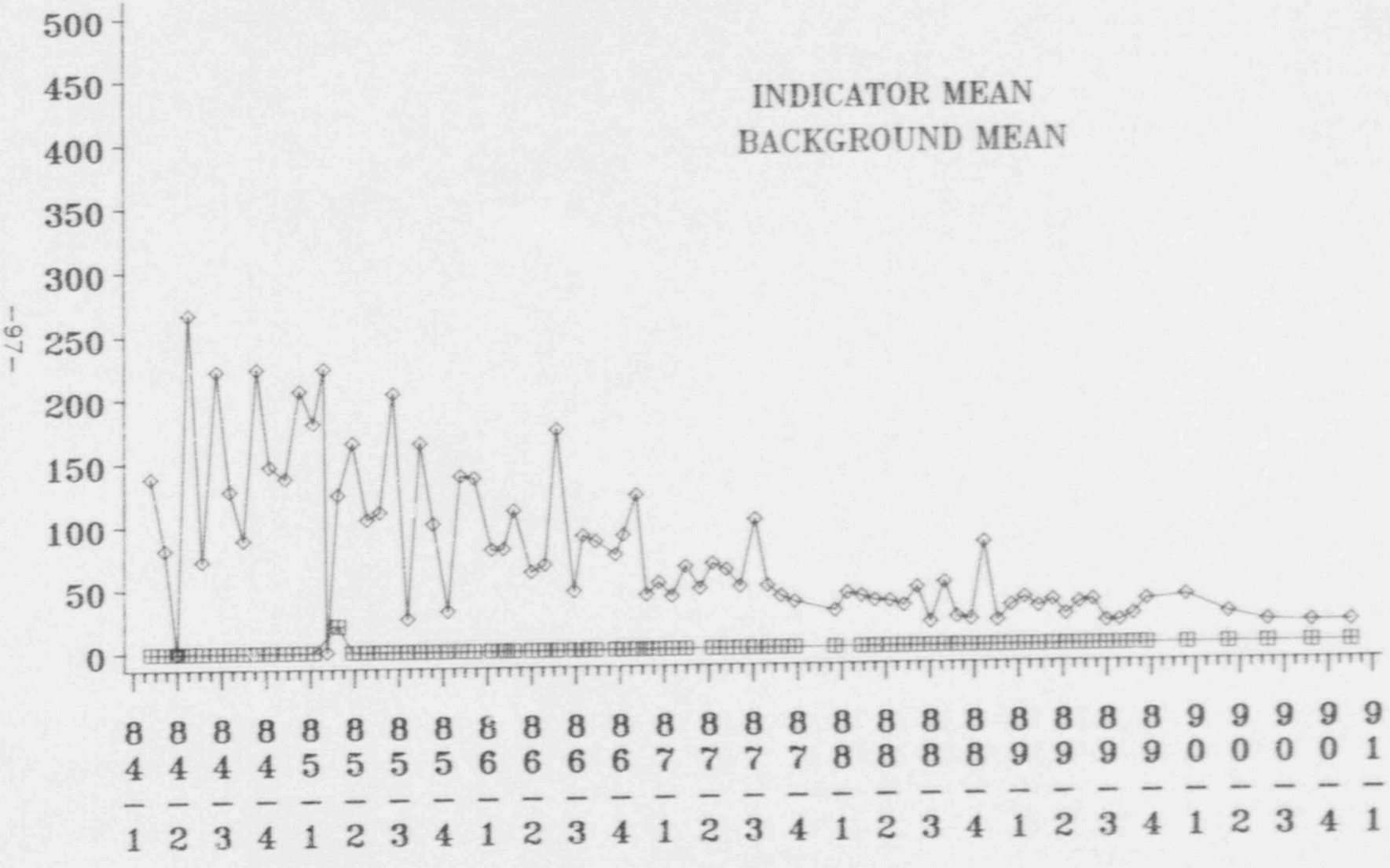


FIGURE 15

MEAN COBALT–60 CONCENTRATION IN BLUE CRAB – 1984 THROUGH 1990
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PICOCURIES PER KILOGRAM (WET)

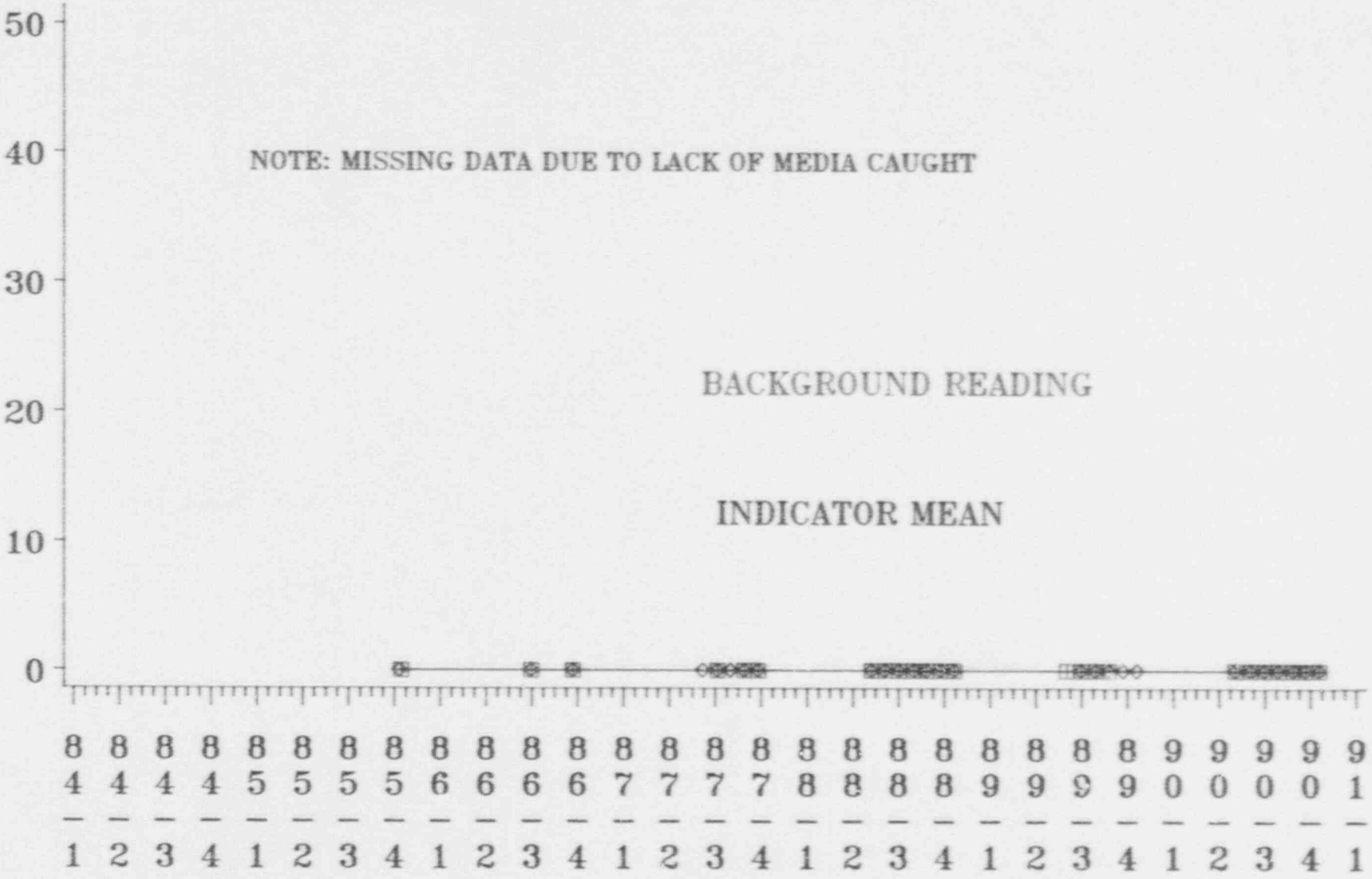


FIGURE 16

Naturally occurring potassium-40 (K-40) was detected in each of the 46 gamma isotopic analyses (Table 3). No other radionuclides were detected in any fish sample.

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 1990. 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 s[illegible]oundary in the two sectors with the highest potential for radi[illegible] deposition in lieu of performing an annual garden census. Bo[illegible] g[illegible]s are greater than 50 square meters in size and produce green leafy v[illegible]ables. A commercial farm located approximately 24 miles northwest [illegible] 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 July and ending in December 1990. A gamma isotopic analysis was performed on each sample.

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

Results

The results of the terrestrial monitoring during 1990 demonstrated that the radioactive effluents associated with the OCNGS did not have any measurable effects on soil or vegetation.

Naturally occurring potassium-40 activity was detected in cabbage, collard, and Swiss chard samples (Table 3). Potassium-40 was detected in 100 percent of the samples collected from both indicator and background stations. Another naturally occurring nuclide, beryllium-7, was identified in 8 of 20 cabbage and collard samples collected at indicator stations and in 2 of 6 collard samples collected from background locations. No background cabbage samples could be obtained. Cesium-137 activity was detected in 2 of 20 indicator station samples of cabbage and collards, but not detected in six background samples of collards (Figure 17). The maximum concentration of cesium-137 was 19.0 pCi/kg (wet) which is only 14 percent of the lower limit of detection (80 pCi/kg (wet)) and less than one percent of the reporting level (2000 pCi/kg (wet)) specified by the OCNGS Technical Specifications.

Cesium-137 activity was detected in all indicator and background soil samples collected from the gardens in which vegetables were grown (Table 3). Closer analysis reveals that the background mean (190 pCi/kg (dry)) was higher than the indicator mean concentration (142 pCi/kg (dry)) and the indicator maximum concentration (180 pCi/kg (dry)). It is well established that root uptake of Cs-137 from soil is minimal and that foliar absorption is the main pathway of Cs-137 to the food chain (Ref. 20). These results suggest that the cesium-137 detected in vegetables was atmospherically deposited rather than taken up from the soil. Although cesium-137 activity was released as a gaseous effluent of the OCNGS in 1990, it accounted for only 0.026 percent of the total gaseous particulate effluent released (Table 2) and was only released

MONTHLY CESIUM-137 CONCENTRATION IN COLLARDS
OYSTER CREEK RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
RESULTS IN PICOCURIES PER KILOGRAM (WET)

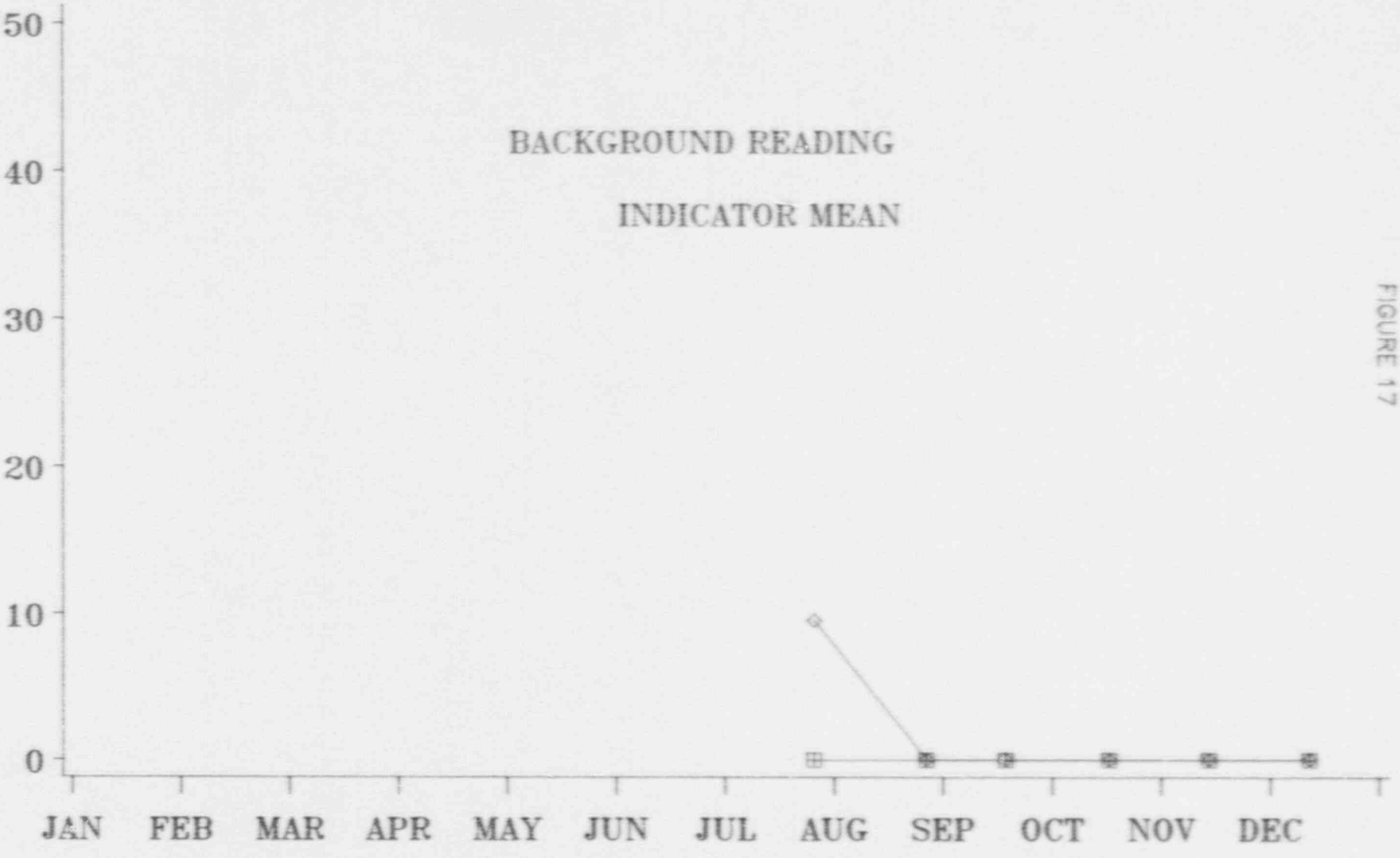


FIGURE 17

during April and May, prior to the planting of the cabbage and collards at the indicator stations. Furthermore, our historical data base shows that cesium-137 activity has been detected in vegetables on a more frequent basis, and in higher concentrations, during years in which the radionuclide was not released with OCNGS gaseous effluents. For example, cesium-137 activity was detected in 50 percent and 12 percent of the indicator station vegetable samples collected in 1988 and 1989 respectively, although no cesium-137 was released with effluents during those years. The concentration of cesium-137 in vegetables during those years ranged from 17.1 to 44.5 pCi/kg (wet). During 1990, when small quantities of cesium-137 were released with OCNGS effluents, this radionuclide occurred in only 10 percent of the vegetable samples, at concentrations ranging from 11.0-19.0 pCi/kg (wet). These results indicate that the minute concentrations of cesium-137 detected in vegetables were due to fallout from previous weapons testing and the Chernobyl nuclear accident and not the result of deposition of effluents from the OCNGS. No other radionuclide was detected as a deposition product on vegetables.

In addition to cesium-137 activity, naturally occurring potassium-40, radium-226, and actinium-228 activity was observed in all soil samples collected from indicator and background stations (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 1990, fifteen of these wells located in the Cape May, Cohansey and Kirkwood aquifers, were sampled semiannually using grab sample methodology. The samples were analyzed for tritium and gamma emitting nuclides.

Results

The results of the groundwater monitoring during 1990 demonstrated that, as in previous years, the radioactive effluents associated with the OCNGS did not have any measurable effects on offsite groundwater quality.

Sixty-three routine REMP well water samples were collected during 1990 (Table 3). Naturally occurring Ra-226 (from the uranium decay series) (Ref. 23), was detected in only one sample and was the only gamma-emitting nuclide detected. Tritium activity was detected in two indicator samples and one background sample. These results were not considered significant because the maximum tritium concentration (230 pCi/l) was only one percent of the EPA drinking water limit and less than 12 percent of the lower limit of detection required by the OCNGS Technical Specifications.

The results of the analyses of 30 samples from the onsite spill monitoring well network were similar (Appendix H). Naturally occurring Ra-226 was detected in only one of thirty samples and was the only gamma-emitting nuclide detected. Tritium activity was detected in only five samples. Although the maximum onsite tritium level (1800 pCi/liter) was significantly greater than that observed in offsite wells, and may be the result of spills that have occurred in the past, it was only nine 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 1990 operations at OCNGS were well below all applicable regulatory limits and were significantly less than doses received from common sources of radiation. The 1990 whole body dose potentially received by an assumed maximum exposed individual from OCNGS liquid and airborne effluents was conservatively calculated to be about 0.0087 millirem total or only 0.0348 percent of the OCNGS Technical Specification limit. The 1990 whole body dose to the surrounding population from OCNGS liquid and airborne effluents was calculated to be 2.74 E-4 person-rem and 0.34 person-rem respectively. This is approximately 2.9 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 Guideline 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.

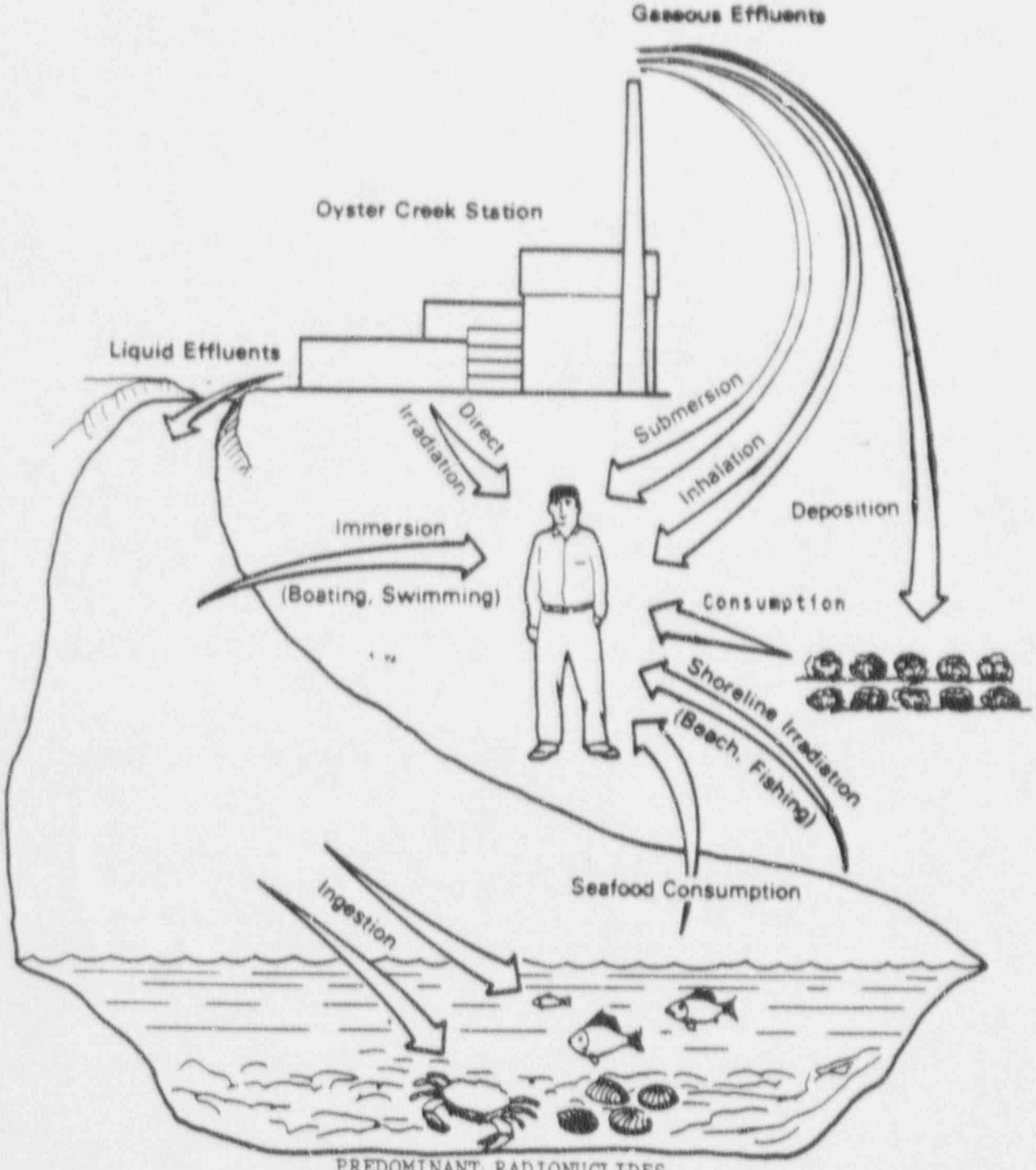
The type and amount of radioactivity released from the OCNGS is calculated using measurements from effluent radiation monitoring instruments and effluent sample analysis. Once released, the dispersion of radionuclides in the environment is readily determined by computer modelling. Airborne releases are 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 18. 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 production. Data files include such information as the distance from the plant stack to the site boundary in each compass sector (sixteen in all), the population groupings, gardens of more than 500 square feet, meat animals, and crop yields.

When determining the dose to humans, it is necessary to consider all pathways and all exposed tissues, summing the dose from each to provide the total dose for each organ as well as the whole body from a given radionuclide in the environment. Dose calculations involve determining the energy absorbed per unit mass in the various tissues. Thus, for radionuclides taken into the body, the metabolism of the radionuclide in

FIGURE 18

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 Vegetables

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

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

TRITIUM (H-3)
Inhalation and Consumption
of Vegetables

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 calculated 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 5 and 6. Table 5 compares the calculated maximum dose to an individual of the public to the OCNGS Technical Specifications, 40CFR190, and 10CFR50 Appendix I dose limits. Table 6 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 less than one percent to a maximum of only 0.38 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 5

CALCULATED MAXIMUM HYPOTHETICAL DOSES TO AN INDIVIDUAL FROM LIQUID AND AIRBORNE EFFLUENT RELEASES FROM THE OCNGS FOR 1990

EFFLUENT RELEASED	REGULATORY LIMITS mRem/YEAR	SOURCE	CALCULATED DOSE mRem/YEAR	PERCENT OF REGULATORY LIMIT
LIQUID	3 - TOTAL BODY	TECH SPEC 3.6.J.1	1.28 E-5	4.27 E-4
LIQUID	10 - ANY ORGAN	TECH SPEC 3.6.J.1	2.01 E-5	2.01 E-4
AIRBORNE (NOBLE GAS)	5 - TOTAL BODY	10 CFR 50 APP. I	0.0087	0.174
AIRBORNE (NOBLE GAS)	15 - SKIN	10 CFR 50 APP. I	0.0105	0.070
AIRBORNE (IODINE AND PARTICULATE)	15 - ANY ORGAN	TECH SPEC 3.6.M.1	0.0572	0.381
TOTAL-LIQUID AND AIRBORNE	25 - TOTAL BODY	TECH SPEC 3.6.N.1*	0.0087	0.034
TOTAL-LIQUID AND AIRBORNE	75 - THYROID	TECH SPEC 3.6.N.1*	0.0572	0.076
TOTAL-LIQUID AND AIRBORNE	25 - ANY OTHER ORGAN	TECH SPEC 3.6.N.1*	0.0105	0.044

* 40 CFR 90

TABLE 6

CALCULATED MAXIMUM TOTAL RADIATION DOSES TO THE
POPULATION FROM LIQUID AND AIRBORNE EFFLUENT RELEASES
FROM THE OCNGS FOR 1990

	Calculated Population Total Body Dose Person-Rem/Year OCNGS
From Radionuclides in Liquid Releases	2.74 E-4
(Barnegat Bay and Atlantic Ocean Users)	
From Radionuclides in Airborne Releases (Within 50-Mile Radius of OCNGS)	0.34

DOSE DUE TO NATURAL BACKGROUND RADIATION

Approximately 990,000 Person-Rem Per Year

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

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APPENDIX A

1990 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, NJ
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
WWA	19	1.6	73	ENE of site, 1015 Inland Road, Forked River Beach, Forked River, NJ

TABLE A-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance	Azimuth	Description
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	1.8	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)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Sample Medium	Station Code	Distance	Azimuth	Description
VEG, 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	3.0	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	13[illegible]	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	01	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	161	SSE of site, on Bonita Drive at Barnegat Bay, Pole JC133 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	4.8 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, Francis residence, Island Beach State
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
GPU ENVIRONMENTAL CONTROLS FOR
OYSTER CREEK NUCLEAR GENERATING STATION
1990 (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	689	GR-Beta Gamma	weekly 4 week composite	689 169
Air Iodine	13	weekly	689	I-131	weekly	689
Precipitation	13	4-week combined for a 12-week composite	52	Gamma H-3	12-week composite 12-week composite	24 (3) 24 (3)
Well Water	5	4-week	63	Gamma H-3 I-131	4-week 4-week 4-week	63 63 63
Surface Water	8	4-week	104	Gamma H-3 I-131	4-week 4-week 4-week	104 104 104
Clam	5	4-week	65	Gamma	4-week	65
Sediment	8	4-week	32	Gamma	12-week composite	32
Vegetables	3	4-week	29	Gamma	4-week	29
Soil (4)	3	12-week	6	Gamma	12-week	6
Fish	3	4-week	46	Gamma	4-week	46
Crab	3	4-week	20	Gamma	4-week	20
TLD-Teledyne Isotopes	63	12-week	252	Immersion Dose	12-week	252
TLD-Panasonic	63	12-week	257	Immersion Dose	12-week	257

(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 shipped for analyses.

(4) Only collected when vegetables are collected.

TABLE A-3

SAMPLING AND ANALYSIS EXCEPTIONS - 1990

More than the minimum number of samples and analyses required by the Oyster Creek Technical Specifications were collected and performed during 1990. No sampling and/or analysis exception occurred in 1990 that resulted in a deviation from or violation of the requirements of the Technical Specifications.

APPENDIX B

1990 Lower Limits of Detection (LLD) Exceptions

TABLE B-1

TECHNICAL SPECIFICATIONS ANALYTICAL RESULTS WHICH FAILED TO MEET THE REQUIRED LLD DURING 1990

Sample Media	Analysis	Required LLD	No. of Samples Out of Compliance	Comments
Air Particulate	Gross Beta	0.01 pCi/m^3	2	Low Sample Volume
Air Iodine	I-131	0.07 pCi/m^3	4	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 the 1990 REMP

TABLE C-1

CHANGES EFFECTED IN THE 1990 REMP

January, 1990	There was a modification of the gamma isotopic analysis reporting output from the primary analyses laboratory (GPU Nuclear Corporation, Environmental Radioactivity Laboratory, Harrisburg, Pa.). Prior to the change, a gamma isotopic analysis was capable of detecting results for 30 nuclides. This modification involved extracting 14 of the 30 nuclides because they were not common to a BWR (OCNGS is a Boiling Water Reactor) or not usable in assessing environmental impact. (e.g. I-133 was dropped because its half-life is only 20.8 hours).
January, 1990	There was a modification of the reporting output for all analysis from the primary analysis laboratory. If the result is a positive activity, no lower limit of detection (LLD) is reported. Prior to this change, an LLD was provided whether the result was positive or negative.

APPENDIX D

1990 Quality Assurance Results

The Oyster Creek Environmental Controls 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 sample analyses laboratories perform duplicate analyses on every twentieth sample. The number of duplicate analyses performed in 1990 is outlined in Table D-1. Results of the two analyses were reviewed per procedure 6635-ADM-4500.07. No non-agreements occurred during 1990 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 1990. Seven non-agreements occurred between analysis in 1990. Investigations were conducted in an attempt to resolve these non-agreements. The results of these investigations are summarized in Table D-3. Results of investigations of 1989 sample analysis non-agreements, which were unresolved when the 1989 OCNGS Radiological Environmental Monitoring Program Report was issued, have also been included in Table D-3.

Audits will be conducted during 1991 at the REMP sample analyses laboratories to ensure that samples are handled and analyzed in accordance with all applicable procedures and specifications.

TABLE D-1

1990 QA SAMPLE PROGRAM
NUMBER OF DUPLICATE ANALYSES PERFORMED

SAMPLE MEDIUM	ANALYSES GROSS BETA	H-3	I-131	GAMMA ISOTOPIC
AIR PARTICULATE	23			12
AIR IODINE			41	
RAIN WATER		2		2
WELL WATER		4	4	5
SURFACE WATER		2*	2*	9
AQUATIC SEDIMENT				3
CLAMS				4
VEGETABLES				1*
SOIL				
FISH				1
CRAB				3

* 1 DUPLICATE ON QC SAMPLE

TABLE D-2

1990 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 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	8	MONTHLY	1	QUARTERLY
Vegetables	3	MONTHLY WHEN AVAILABLE	1	QUARTERLY WHEN AVAILABLE
TLD	63	QUARTERLY	2	QUARTERLY

TABLE D-3
RESOLUTION OF OCNGS PEMP SPLIT SAMPLE ANALYTICAL
NON-AGREEMENTS

SAMPLE MEDIUM	SAMPLE DATE	NUCLIDE	AGREEMENT AFTER RE-ANALYSIS	REASON FOR NON-AGREEMENT
Aquatic Sediment	1-09-89	Cs-137	Sample discarded - could not be re-analyzed.	
Clam	1-09-89	K-40	YES	
Aquatic Sediment	4-05-89	Ac-228	YES	
Aquatic Sediment	6-26-89	K-40	NO	Non-homogeneous distribution of radioactivity in sediment.
Aquatic Sediment	5-31-90	Ra-226	Sample discarded - could not be re-analyzed.	
Surface Water	8-25-90	Ra-226	YES	
Surface Water	8-25-90	H-3	YES	
Surface Water	11-15-90	K-40	YES	
Aquatic Sediment	11-15-90	K-40	YES	
Aquatic Sediment	11-15-90	Ra-226	NO	Non-homogeneous distribution of radioactivity in sediment.
Soil	11-15-90	Ra-226	NO	Non-homogeneous distribution of radioactivity in sediment.

APPENDIX E

1990 US EPA Cross-Check Results

TABLE E-1

OYSTER CREEK NUCLEAR GENERATING STATION

US EPA CROSS-CHECK PROGRAM 1990

DATE	MEDIA	NUCLIDE	EPA RESULTS (A)	GPUN-ERL* RESULTS (B)	TI** RESULTS (C)
Jan 1990	WATER	Gross Alpha	12.0 ± 8.7	11.7 ± 0.6	10.0 ± 1.7
		Gross Beta	12.0 ± 8.7	13.7 ± 0.6	12.3 ± 1.5
Feb 1990	WATER	Ba-133	74.0 ± 12.1	81.3 ± 1.5	66.0 ± 3.5
		Co-60	15.0 ± 8.7	12.7 ± 1.5	15.0 ± 3.5
		Cs-134	18.0 ± 8.7	17.0 ± 1.0	15.3 ± 2.3
		Cs-137	18.0 ± 8.7	18.0 ± 1.0	19.3 ± 3.2
		Ru-106	139.0 ± 24.2	140.0 ± 10.0	113.7 ± 4.0
		Zn-65	139.0 ± 24.2	133.3 ± 5.8	131.3 ± 9.1
		H-3	4976.0 ± 862.6	5133.3 ± 57.7	4900.0 ± 100.0
Mar 1990	AIR FILTER	Cs-137	10.0 ± 8.7	11.7 ± 0.6	10.7 ± 1.2
		Gross Alpha	5.0 ± 8.7	6.3 ± 0.6	6.3 ± 0.6
		Gross Beta	31.0 ± 8.7	28.7 ± 1.5	31.7 ± 0.6
Apr 1990	WATFR	Cs-134	15.0 ± 8.7	12.7 ± 0.6	12.7 ± 1.5
		Cs-137	15.0 ± 8.7	14.3 ± 1.5	16.3 ± 1.2
		Gross Alpha	90.0 ± 39.9	83.3 ± 8.5	79.3 ± 2.9
		Gross Beta	52.0 ± 8.7	50.0 ± 2.0	53.3 ± 1.5
		Sr-89	10.0 ± 8.7	NO DATA (D)	10.7 ± 1.2
		Sr-90	10.0 ± 2.6	NO DATA (D)	9.7 ± 0.6
		Ra-226	5.0 ± 1.4	NO DATA (D)	5.7 ± 0.2
		Ra-228	10.2 ± 2.6	NO DATA (D)	9.4 ± 1.4
		U (Nat.)	20.0 ± 10.4	NO DATA (D)	19.0 ± 0.0
Apr 1990	MILK	Cs-137	24.0 ± 8.7	25.5 ± 1.5	27.3 ± 2.5
		I-131	99.0 ± 17.3	98.3 ± 2.1	89.7 ± 3.2
		Sr-89	23.0 ± 8.7	NO DATA (D)	24.7 ± 1.5
		Sr-90	23.0 ± 8.7	NO DATA (D)	24.0 ± 0.0
		K-40	1550.0 ± 135.1	1533.3 ± 57.7	1483.3 ± 75.1
May 1990	WATER	Gross Alpha	22.0 ± 10.4	27.0 ± 2.7	16.0 ± 1.0
		Gross Beta	15.0 ± 8.7	17.3 ± 0.6	17.0 ± 1.0
		Sr-89	7.0 ± 8.7	NO DATA (D)	6.7 ± 0.6
		Sr-90	7.0 ± 8.7	NO DATA (D)	6.7 ± 0.6
Jun 1990	WATER	Ba-133	99.0 ± 17.3	98.3 ± 1.5	93.0 ± 6.1
		Co-60	24.0 ± 8.7	25.3 ± 1.5	25.3 ± 2.5
		Cs-134	24.0 ± 8.7	23.0 ± 1.0	23.7 ± 2.9
		Cs-137	25.0 ± 8.7	25.0 ± 1.7	24.7 ± 2.1
		Ru-106	210.0 ± 36.4	193.3 ± 30.6	196.0 ± 20.7
		Zn-65	148.0 ± 26.0	143.3 ± 5.8	148.1 ± 3.1
		H-3	2933.0 ± 621.1	3000.0 ±100.0	2900.0 ± 100.0
Jul 1990	WATER	Ra-226	12.1 ± 3.1	NO DATA (D)	11.4 ± 0.6
		Ra-228	5.1 ± 2.3	NO DATA (D)	4.2 ± 0.8
		U (Nat.)	20.8 ± 5.2	NO DATA (D)	19.0 ± 0.4

TABLE E-1

OYSTER CREEK NUCLEAR GENERATING STATION

US EPA CROSS-CHECK PROGRAM 1990

DATE	MEDIA	NUCLIDE	EPA RESULTS (A)	GPUN-ERL* RESULTS (B)	TI** RESULTS (C)
Aug 1990	WATER	I-131	39.0 ± 10.4	41.3 ± 2.1	36.0 ± 3.0
		Pu-239	9.1 ± 1.6	NO DATA (D)	11.5 ± 2.3
	AIR FILTER	Gross Alpha	10.0 ± 8.7	12.7 ± 0.7	16.0 ± 1.0
		Gross Beta	62.0 ± 8.7	59.0 ± 1.0	63.3 ± 1.5
		Sr-90	20.0 ± 8.7	NO DATA (D)	18.0 ± 1.0
		Cs-137	20.0 ± 8.7	23.7 ± 0.6	18.3 ± 3.2
Sep 1990	WATER	Gross Alpha	10.0 ± 8.7	15.7 ± 0.6	11.0 ± 1.0
		Gross Beta	10.0 ± 8.7	11.3 ± 0.6	11.0 ± 1.0
		Sr-89	10.0 ± 8.7	NO DATA (D)	8.7 ± 0.6
		Sr-90	9.0 ± 8.7	NO DATA (D)	9.0 ± 1.0
	MILK	Sr-89	16.0 ± 8.7	NO DATA (D)	9.0 ± 2.7
		Sr-90	20.0 ± 8.7	NO DATA (D)	15.3 ± 0.6
		I-131	58.0 ± 10.4	59.7 ± 0.6	54.7 ± 1.5
		Cs-137	20.0 ± 8.7	20.0 ± 1.0	23.0 ± 1.7
		K-40	1700.0 ± 147.2	1700.0 ± 100.0	1710.0 ± 65.5
Oct 1990	WATER	Co-60	20.0 ± 8.7	NO DATA (D)	21.0 ± 1.0
		Zn-65	115.0 ± 20.8	116.7 ± 5.8	115.0 ± 11.5
		Ru-106	151.0 ± 26.0	146.7 ± 5.8	142.0 ± 8.7
		Cs-134	12.0 ± 8.7	10.0 ± 1.0	11.0 ± 0.0
		Cs-137	12.0 ± 8.7	12.7 ± 0.6	16.3 ± 2.5
		Ba-133	110.0 ± 19.1	110.0 ± 0.0	94.7 ± 5.1
		H-3	7203.0 ±1247.1	7633.3 ± 208.2	7133.3 ± 251.7
Nov 1990	WATER	U (Nat)	35.5 ± 6.2	NO DATA (D)	35.3 ± 1.5

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

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

A. EPA results are presented as the known values and the expected laboratory precision (one sigma, one determination) and control limits as defined by the EPA. Units are pCi/L for water and milk except K-40 is in mg/L. Units are total pCi for air particulate filters. Units for food are pCi/kg except K-40 which is mg/kg.

B. GPUN-ERL results are given as the average ± experimental sigma. Units are pCi/L for water and milk except K-40 is in mg/L. Units are total pCi for air particulate filters. Units for food are pCi/kg.

C. Teledyne Westwood results are given as the average ± experimental sigma. Units are pCi/L for water and milk except K-40 is in mg/L. Units are total pCi for air particulate filters. Units for food are pCi/kg.

D. Results for Sr-89, Sr-90, Ra-226, Ra-228, Pu-239 and naturally-occurring Uranium were not provided to the EPA. Analyses of these nuclides are not routinely performed by GPUN-ERL.

APPENDIX F

1990 Annual Dairy Census

Annual Dairy Census - 1990

Ocean County Agricultural Agent, Ms. Debra Smith-Fiola, was contacted regarding the occurrence of dairy animals within a five mile radius of the OCNGS. According to her records, 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 1990 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 1990 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 effected.

For the 1990 reporting period, the calculated maximum hypothetical total body dose received by anyone from liquid effluents would have been 1.28 E-5 mrem to an adult. This represents 4.27 E-4 percent of the OCNGS Technical Specification annual dose limits. Similarly, the maximum hypothetical organ dose from liquid effluents would have been 2.01 E-5 mrem to the liver of an adult. This represents 2.01 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 (Table G-1). The notation of "air dose" is interpreted to mean that these 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 the releases for the 1990 reporting period, the maximum plume exposure (air dose) would have been 0.0187 and 0.0023 mrad for OCNGS gamma and beta dose, respectively. These doses are equal to 0.187 percent and 0.012 percent of the OCNGS Technical Specification annual dose limits, respectively.

The calculated doses to the closest receptor, individual, (1208 meters) in the maximally affected sector (NNE) are presented in lines 5 and 6 of Table G-1. Plume exposures to an individual, regardless of age, from gaseous effluents during the 1990 reporting period were 0.0087 mrem and 0.0105 mrem for total body and skin exposure, respectively. These doses are equivalent to 0.174 percent and 0.070 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 again reflects the maximum exposed organ for the appropriate age group. During 1990, gaseous iodines and particulates from OCNGS would have resulted in a maximum dose of 0.0572 mrem to the thyroid of an infant. This dose is only 0.381 percent of the OCNGS Technical Specification annual dose limits.

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 G-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 0.34 person-rem total body for the 1990 reporting period. This is approximately 2.9 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 1990

Individual Doses

	Effluent Released	Regulatory Limits mRem/Year	Source	Calculated Dose mRem/year	Age Group	Location Dist (m)	Location Dir (toward)	Percent Regulatory Limit
1.	LIQUID	3 mRem Total Body	Tech. Spec. 3.6.J.1	1.28 E-5	Adult	610*	SE*	4.27 E-4
2.	LIQUID	10 mRem Any Organ	Tech. Spec. 3.6.J.1	2.01 E-5	Teen	610*	SE*	2.01 E-4
3.	AIRBORNE (Noble Gas)	10 mRad Gamma Radiation	Tech. Spec. 3.6.L.1	0.0187	-	500	NNE	0.18
4.	AIRBORNE (Noble Gas)	20 mRad Beta Radiation	Tech. Spec. 3.6.L.1	0.0023	-	5000	NNE	0.01
5.	AIRBORNE (Noble Gas)	5 mRem Total Body	10CFR50 App. I	0.0087	All	1208	NNE	0.17
6.	AIRBORNE (Noble Gas)	15 mRem Skin	10CFR50 App. I	0.0105	All	1208	NNE	0.07
7.	AIRBORNE (Iodine and Particulate)	15 mRem Any Organ	Tech. Spec. 3.6.M.1	0.0572	Infant	1006	ESE	0.38

Population Doses

	Effluent Released	Applicable Organ	Calculated Dose (Person-rem)
8.	LIQUID	Total Body	2.74 E-4
9.	LIQUID	Thyroid	5.82 E-5
10.	GASEOUS	Total Body	0.34
11.	GASEOUS	Thyroid	0.57

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

APPENDIX H

1990 Groundwater Monitoring Results

TABLE H-1

OCNGS - GROUNDWATER RESULTS

CONCENTRATION IN pCi/LITER +/- 2 STANDARD DEVIATION

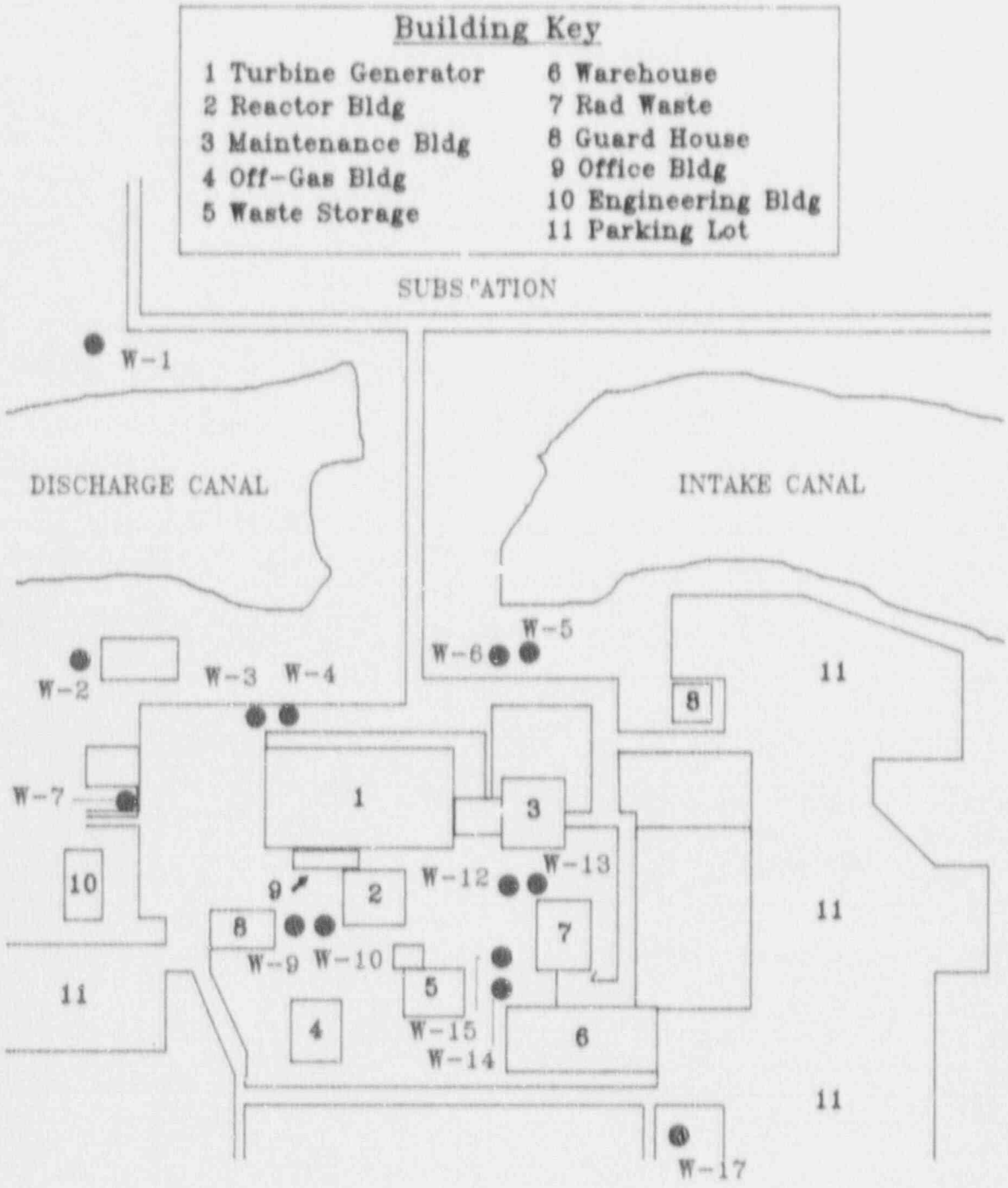
MARCH 1990

STATION	TRITIUM RESULTS	GAMMA ISOTOPIC RESULTS
OC-WW-1	210 +/- 100	ALL NUCLIDES < LLD
OC-WW-2	< 140	ALL NUCLIDES < LLD
OC-WW-3	200 +/- 100	ALL NUCLIDES < LLD
OC-WW-4	< 140	ALL NUCLIDES < LLD
OC-WW-5	< 140	ALL NUCLIDES < LLD
OC-WW-6	< 140	ALL NUCLIDES < LLD
OC-WW-7	150 +/- 90	ALL NUCLIDES < LLD
OC-WW-9	< 140	ALL NUCLIDES < LLD
OC-WW-10	< 140	ALL NUCLIDES < LLD
OC-WW-12	< 140	ALL NUCLIDES < LLD
OC-WW-13	< 140	ALL NUCLIDES < LLD
OC-WW-14	1800 +/- 200	ALL NUCLIDES < LLD
OC-WW-15	< 140	ALL NUCLIDES < LLD
OC-WW-16	< 140	ALL NUCLIDES < LLD
OC-WW-17	< 140	ALL NUCLIDES < LLD

SEPTEMBER 1990

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-7	< 150	ALL NUCLIDES < LLD
OC-WW-9	< 150	ALL NUCLIDES < LLD
OC-WW-10	< 150	ALL NUCLIDES < LLD
OC-WW-12	< 150	Ra-226 4.3 +/- 3.9 ALL OTHER NUCLIDES < LLD
OC-WW-13	< 150	ALL NUCLIDES < LLD
OC-WW-14	1400 +/- 100	ALL NUCLIDES < LLD
OC-WW-15	< 150	ALL NUCLIDES < LLD
OC-WW-16	< 150	ALL NUCLIDES < LLD
OC-WW-17	< 170	ALL NUCLIDES < LLD

Figure H-1
Locations Of On-Site Wells



APPENDIX I

1990 REMP Sample Collection and Analysis Methods

TABLE I-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1990

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 9420-IMP-4592.05	Low background gas flow proportional counting
Gamma Spectroscopy	APT	Four week composite of each station	OC-EC 6635-IMP-4522.05	4 filters (approximately 2400 cubic meters)	TMI-EC 9420-IMP-4592.05	Gamma isotopic analysis
Gamma Spectroscopy	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 Spectroscopy	SWA	Four week grab sample	OC-EC 6635-IMP-4522.06	7.5 liters	TMI-EC 6615-IMP-4592.06	Gamma isotopic analysis
					TI-Midwest GS-01	Gamma isotopic analysis
					TI-Westwood PRO-042-5	Gamma Isotopic analysis
Gamma Spectroscopy	RWA	Twelve week composite	OC-EC 6635-IMP-4522.07	Minimum of 0.5 liters	TMI-EC 6615-IMP-4592.06	Gamma isotopic analysis
					TI-Midwest GS-01	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
1990

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Approximate Sample Size Collected	Analysis Procedure Number	Procedure Abstract
Gamma Spectroscopy	WWA	Four week grab sample	OC-EC 6635-IMP-4522.10	7.5 liters	TMI-EC 6615-IMP-4592.06	Gamma isotopic analysis
					TI-Midwest GS-01	Gamma isotopic analysis
					TI-Westwood PRO-042-5	Gamma Isotopic analysis
Gamma Spectroscopy	CLAM	Four week grab sample	OC-EC 6635-IMP-4522.14	1 kg (if possible)	TMI-EC 6615-IMP-4592.03	Gamma isotopic analysis
	FISH	Semiannual grab sample	6635-IMP-4522.16			
	CRAB	Semiannual grab sample			TI-Midwest GS-01	Gamma isotopic analysis
					TI-Westwood PRO-042-5	Gamma Isotopic analysis
Gamma Spectroscopy	AQS	Twelve week composite of each station	OC-EC	3.8 liters	TMI-EC	Gamma isotopic
	SOIL	Twelve week grab sample (when vegetables are available)	6635-IMP-4522.03 6635-IMP-4522.08	(if possible)	6615-IMP-4592.04	analysis
					TI-Midwest GS-01	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
1990

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Approximate Sample Size Collected	Analysis Procedure Number	Procedure Abstract
Gamma Spectroscopy	VEG	Four week grab sample	OC-EC 6635-IMP-4522.04	1 kg or more (if possible)	TMI-EC 6615-IMP-4592.03	Gamma isotopic analysis
					TI-Midwest GS-01	Gamma isotopic analysis
					TI-Westwood PRO-042-5	Gamma Isotopic analysis
Tritium	SWA	Four week grab sample	OC-EC 6635-IMP-4522.06	7.5 liters	TMI-EC 6615-IMP-4592.02	Sample mixed with scintillation fluid for scintillation counting
					TI-Midwest T-02	Sample distilled, mixed with scintillation fluid for scintillation counting
					TI-Westwood PRO-052-2	Sample vaporized and water vapor counted.

TABLE I-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1990

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Approximate Sample Size Collected	Analysis Procedure Number	Procedure Abstract
Tritium	RWA	Twelve week composite sample	OC-EC 6635-IMP-4522.07	Minimum of 0.5 liters	TMI-EC 6615-IMP-4592.02	Sample mixed with scintillation fluid for scintillation counting
					TI-Midwest T-02	Sample distilled, mixed with scintillation fluid for scintillation counting
					TI-Westwood PRO-052-2	Sample vaporized and water vapor counted
Tritium	WWA	Four week grab sample	OC-EC 6635-IMP-4522.10	7.5 liters	TMI-EC 6615-IMP-4592.02	Sample mixed with scintillation fluid for scintillation counting
					TI-Midwest T-02	Sample distilled, mixed with scintillation fluid for scintillation counting
					TI-Westwood PRO-052-2	Sample vaporized and water vapor counted.

TABLE I-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
SUMMARY OF SAMPLE COLLECTION AND ANALYSIS METHODS
1990

Analysis	Sample Medium	Sampling Method	Collection Procedure Number	Approximate Sample Size Collected	Analysis Procedure Number	Procedure Abstract
TLD (Panasonic)	Immersion Dose	Dosimeters exchanged quarterly	OC-EC 6635-IMP-4522.02	Four Badges	TMI-2 9230-OPS-4250.01	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

1990 TLD Quarterly Data

TABLE J-1

Oyster Creek Nuclear Generating Station
1990 REMP Quarterly TLD Report - Teledyne Isotopes
(Units - MilliRem Per Standard Month +/- 2-Standard Deviations)

STATION	First Quarter 1990 Reading	Std. Dev	Second Quarter 1990 Reading	Std. Dev	Third Quarter 1990 Reading	Std. Dev	Fourth Quarter 1990 Reading	Std. Dev
A	4.5	+/- 0.7	5.3	+/- 0.1	4.8	+/- 0.2	3.8	+/- 0.2
C	4.2	+/- 1.0	3.7	+/- 0.3	3.9	+/- 0.2	3.6	+/- 0.3
H	4.0	+/- 0.4	3.5	+/- 0.4	4.8	+/- 0.3	3.7	+/- 0.1
1	4.8	+/- 1.1	4.1	+/- 0.3	5.7	+/- 0.4	4.6	+/- 0.3
3	4.1	+/- 0.6	4.6	+/- 0.2	4.7	+/- 0.4	3.5	+/- 0.2
4	5.3	+/- 0.7	3.5	+/- 0.3	4.3	+/- 0.2	3.2	+/- 0.1
5	4.0	+/- 0.5	3.5	+/- 0.2	4.3	+/- 0.4	3.5	+/- 0.3
6	4.0	+/- 0.6	3.5	+/- 0.4	3.4	+/- 0.2	3.5	+/- 0.1
7	3.8	+/- 0.4	4.5	+/- 0.3	3.2	+/- 0.1	3.2	+/- 0.2
8	4.1	+/- 0.4	4.4	+/- 0.3	4.7	+/- 0.6	3.7	+/- 0.2
9	4.1	+/- 0.4	4.7	+/- 0.3	4.4	+/- 0.2	4.5	+/- 0.3
T1	4.8	+/- 0.4	4.2	+/- 0.3	4.6	+/- 0.2	5.4	+/- 0.5
10	4.6	+/- 0.4	3.4	+/- 0.2	TLD LOST		4.3	+/- 0.3
11	3.7	+/- 0.6	3.2	+/- 0.1	3.3	+/- 0.2	4.1	+/- 0.3
12	4.0	+/- 0.4	4.8	+/- 0.2	3.8	+/- 0.2	3.8	+/- 0.3
13	3.7	+/- 0.3	3.3	+/- 0.1	3.2	+/- 0.1	3.9	+/- 0.4
14	4.7	+/- 0.6	4.2	+/- 0.3	4.2	+/- 0.3	4.2	+/- 0.4
15	4.1	+/- 0.4	3.8	+/- 0.3	3.7	+/- 0.3	4.5	+/- 0.2
16	3.7	+/- 0.3	3.3	+/- 0.1	3.2	+/- 0.1	3.4	+/- 0.1
17	3.8	+/- 0.4	3.4	+/- 0.2	3.6	+/- 0.2	3.4	+/- 0.1
20	3.9	+/- 0.9	TLD LOST		3.4	+/- 0.2	3.8	+/- 0.8
22	4.9	+/- 0.1	3.4	+/- 0.1	3.4	+/- 0.1	3.8	+/- 0.5
51	6.1	+/- 0.4	6.0	+/- 0.9	4.4	+/- 0.2	4.6	+/- 0.2
52	6.3	+/- 1.1	7.2	+/- 0.5	5.0	+/- 0.2	5.0	+/- 0.2
53	4.8	+/- 0.7	4.2	+/- 0.4	4.5	+/- 0.6	4.5	+/- 0.3
54	4.0	+/- 0.4	3.6	+/- 0.1	3.9	+/- 0.3	3.6	+/- 0.3
55	3.9	+/- 0.3	3.6	+/- 0.1	3.9	+/- 0.3	4.1	+/- 0.6
56	4.3	+/- 0.4	4.7	+/- 0.4	4.1	+/- 0.2	3.9	+/- 0.3
57	5.0	+/- 0.8	4.3	+/- 0.4	5.0	+/- 0.6	5.1	+/- 0.8
58	5.6	+/- 0.5	3.7	+/- 0.6	5.5	+/- 0.3	4.4	+/- 0.6
59	4.7	+/- 0.4	5.5	+/- 0.3	4.5	+/- 0.4	5.2	+/- 0.1
60	3.8	+/- 0.3	3.6	+/- 0.2	3.7	+/- 0.2	3.5	+/- 0.2
61	4.0	+/- 0.4	4.5	+/- 0.5	TLD LOST		3.6	+/- 0.2

TABLE J-1 (Continued)

Oyster Creek Nuclear Generating Station
1990 REMP Quarterly TLD Report - Teledyne Isotopes
(Units - MilliRem Per Standard Month +/- 2-Standard Deviations)

STATION	First Quarter 1990 Reading	Std. Dev	Second Quarter 1990 Reading	Std. Dev	Third Quarter 1990 Reading	Std. Dev	Fourth Quarter 1990 Reading	Std. Dev
62	*8.3	+/- 1.2	3.5	+/- 0.4	3.8	+/- 0.4	4.4	+/- 0.4
63	4.8	+/- 0.6	3.8	+/- 0.4	3.9	+/- 0.4	3.6	+/- 0.2
64	*8.1	+/- 1.7	4.3	+/- 0.4	3.6	+/- 0.5	3.4	+/- 0.2
65	4.5	+/- 0.5	*8.0	+/- 2.7	4.8	+/- 0.2	3.4	+/- 0.2
66	3.7	+/- 0.3	4.5	+/- 0.4	4.5	+/- 0.2	4.2	+/- 0.2
67	4.0	+/- 0.2	3.4	+/- 0.2	3.6	+/- 0.2	4.4	+/- 0.3
69	3.8	+/- 0.2	4.1	+/- 0.3	3.5	+/- 0.2	3.4	+/- 0.2
70	3.3	+/- 0.2	3.2	+/- 0.1	3.3	+/- 0.2	4.0	+/- 0.4
71	3.9	+/- 0.3	3.3	+/- 0.2	3.5	+/- 0.2	3.6	+/- 0.1
73	3.7	+/- 0.3	4.1	+/- 0.3	3.3	+/- 0.2	3.9	+/- 0.8
74	3.9	+/- 0.3	TLD LOST		3.4	+/- 0.2	4.4	+/- 0.3
75	4.1	+/- 0.2	3.8	+/- 0.1	3.7	+/- 0.1	3.8	+/- 0.1
76	3.7	+/- 0.3	3.1	+/- 0.1	3.4	+/- 0.1	3.3	+/- 0.2
77	3.8	+/- 0.3	3.3	+/- 0.1	4.2	+/- 0.1	3.5	+/- 0.2
78	3.8	+/- 0.1	4.1	+/- 0.2	3.5	+/- 0.1	4.5	+/- 0.4
79	4.2	+/- 0.3	3.6	+/- 0.3	TLD LOST		TLD LOST	
80	3.5	+/- 0.2	3.2	+/- 0.0	3.5	+/- 0.3	4.1	+/- 0.4
81	6.0	+/- 0.3	4.6	+/- 0.2	3.9	+/- 0.3	5.2	+/- 0.2
82	5.1	+/- 0.3	4.4	+/- 0.5	TLD LOST		3.8	+/- 0.3
83	5.4	+/- 0.2	3.5	+/- 0.2	3.8	+/- 0.2	3.6	+/- 0.3
84	5.5	+/- 0.5	4.6	+/- 0.5	4.0	+/- 0.3	3.7	+/- 0.2
85	5.4	+/- 0.2	4.2	+/- 0.4	TLD LOST		3.5	+/- 0.2
86	4.1	+/- 0.3	4.3	+/- 0.3	4.4	+/- 0.3	3.5	+/- 0.1
87	5.5	+/- 0.1	3.8	+/- 0.2	4.0	+/- 0.2	4.0	+/- 0.3
88	3.8	+/- 0.1	3.1	+/- 0.1	3.4	+/- 0.2	3.3	+/- 0.1
89	4.7	+/- 0.2	3.1	+/- 0.1	4.2	+/- 0.2	3.2	+/- 0.2
90	4.5	+/- 0.3	3.2	+/- 0.3	3.4	+/- 0.3	3.1	+/- 0.2
91	3.9	+/- 0.1	3.5	+/- 0.2	4.9	+/- 0.3	3.6	+/- 0.3
92	6.2	+/- 0.0	4.3	+/- 0.3	4.3	+/- 0.2	4.2	+/- 0.3
95	3.9	+/- 0.2	4.2	+/- 0.3	4.5	+/- 0.2	3.5	+/- 0.2
96	*5.5	+/- 0.6	*9.3	+/- 2.2	*6.1	+/- 0.9	4.2	+/- 0.4
97	5.6	+/- 0.2	3.5	+/- 0.2	3.5	+/- 0.1	4.4	+/- 0.1

* Dose was probably increased when dosimeters were inadvertently exposed to gamma radiation from radiography during construction of a natural gas pipeline.

TABLE J-2

Oyster Creek Nuclear Generating Station
1990 REMP Quarterly TLD Report - Panasonic
(Units - MilliRem Per Standard Quarter +/- 2-Standard Deviations)

STATION	First Quarter 1990 Reading	Std. Dev	Second Quarter 1990 Reading	Std. Dev	Third Quarter 1990 Reading	Std. Dev	Fourth Quarter 1990 Reading	Std. Dev
A	12.70	+/- 0.33	11.40	+/- 0.87	11.90	+/- 0.84	12.00	+/- 0.68
C	12.10	+/- 0.97	11.10	+/- 1.10	11.30	+/- 0.47	10.40	+/- 0.68
H	11.90	+/- 0.40	10.30	+/- 0.88	10.10	+/- 0.55	9.95	+/- 0.40
1	11.80	+/- 0.89	11.20	+/- 0.63	11.60	+/- 0.87	11.50	+/- 0.40
3	11.50	+/- 0.35	10.10	+/- 0.64	10.30	+/- 0.46	10.40	+/- 0.87
4	10.50	+/- 0.71	9.92	+/- 0.69	9.99	+/- 0.88	9.07	+/- 0.37
5	11.70	+/- 0.87	11.00	+/- 1.00	10.70	+/- 0.61	11.20	+/- 0.60
6	11.50	+/- 0.69	10.10	+/- 1.01	10.50	+/- 0.57	9.79	+/- 0.77
7	10.30	+/- 0.65	9.04	+/- 1.13	10.00	+/- 0.39	9.99	+/- 4.22
8	11.30	+/- 0.91	11.20	+/- 0.86	10.90	+/- 0.60	9.82	+/- 1.03
9	12.40	+/- 0.53	11.20	+/- 0.58	11.20	+/- 0.81	10.90	+/- 0.64
T1	11.50	+/- 1.14	10.70	+/- 1.10	12.40	+/- 0.95	11.40	+/- 0.79
10	10.70	+/- 0.33	11.30	+/- 0.86	11.10	+/- 0.82	10.40	+/- 0.24
11	TLD LOST		10.10	+/- 0.94	10.40	+/- 0.41	9.91	+/- 0.59
12	11.30	+/- 0.53	10.70	+/- 0.81	12.00	+/- 0.86	11.50	+/- 0.82
13	10.40	+/- 0.92	9.22	+/- 0.42	10.70	+/- 0.97	9.45	+/- 0.95
14	13.30	+/- 1.05	12.50	+/- 0.81	14.10	+/- 1.02	11.90	+/- 0.81
15	11.50	+/- 0.61	10.40	+/- 0.36	11.80	+/- 0.61	10.20	+/- 0.66
16	11.80	+/- 1.15	9.18	+/- 0.92	10.40	+/- 1.03	9.50	+/- 0.62
17	11.40	+/- 0.76	10.50	+/- 0.84	11.70	+/- 0.96	10.20	+/- 3.32
20	11.20	+/- 0.53	9.95	+/- 0.63	10.90	+/- 0.66	9.72	+/- 0.81
22	11.20	+/- 0.94	9.46	+/- 1.20	10.50	+/- 0.50	9.12	+/- 0.44
51	14.10	+/- 1.23	16.30	+/- 1.19	14.00	+/- 1.60	11.80	+/- 1.13
52	15.60	+/- 0.64	17.30	+/- 1.31	14.40	+/- 1.03	13.80	+/- 0.75
53	13.00	+/- 0.69	12.30	+/- 0.66	13.40	+/- 0.77	11.90	+/- 0.42
54	10.70	+/- 0.97	10.70	+/- 0.82	12.00	+/- 0.88	10.20	+/- 0.88
55	11.20	+/- 0.69	10.20	+/- 0.40	11.00	+/- 0.97	10.10	+/- 0.45
56	12.40	+/- 0.57	11.60	+/- 0.51	12.90	+/- 1.20	11.10	+/- 0.37
57	13.20	+/- 2.45	12.90	+/- 1.00	15.80	+/- 2.55	14.90	+/- 1.46
58	12.80	+/- 0.66	11.40	+/- 0.54	14.20	+/- 0.85	11.90	+/- 0.90
59	13.00	+/- 0.78	11.80	+/- 0.95	12.40	+/- 1.73	12.40	+/- 1.00
60	10.90	+/- 0.67	10.10	+/- 0.50	11.00	+/- 1.14	11.00	+/- 1.11
61	11.60	+/- 0.53	12.70	+/- 0.49	11.40	+/- 1.01	10.10	+/- 0.71

TABLE J-2 (Continued)

Oyster Creek Nuclear Generating Station
1990 REMP Quarterly TLD Report - Panasonic
(Units - MilliRem Per Standard Quarter +/- 2-Standard Deviations)

STATION	First Quarter 1990 Reading	Std. Dev	Second Quarter 1990 Reading	Std. Dev	Third Quarter 1990 Reading	Std. Dev	Fourth Quarter 1990 Reading	Std. Dev
62	*21.90	+/- 0.70	10.20	+/- 0.97	11.90	+/- 1.42	11.10	+/- 0.86
63	14.40	+/- 0.59	11.30	+/- 0.60	11.40	+/- 1.37	10.70	+/- 0.53
64	*24.50	+/- 2.41	10.50	+/- 0.39	11.40	+/- 0.69	10.40	+/- 1.16
65	13.30	+/- 0.79	*25.60	+/- 3.74	11.10	+/- 0.55	9.91	+/- 0.51
66	10.90	+/- 0.32	11.50	+/- 1.09	10.50	+/- 1.24	9.55	+/- 0.86
67	11.70	+/- 0.92	11.10	+/- 0.70	11.50	+/- 0.72	10.20	+/- 1.03
69	12.20	+/- 1.12	10.00	+/- 0.43	11.50	+/- 14.20	9.59	+/- 0.39
70	12.10	+/- 1.17	9.38	+/- 0.61	10.80	+/- 0.82	9.17	+/- 0.56
71	11.80	+/- 0.27	10.40	+/- 0.72	11.60	+/- 0.68	10.20	+/- 0.91
73	11.00	+/- 0.47	TLD LOST		10.00	+/- 0.85	9.07	+/- 0.81
74	11.00	+/- 1.11	TLD LOST		10.40	+/- 0.88	10.10	+/- 0.53
75	11.50	+/- 1.28	11.10	+/- 0.87	13.20	+/- 1.14	10.60	+/- 0.62
76	10.60	+/- 1.13	9.63	+/- 0.55	10.50	+/- 0.95	9.37	+/- 0.24
77	10.60	+/- 1.20	9.96	+/- 0.56	10.90	+/- 0.97	9.74	+/- 0.40
78	10.90	+/- 0.94	9.96	+/- 0.75	11.10	+/- 0.62	9.83	+/- 0.54
79	10.40	+/- 0.83	8.70	+/- 0.56	19.86	+/- 0.24	8.51	+/- 0.63
80	10.90	+/- 1.04	12.70	+/- 3.47	10.60	+/- 0.73	9.76	+/- 0.59
81	11.90	+/- 1.61	11.00	+/- 0.39	11.60	+/- 1.02	10.40	+/- 0.43
82	12.90	+/- 0.78	11.10	+/- 0.77	11.60	+/- 0.79	10.40	+/- 0.54
83	12.30	+/- 0.49	10.20	+/- 1.00	11.60	+/- 0.75	10.00	+/- 0.40
84	13.20	+/- 0.84	11.00	+/- 0.56	12.30	+/- 0.42	10.80	+/- 0.77
85	11.50	+/- 0.43	9.77	+/- 1.01	11.50	+/- 0.73	9.47	+/- 0.68
86	12.00	+/- 0.91	9.79	+/- 0.65	11.20	+/- 0.65	10.10	+/- 0.56
87	12.90	+/- 0.99	11.80	+/- 0.56	13.00	+/- 1.06	11.30	+/- 0.84
88	11.00	+/- 1.24	9.13	+/- 0.81	10.50	+/- 0.71	9.08	+/- 0.44
89	10.60	+/- 0.46	9.09	+/- 0.66	10.40	+/- 0.35	9.44	+/- 0.30
90	10.70	+/- 0.60	9.13	+/- 0.28	10.40	+/- 0.75	9.11	+/- 0.62
91	11.40	+/- 0.81	10.50	+/- 0.49	11.40	+/- 1.67	9.79	+/- 0.91
92	14.30	+/- 1.64	12.40	+/- 0.43	12.70	+/- 0.80	11.90	+/- 1.25
95	10.70	+/- 1.03	9.40	+/- 0.77	11.40	+/- 1.29	8.83	+/- 0.80
96	*11.60	+/- 0.43	*23.40	+/- 1.45	*11.90	+/- 0.95	9.93	+/- 0.82
97	11.20	+/- 0.89	9.88	+/- 0.58	10.40	+/- 0.60	9.62	+/- 0.36

* Dose was probably increased when dosimeters were inadvertently exposed to gamma radiation from radiography during construction of a natural gas pipeline.