ANNUAL ENVIRONMENTAL OPERATING REPORT FOR PERRY NUCLEAR POWER PLANT

January 1, 1992 to December 31, 1992

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SUMMARY

This Annual Environmental Operating Report details the results of Environmental Monitoring Programs conducted at the Perry Nuclear Power Plant (PNPP) from January 1 through December 31, 1992. Report topics include Radiological Environmental Monitoring, Land Use Census, Clam/mussel Monitoring, Aerial Remote Sensing, Herbicide Use, and Special Reports. The operation of the PNPP did not result in any significant adverse environmental impact in 1992.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The Radiological Environmental Monitoring Program (REMP) was established in 1981 to monitor the radiological conditions in the environment around PNPP. Prior to plant start up, a preoperational program was established to provide data on background radiation and radioactivity normally present in the area. PNPP has continued to monitor the environment during plant operation by sampling precipitation, air, milk, produce, animal feed, soil, vegetation, water, fish and shoreline sediments, as well as measuring radiation directly.

Over 1200 radiological environmental samples were collected in 1992. The results of the REMP indicate that radioactive releases have been well controlled. They also indicate that PNPP complies with all applicable federal regulations. Results are divided into four sections: atmospheric monitoring, terrestrial monitoring, aquatic monitoring and direct radiation monitoring.

- Samples of air and precipitation are collected to monitor the atmosphere. The 1992 results are similar to those observed in preoperational and previous operational programs. Only normal background environmental radioactivity was detected.
- Terrestrial monitoring includes analysis of milk, produce, vegetation, animal feed and soil samples. The results of the sample analyses indicate concentrations of radioactivity similar to previous years, and that no build-up of radioactivity attributable to the operation of PNPP has occurred.
- Aquatic monitoring includes the collection and analysis of water, fish, and shoreline sediments. Water and fish sample results indicate normal background concentrations of radionuclides. In addition to routine environmental background monitoring, sediment samples are used to document and track very slight contamination found in a small stream to the east of the plant site.
- Direct radiation measurements averaged 16.6 mrem/91 days at indicator locations and 15.5 mrem/91 days at control locations, showing that, in 1992, radiation in the area of PNPP was similar to radiation at locations greater than 5 miles away from the Plant.

The 1992 operation of PNPP caused no significant change in the quality of the environment. All radioactivity released in the plant's effluents was well below the applicable federal regulatory limits. The estimated radiation dose to the general public due to the operation of PNPP in 1991 was also well below the applicable federal regulatory limits.

LAND USE CENSUS

In order to estimate radiation dose attributable to the operation of PNPP, the pathways through which public exposure can occur must be known. To identify these exposure pathways, an Annual Land Use Census is performed as part of the REMP. During the census, PNPP personnel travel every public road within a five mile radius of the plant to identify the radiological exposure pathways.

CLAM/MUSSEL MONITORING

Clam and mussel shells can clog plant piping and components that use raw water. For this reason, sampling for these benthic macroinvertibrates has been conducted in Lake Erie in the vicinity of PNPP since 1971, specifically for *Corbicula* (Asiatic clams) since 1981, and for *Dreissena* (zebra mussels) since 1989.

Since no *Corbicula* have ever been found at PNPP, routine *Corbicula* monitoring provides data to determine whether this pest species has arrived in the vicinity of PNPP. The zebra mussel program includes both monitoring and control and is directed at minimizing the mussel's impact on plant operation. This program has successfully prevented the zebra mussel from causing any operational problems at PNPP in 1992.

AERIAL REMOTE SENSING

Aerial Remote Sensing is a way of monitoring the plant area environment by examining photographs taken from an airplane. It is used to help determine the impact, if any, of the deposition of the drift from the cooling tower plume. This program has been conducted regularly since 1987; no impact has been identified to date.

HERBICIDE USE

Because the PNPP site has several special habitat areas, the use of herbicides is closely monitored. This ensures compliance with Ohio Environmental Protection Agency requirements and protects the site's natural areas. Herbicide use is restricted to specific areas and has not had a negative impact on the environment around the plant.

SPECIAL REPORTS

Significant environmental events, noncompliance with environmental regulations, and changes in plant design or operation that affect the environment are reported to regulatory agencies as they occur. These special reports are also compiled annually in this report.

INTRODUCTION

Coal, oil natural gas, and hydropower are used to run most of the nation's electric generation stations; however, each method has its drawbacks. Coal-fired power can affect the environment through mining, acid rain, and airborne discharges. Oil and natural gas are in limited supply and are therefore, costly; hydropower is limited due to the environmental impact of damming out water ways and the scarcity of suitable sites in our country.

Nuclear energy provides an alternate source of energy which is readily available. The operation of nuclear power stations has a very small impact on the environment. In fact, PNPP is surrounded by hundreds of acres of woods and meadows that are home to a wide variety of plant and animal life.

In order to more fully understand this unique source of energy, background information on the Perry site, fundamentals of radiation, reactor operation, and effluent control is provided in the next two chapters.

PHYSICAL AND ECOLOGICAL FEATURES OF THE SITE

The Perry Nuclear Power Plant is located in North Perry Village of Lake County, Ohio. It is on the south shore of Lake Erie. The site is located north of Ohio Route 20, approximately 35 miles northeast of Cleveland, Ohio.

The site occupies approximately 1100 acres and is relatively flat. The land has a very gentle slope toward Lake Erie, and is crossed by two streams that drain into the lake. About 45% of the site area is covered by woodland. The remainder is grasslands and land that has been used for farms and nurseries before plant construction. This variety of habitats provides food and shelter for a variety of amphibians, reptiles, birds and mammals. Deer, beaver and fox are some of the common woodland mammals. Avian species include red tailed hawks, kingfishers, great blue heron, and a variety of songbirds and seagulls. The spotted turtle (*clemmys guttata*), which is a State listed Species of Special Concern, has an established breeding population on site.

Aside from woodland, most of the land around the site is used for agriculture and pasture. Favorable conditions along Lake Erie have encouraged the growth of a highly productive nursery industry. The major residential areas are the villages of Perry, North Perry, and Madison.

PNPP is a boiling water reactor with the capacity to generate 1205 Megawatts electric. The main circulating water system uses a natural draft cooling tower to remove heat from cooling water. In addition, up to 90,000 gallons of water are withdrawn from Lake Erie each minute to provide plant service water as well as make up to the circulating water system. The plant discharge is permitted by the Ohio Environmental Protection Agency as an authorized National Pollutant Discharge Elimination System discharge point.

NUCLEAR POWER GENERATION

There are several sources of steam used by power plants to generate electricity, including the burning of fossil fuels such as coal, oil, or natural gas; the earth's natural steam, called geothermal energy; and steam produced inside a nuclear reactor from the heat released when atoms of uranium are split, or fissioned. Beside steam, water power (hydropower) and wind power can be used to turn turbines to produce electricity.

Electricity is produced in a nuclear power station in essentially the same way as in a fossil-fueled station. Heat changes water to steam that turns a turbine. In a fossil-fueled station, the fuel is burned in a furnace. Inside the boiler, water is turned into steam. In a nuclear station, the furnace is replaced by a reactor containing a core of nuclear fuel, primarily uranium. Heat is produced when the atoms of uranium are fissioned inside the reactor.

What is Fission?

A special attractive force called the binding force holds the protons and neutrons together in the nucleus of the atom. The strength of this binding force varies from atom to atom. If it is weak enough, the nucleus can be split when it is bombarded by a free neutron. This causes the entire atom to split, producing small atoms, more free neutrons, and heat (Figure 1). In a nuclear reactor, a chain reaction of fission events provides the heat necessary to boil the water to produce steam.

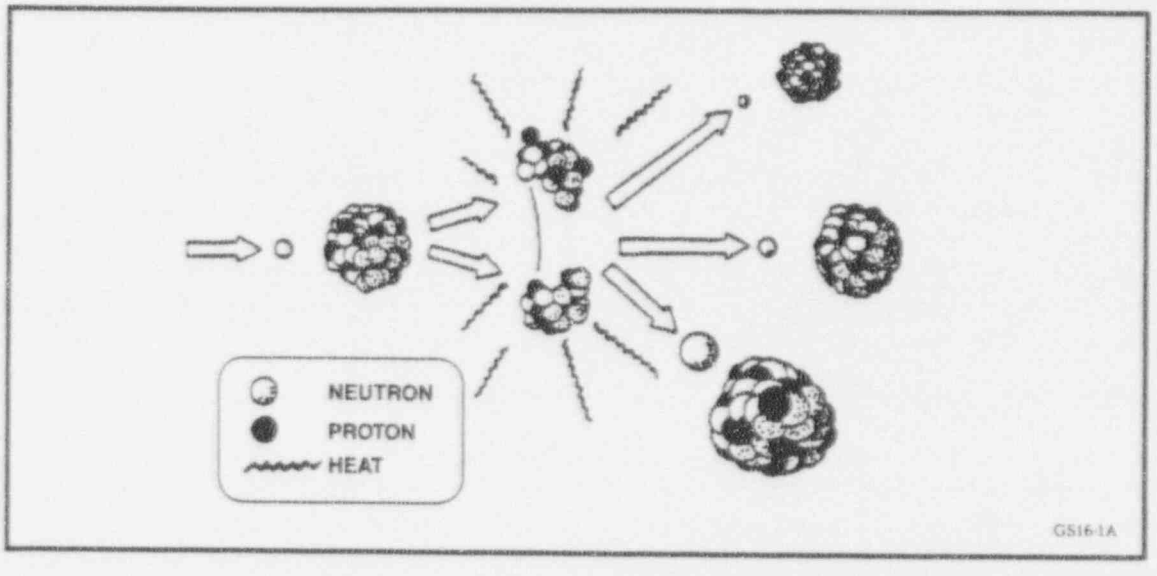


Figure 1: When a heavy atom, such as Uranium-235 is fissioned, heat, free neutrons, and fission fragments result. The free neutrons can then strike neighboring atoms causing them to fission also. In the proper environment, this process can continue indefinitely in a chain reaction.

Nuclear Fuel

The fissioning of one uranium atom releases approximately 50 million times more energy than the combustion of a single carbon atom common to all fossil fuels. Since a single small reactor fuel pellet contains trillions of atoms, each pellet can release an extremely large amount of energy. The amount of electricity that can be generated from three small fuel pellets, each about 5/8 inch long and 3/8 inch in diameter, would require about 2.7 tons of coal or 9 barrels of oil to generate.

Nuclear fission occurs spontaneously in nature, but these natural occurrences cannot normally sustain themselves because the freed neutrons are absorbed by non-fissionable atoms. In contrast, a nuclear reactor minimizes neutron losses, thus sustaining the fission process by several means:

- o using fuel that is free of impurities that might absorb the freed neutrons;
- o increasing the concentration of the rarer fissionable isotope of uranium (U-235) relative to the concentration of U-238, a more common isotope that does not fission easily; and
- o increasing the probability of fission by slowing down neutrons by using a "moderator" such as water.

Natural uranium contains less than one percent U-235 when it is mined. Before it can be economically used in a nuclear reactor, it is enriched to approximately three percent U-235 relative to U-238. In contrast, the nuclear material used in nuclear weapons has been enriched to over 97 percent. Because of the low levels of U-235 in nuclear fuel, a nuclear power station cannot explode like a bomb. Nor could the fuel, as it exists at a power station, be used to make a bomb.

After the uranium is separated from the earth and rock in the ore, it is milled. After milling the ore to a granular form and dissolving out the uranium with acid, the uranium is converted to uranium hexafluoride (UF_6), a chemical form of uranium that exists as a gas at temperatures slightly above room temperature. The uranium is then highly purified and shipped to a facility where it is enriched by gaseous diffusion to increase the concentration of U-235 in the fuel. The enriched gaseous UF_6 is converted into powered uranium dioxide (UO2), a highly stable ceramic material. The UO_2 powder is put under high pressure to form fuel pellets. Approximately five pounds of these pellets are placed into a long metal tube made of zirconium alloy. The tubes constitute the fuel cladding. The fuel cladding is highly resistant to heat, radiation and corrosion. When the tubes are filled with fuel pellets, they are called fuel rods.

Boiling Water Reactor System

Sixty-two fuel rods comprise a single fuel bundle. The reactor core at PNPP contains 748 of these fuel bundles, each approximately 13 feet tall. The reactor vessel weighs 805 tons, is 20 feet in diameter and 70 feet high, and has 6-inch thick steel walls.

Perry uses a Boiling Water Reactor (BWR) to generate electricity (see Figure 2). The heat released by nuclear fission in the CORE causes water to boil. The steam passes through the MAIN STEAM pipes to the TURBINE-GENERATOR. the turbine's blades spin due to the high temperature steam striking the blades. The turbine spins a magnetic field inside the generator, causing electricity to be produced.

Low-temperature steam exhausts from the turbine, into the CONDENSER where it is cooled back into water. This water is then pumped back to the reactor and reused.

SAFETY BARRIERS

The smaller atoms formed when U-235 atoms are fissioned are called fission products. They consist of many different elements, most of which are radioactive. There are three physical barriers at PNPP that prevent the release of these fission products from the plant. The first barrier is the fuel cladding itself. The second is the wall of the reactor vessel, and the third is the steel containment vessel. The shield building, with steel reinforced concrete walls three feet thick, protects the containment vessel from environmental factors like tornadoes and hurricanes.

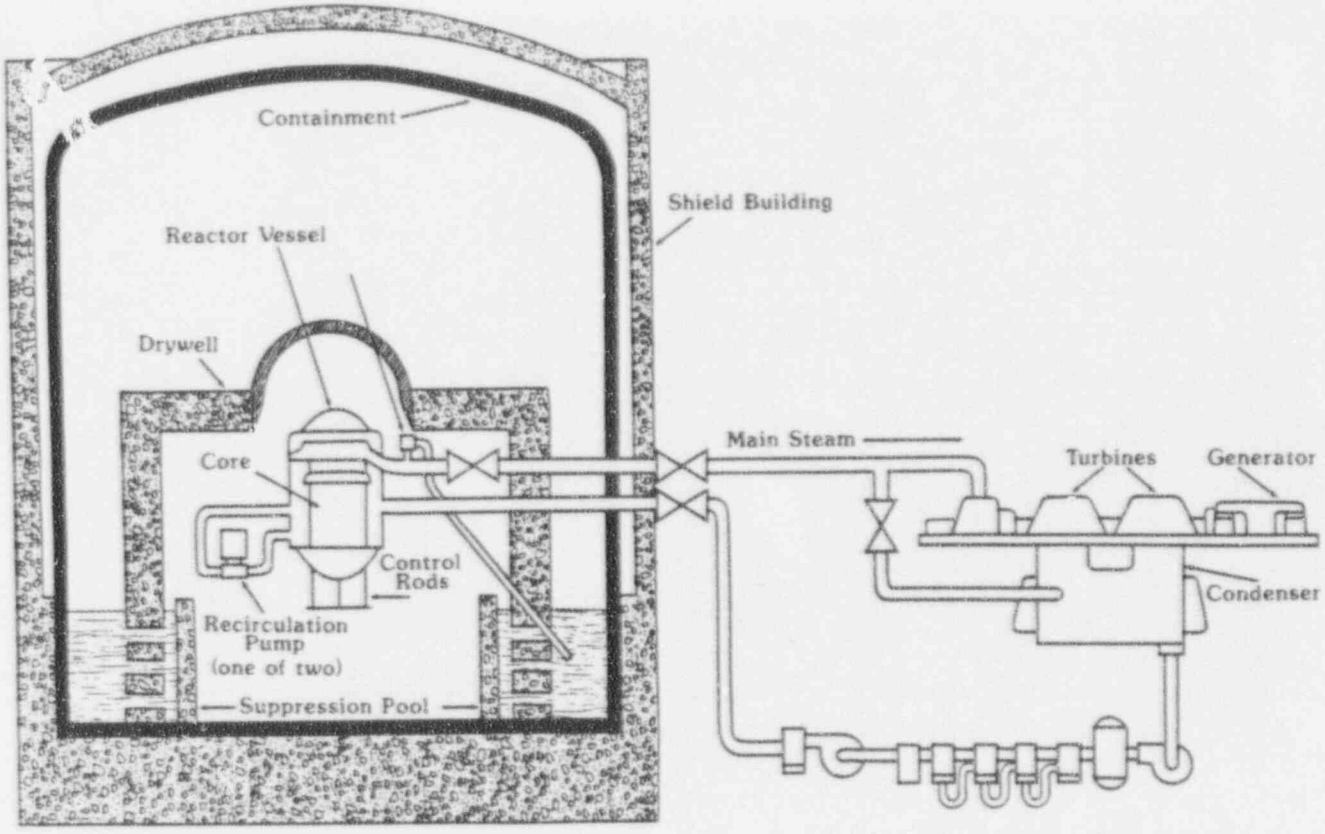


Figure 2: Boiling Water Reactor System

The fission products are retained in the zirconium-clad fuel rods unless a cladding defect (a pinhole, for example) develops. In an emergency situation, overheating the cladding can cause defects. To prevent overheating (and the release of fission products from the fuel), PNPP is equipped with cooling systems designed to respond during emergencies (see Figure 3).

The purpose of the emergency cooling systems is to prevent the accidental overheating of the uranium FUEL inside the REACTOR VESSEL. These systems do not operate when the plant is making electricity. They operate only if the Boiling Water Reactor system fails and routine cooling systems malfunction. Perry has several emergency cooling systems to insure that this important safety function is duplicated.

Perry has five automatic pumping systems that will supply emergency cooling water to the reactor fuel. HIGH PRESSURE CORE SPRAY (HPCS) uses a single pump, LOW PRESSURE CORE SPRAY (LPCS) uses a single pump, and LOW PRESSURE COOLANT INJECTION (LPCI) utilizes three pumps. Each pump can move 6000 gallons of water per minute.

There are two main reservoirs of pure water for the 5 pumps. The CONDENSATE STORAGE TANK holds more than 150,000 gallons for HPCS, LPCS, and LPCI. The SUPPRESSION POOL is a large donut shaped pool in the containment building which contains approximately one million gallons of water, also used for HPCS, LPCS, and LPCI.

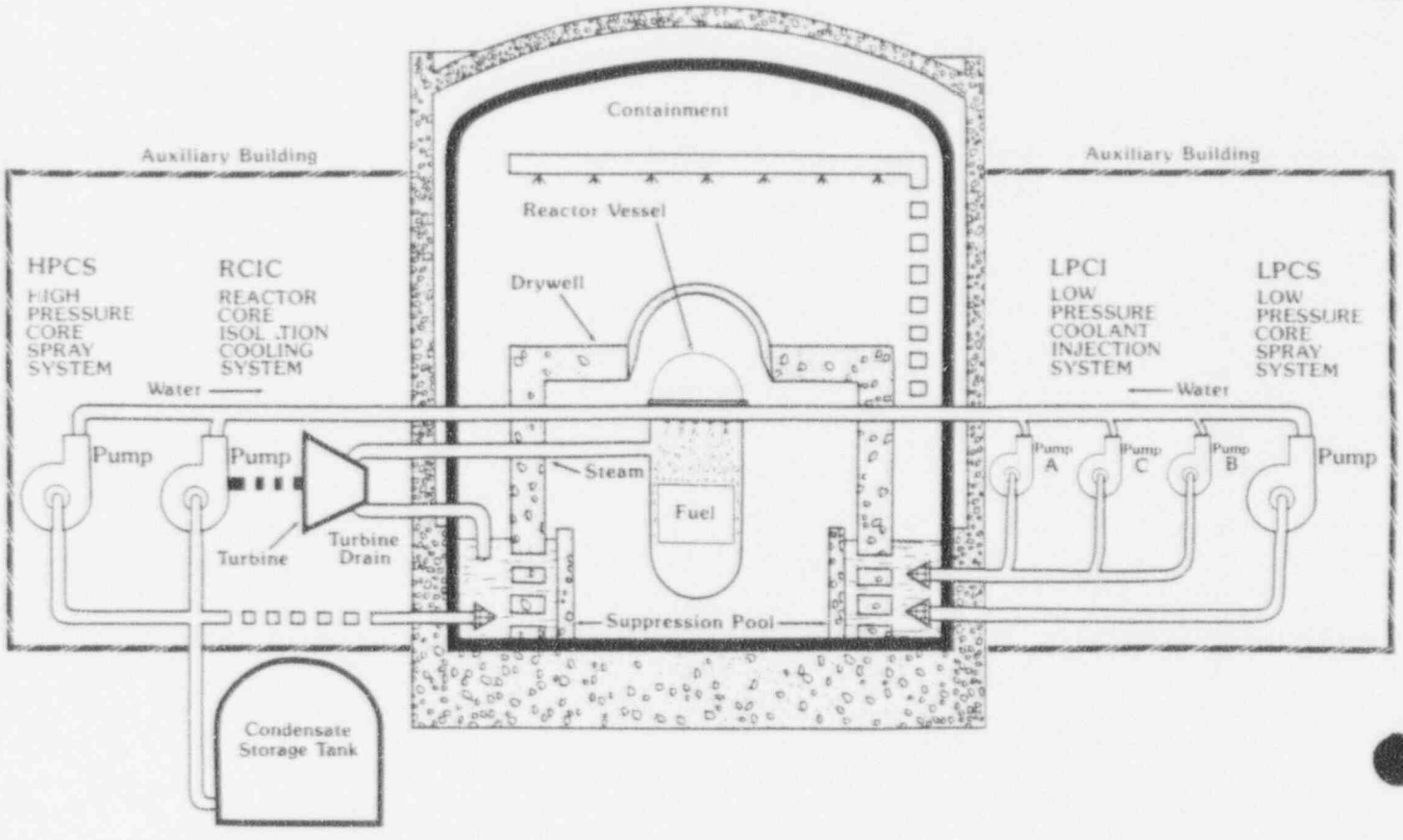


Figure 3: Emergency Cooling Systems

The REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) may be used by the reactor operator if the automatic systems fail. RCIC starts automatically by admitting STEAM to the RCIC TURBINE. The TURBINE runs the RCIC pump which moves water into the reactor at 850 gallons per minute.

If all cooling systems fail, the containment building itself can be flooded with water from Lake Erie.

BENEFITS OF NUCLEAR POWER

Nuclear power plays an important part in meeting today's electricity needs, and will continue to serve as an important source of electric energy well into the future. In 1980, nuclear power accounted for only 11% of the electricity produced in the United States. By the end of 1991, however, this number had grown to 25%. At the same time, dependence on oil as an energy source has been cut almost in half. By decreasing the nation's dependence on oil, dependence on foreign oil supplies also decreases, thereby ensuring the nation can continue to be self-sufficient in meeting the energy needs of its private and business sectors.

Nuclear power offers several advantages over alternative sources of electric energy:

- o nuclear power stations in the United States have an excellent safety record dating back to 1957 when the first commercial nuclear power station began operating,
- o uranium, the fuel for nuclear power stations, is a relatively inexpensive fuel that is readily available in the United States, and
- o nuclear power is the cleanest energy source for power stations that use steam to produce electricity.

FUNDAMENTALS OF RADIATION

THE ATOM

The world is made up of atoms. Atoms consist of two basic parts: the core, or nucleus, and the electrons orbiting the nucleus. The nucleus is made up of protons, which are positively charged, and neutrons, which have no charge. The electrons circling the nucleus have a negative charge. The electrical charge of an atom is very important. Since ordinary matter has a natural tendency to be stable, the atoms that make up matter must also be electrically neutral. To keep the atom electrically neutral, the number of electrons in an atom must equal the number of protons.

The number of protons in the nucleus is referred to as the atomic number. The atomic number is the identifier of the atom. If it changes, the number of electrons and the chemical properties of the atom change. For example, for an atom to be hydrogen, it must have one proton and one electron. If a hydrogen atom were to gain a proton, it would no longer be hydrogen; it would be helium, which has two protons and two electrons. Uranium must have 92 protons. Since protons are positively charged, the uranium atom must also have 92 electrons, which are negatively charged, for it to be electrically neutral.

Protons and neutrons are similar in size, and both of them are considerably larger than electrons (about 1,800 times heavier). Therefore the weight (mass) of the atom is principally determined by the nucleus. The sum of the protons and neutrons in the atom is called the mass number or atomic weight.

Unlike protons, the number of neutrons a specific atom contains can vary since they have no charge and don't need to be balanced by electrons. Therefore the mass number can vary. For example, a hydrogen atom always has one proton, but it can have either zero, one, or two neutrons. The different hydrogen atoms are called isotopes of hydrogen. Isotopes are labeled with their mass number. A hydrogen atom without a neutron is referred to as hydrogen-1 where 1 is the mass number. The hydrogen isotope with one neutron is referred to as hydrogen-2 (deuterium), and the isotope with two neutrons is referred to as hydrogen-3 (tritium). In nature, 99.985% is H-1, 0.015% is H-2, and a small trace is H-3.

RADIATION AND RADIOACTIVITY

Radioactive decay is a process in which a nucleus of an unstable atom becomes more stable by spontaneously emitting energy, or disintegrating. Radiation refers to the energy that is released in the form of particles or waves when the disintegration or decay of the nucleus occurs. This section includes a discussion on the three main forms of radiation produced by radioactive decay: alpha particles, beta particles, and gamma rays.

Alpha Particles

Alpha particles consist of two protons and two neutrons and have a positive charge. Because of their charge and large size, alpha particles do not travel very far when released (one to eight centimeters in air). They are unable to penetrate any solid material, such as paper or skin, to any significant depth. However, if alpha particles are released inside the body, they can damage the soft internal tissues because they deposit all their energy in a very small volume. Radioactive uranium releases alpha particles, so if uranium dust is inhaled or swallowed, biological effects may occur.

Beta Particles

Beta particles are essentially electrons and carry a negative electrical charge. They are much smaller than alpha particles and travel at nearly the speed of light, thus they can travel for longer distances in air and penetrate solid materials more readily than alpha particles. Beta particles have the same effect as alpha particles, but since they are smaller, faster, and have less charge, they cause less concentrated damage when interacting with tissue. External beta radiation primarily affects the skin. Beta particles can be shielded by paper, plastic, or thin metals.

Gamma Rays

Gamma rays are bundles of electromagnetic energy which behave as though they were particles. These pseudo particles can be thought of as a bundle of energy called photons. They are similar to visible light, but of a much higher energy. For example, X-rays can damage the body. Gamma rays are generally more energetic than X-rays. They can travel long distances in air and can even penetrate solid materials such as concrete or steel. Gammas rays are often released during radioactive decay along with alpha and beta particles. Potassium-40 is an example of a naturally-occurring radionuclide found in all humans that decays by emitting a relatively high-energy gamma ray.

Radioactive Decay

As mentioned in the beginning of this section, radioactive decay is a process in which a nucleus of an unstable atom spontaneously decays and releases energy. Some radioactive elements found in nature decay to other elements which are also radioactive, and will, in turn, decay. This is called a radioactive decay chain. A common chain begins with uranium-238 and end with lead-206 (this isotope of lead is stable, which means it does not decay). Each of the various radioactive atoms created during the decay sequence has its own natural rate of decay. The uranium decay sequence is an example common in nature and here at the PNPP.

It takes a different amount of time for each element to decay to the next element in the chain. The amount of time it takes for a radioactive substance to lose half of its radioactivity, or for half of it to become the next element in the chain, is its half-life. All decay chains found in nature begin with an isotope with an extremely long half-life. It is assumed that these atoms were formed at the same time as all the other atoms on earth and are still present because their half-lives are comparable to the age of the earth.

Interaction with Matter

When radiation interacts with other materials, it affects the atoms of those materials principally by knocking the negatively charged electrons out of orbit. This causes the atom to lose its electrical neutrality and become positively charged. An atom that is charged, either positively or negatively, is called an ion. Anything that creates an ion is said to be ionizing. Ions are chemically reactive.

UNITS OF MEASUREMENT

To measure the effect of radiation, scientists have developed ways to measure levels and intensity of radiation. Some of these measurement units require some explanation.

Activity

Activity is the number of atoms in a material that decay per unit of time. Each time an atom decays, radiation is emitted. The curie (Ci) is the unit used to describe the activity of a

material and indicates the rate at which the atoms are decaying. One curie of activity indicates the decay of 37 billion atoms per second.

Smaller units of the curie are often used in this report. Two common units are the microcurie (μCi), one millionth of a curie, and the picocurie (pCi), one trillionth of a curie. The mass, or weight, of radioactive material which would result in one curie of activity depends on the disintegration rate. For example, one gram of radium-226 is one curie of activity, but it would require about 1.5 million grams of natural uranium to equal one curie since radium-226 is more radioactive than natural uranium.

Dose

Biological damage due to alpha, beta, gamma and neutron radiation may result from the ionization caused by these radiations. Some types of radiation, especially alpha particles which cause dense local ionization, can result in up to 20 times the amount of biological damage for the same energy imparted as do gamma or X rays. Therefore, a quality factor must be applied to account for the different ionizing capabilities of various types of ionizing radiation. When the quality factor is multiplied by the absorbed dose, the result is the dose equivalent, which is an estimate of the possible biological damage resulting from exposure to any type of ionizing radiation. The dose equivalent is measured in rem (roentgen equivalent man).

In terms of environmental radiation, the rem is a large unit. Therefore, a smaller unit, the millirem (mrem) is often used. One millirem is equal to 1/1000 of a rem.

EXPOSURE TO BACKGROUND RADIATION

We are constantly exposed to what is called background radiation. This includes the decay of radioactive elements in the earth's crust, a steady stream of high-energy particles from space called cosmic radiation, naturally-occurring radioactive isotopes in the human body like potassium-40, medical procedures, man-made phosphate fertilizers (phosphates and uranium are often found together in nature), and even household items like televisions. In the United States, a person's average annual exposure from background radiation is 360 mrem.

As the Background Radiation Chart (Figure 4) shows, radon is the largest contributor to background radiation. At an average of 200 mrem per year, naturally-occurring radon accounts for more than half of the background dose in the United States. Radon is a colorless, odorless, radioactive gas that results from the decay of radium-226. Radon atoms are produced in soil and migrate through air spaces to the atmosphere. Radon occurs indoors as a result of radon in the soil or rock under the building, or radon in building materials, water supplies, natural gas, or outdoor air. It may enter buildings through walls, floors, vents and other openings, as well as through cracked foundations and slabs, and openings for pipes and sumps.

Further information on radon can be obtained by contacting the state radon program office:

Radiological Health Program
Ohio Department of Health
1224 Kinnear Road, Suite 120
Columbus, Ohio 43212

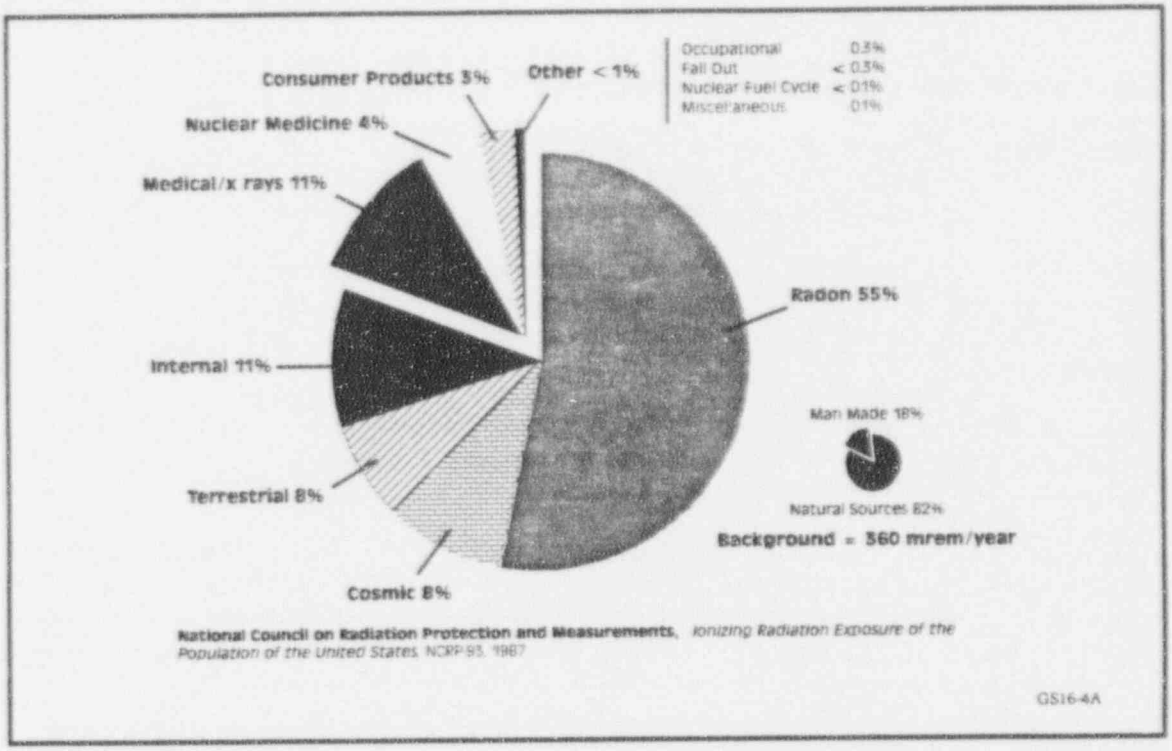


Figure 4: Background Radiation Chart

EFFECTS OF RADIATION

The effects of radiation on humans are divided into two categories, somatic and genetic. Somatic effects are those that develop in the directly exposed individual, including a developing fetus. Genetic effects are those that may be observed in the offspring of the exposed person.

Because we are constantly exposed to both natural and man-made sources of radiation, and because the body has the capacity to repair damage from low levels of radiation, it is extremely difficult to determine the effects from low-level radiation. This section explains why this is true and how somatic and genetic effects may occur.

Somatic Effects

A dose of 1,000,000 mrem of radiation delivered instantaneously will probably kill a human. A dose of 500,000 to 1,000,000 mrem causes severe sickness, but there is some chance for recovery. A dose of 200,000 to 500,000 mrem causes sickness with a good chance for recovery if proper medical attention is received. A dose of 100,000 to 200,000 mrem could cause temporary illness, but will not be lethal. Clinical symptoms of radiation exposure generally won't be seen in individuals who have been exposed to less than 100,000 mrem. Most scientists believe that there are no directly observable short-term radiation effects on human beings exposed to less than 10,000 mrem.

Continuous exposure to lower levels of radiation can produce gradual somatic changes over extended time. For example, someone may develop cancer from man-made radiation, background radiation, or some other source not related to radiation. Because all illnesses caused by low-level radiation can also be caused by other factors, it is presently impossible to determine individual health effects of low-level radiation. However, there are a few groups of

people under medical observation because they have been exposed to higher levels of radiation. These include the survivors of Hiroshima and Nagasaki, uranium miners in the United States and eastern Europe, a group of workers who used paint containing radium, early users of X-ray machines, some Department of Energy employees working in defense facilities, and people suffering from illness where radioactive material was used for treatment.

Even after studying the health effects of radiation on these groups, scientists are still not able to determine with certainty how much additional cancer may have been caused by low-level radiation. This is because the small increases are difficult to differentiate from the natural incidence.

Those exposed to high levels of radiation are at greater immediate risk. We know this because at these higher radiation doses, we see that the number of radiation effects increases as the level of radiation dose increases.

This relationship is not so obvious when dealing with low-level radiation. Scientists have not been able to demonstrate that there is an increase in the number of radiation effects when there is an increase in low-level radiation. In other words, scientific evidence has not confirmed a certain radiation level, or threshold, below which humans can be exposed without causing any present or future medical problems to the exposed individual.

Estimates on the value of the threshold level of radiation, if it exists, vary significantly. As mentioned earlier, some scientists believe it could be as high as 10 rem. Others insist there is no threshold level below which radiation exposure is safe. They feel there is always a direct relation between the amount of radiation to which people are exposed and the number of related radiation effects.

Certain somatic effects have been documented only at high radiation levels. These include cataracts, lowered fertility rate, and a reduction of the number of white cells in the blood. Therefore, the most likely somatic effect of low-level radiation is believed to be some increased risk of cancer.

Genetic Effects

A single ionizing event has the potential to cause a genetic effect. To understand why this is true, it is helpful to look at the structure of a human cell. Human cells normally contain 46 chromosomes; 23 transmitted from the mother, and 23 from the father. These 46 chromosomes contain about 10,000 genes which are passed on to the next generation and which determine many physical characteristics of the individual.

Radiation can cause changes or mutations in these genes. Chromosome fibers can break and rearrange causing interference with the normal cell division of chromosomes, affecting the number and structure. A cell can rejoin the ends of a broken chromosome but, if there are two breaks close enough together in space and time, the broken ends from one break may join incorrectly with those from another. This can cause translocations, inversions, rings, and other types of structural rearrangement. Radiation is not the only mechanism by which such changes can occur. Spontaneous mutations and nonradiation-induced mutations have also been observed.

The mutated genes from one parent can then be passed on to offspring. They typically have no effect on the offspring as long as the genes from the other parent are not mutated in the same way. However, the genes stay in the body of the offspring and are passed on to

following generations. If they meet similar genes when reproducing, they could then become present in the characteristics of the offspring.

There is no evidence that there are radiation levels below which chromosomes are not affected, but the number of occurrences drops dramatically at lower levels of radiation.

HEALTH RISKS

Risks can be defined, in general, as the probability or chance of injury, illness, or death resulting from some activity. However, the perception of risk is affected by how one views the probability, severity, and the benefits gained from accepting the risk. Perhaps the most useful unit for comparing health risks is the average number of days of life expectancy lost each time one performs an activity that includes a health risk. Estimates are calculated by looking at a large number of people, recording their ages at death from apparent causes, and estimating the number of days of life lost. The total number of days of life lost is then averaged over the total group observed. Several studies have compared the projected lower life expectancy resulting from exposure to radiation with other health risks. Some representative numbers are presented in Table 1 (information from B. L. Cohen, Health Physics, Vol. 36, 1976 and Vol. 61, 1991).

In decision making, one should consider the risk in each action. the risk of crossing a street is based on pedestrian fatalities and the assumption that the average person crosses five streets per day. It may be noted that smoking a cigarette has the risk equal to receiving about 5 mrem of radiation, and an overweight person eating a piece of pie a-la-mode runs a risk equal to that of receiving about 25 mrem.

Health Risk	Average Days Lost
Smoking 20 cigarettes/day	*6.6 years*
Overweight (by 20%)	*803*
All accidents combined	*366*
Auto accidents	*207*
Alcohol consumption (U. S. average)	*365*
Home Accidents	*74*
Natural background radiation (including radon)	*38*
Drowning	*24*
Medical diagnostic x-rays (U. S. average)	*6.2*
All catastrophes (earthquake, e.g.)	*4.0*
1 rem (1,000 millirem)	*1.5*

Individual Action	Minutes Life Expectancy Lost
Smoking a cigarette	*10*
Calorie-rich dessert	*50*
Non-diet soft drink	*15*
Diet soft drink (containing saccharin)	*0.15*
Crossing a street	*0.4*
Extra driving	*0.4/mile*
Not fastening seal belt	*0.1/mile*
1 mrem of radiation	*2.1*

Table 1: Health risks

EXPOSURE PATHWAYS

Radiological exposure pathways define the methods by which people may become exposed to radioactivity. The major pathways of concern are those which could cause the highest calculated radiation dose. These pathways are determined from the type and amount of radioactivity released, the environmental transport mechanism, and the use of the environment. The environmental transport mechanism includes consideration of physical factors, such as the hydrological (water) and meteorological (weather) characteristics of the area. This provides information on the water flow, wind speed and wind direction at the time of a gaseous or liquid release. This information is used to evaluate how radionuclides will be distributed in the area. The most important factor in evaluating the exposure pathways is the use of the environment. Many factors are considered such as dietary intake, recreation and the location of homes and farms.

The external and internal exposure pathways considered are shown in Figures 5 and 6. The release of radioactivity in gaseous effluents involves pathways such as direct radiation, deposition on plants, deposition on soil, inhalation and ingestion by animals destined for human consumption, and inhalation by humans. The release of radioactivity in liquid effluents involves pathways such as drinking water, fish consumption, and direct exposure from the lake, both shoreline and immersion in the lake (swimming).

DOSE ASSESSMENT

Dose is the energy deposited by radiation in an exposed individual. Whole body radiation exposure involves the exposure of all organs. Most background exposures are of this form. Both radioactive and non-radioactive elements can enter the body through inhalation (breathing) or ingestion (eating, drinking). When they do, they are usually not distributed evenly. for example, iodine selectively concentrates in the thyroid gland, while cesium collects in muscle and liver tissue, and strontium collects in bone tissue.

The total dose to organs from a given radionuclide depends on the radioactivity present in the organ and the amount of time that the radionuclide remains in the organ. Some radionuclides remain for very short times due to their rapid radioactive decay and/or elimination rate from the body, while other radionuclides may remain in our bodies for longer periods of time.

The dose to people in the area surrounding PNPP is calculated using factors such as effluent measurements, weather conditions, the locations of important pathways (milk, vegetable gardens, and residences), usage factors (inhalation, food consumption), and dilution factors. Some of these factors are determined on an annual basis by making a thorough evaluation of land around the PNPP. This evaluation is called the Land Use Census, and is discussed in a later chapter.

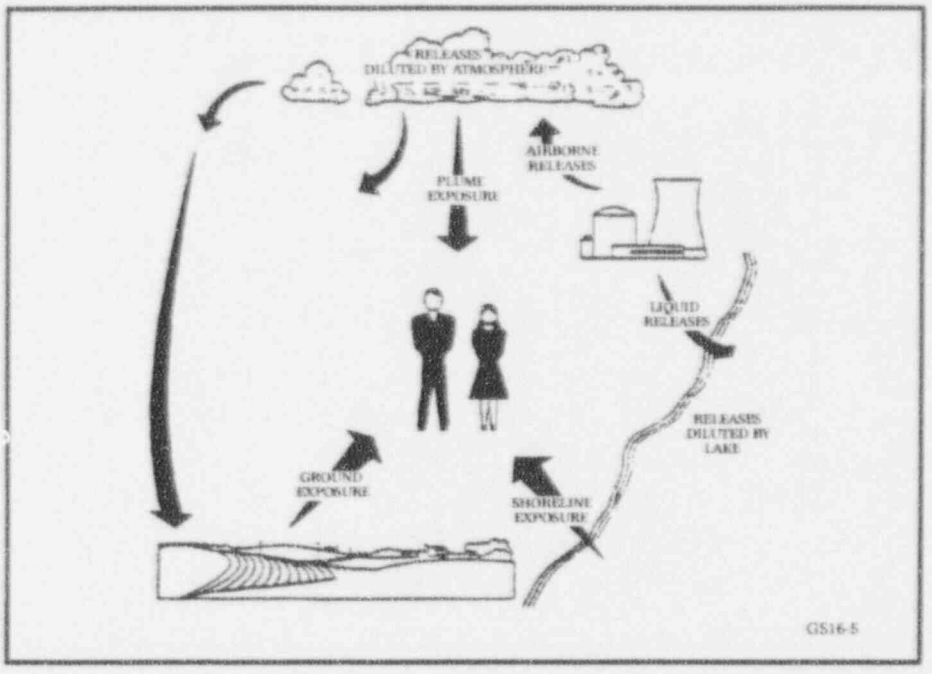


Figure 5: The external exposure pathways, shown here, are monitored thoroughly by the Radiological Environmental Monitoring Program (REMP), and are considered when calculating doses to the public.

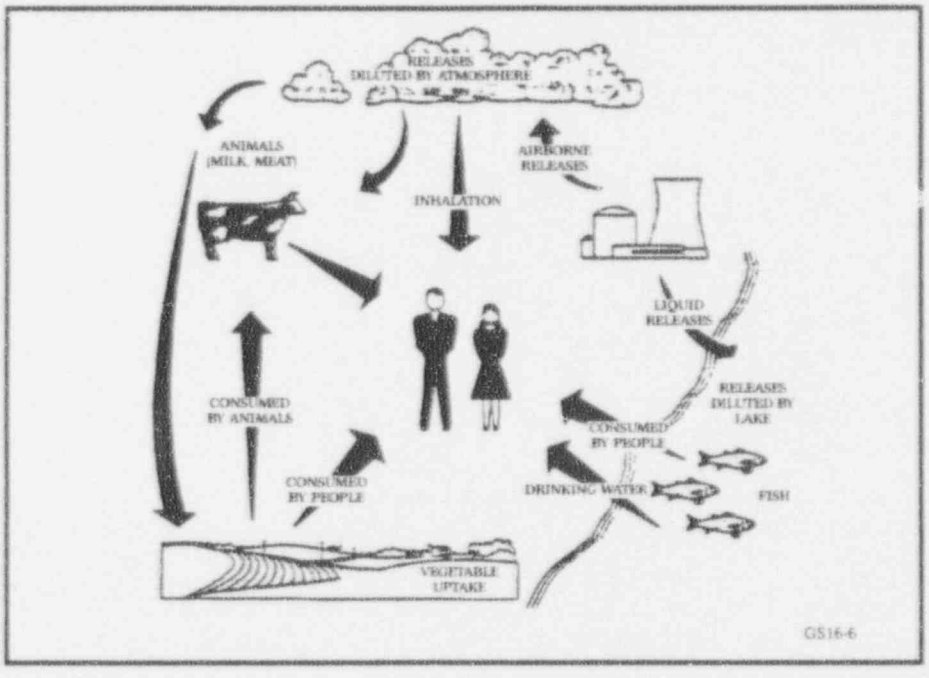


Figure 6: Internal exposure pathways include the methods by which radioactivity could reach people around PNPP via the foods they eat, the milk they drink, and the air they breathe.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

INTRODUCTION

The radiological environmental monitoring program (REMP) was established at PNPP for several reasons. First, it verifies the adequacy of plant design and operation to control radioactive materials and limit effluent releases; second it assesses the radiological impact, if any, that the plant has on the surrounding environment; and third it ensures compliance with regulatory guidelines.

A wide variety of samples are collected as part of the PNPP REMP. The selection of sample types is based on established pathways for the transfer of radionuclides through the environment to humans. The selection of sampling locations is based on sample availability, local meteorology, population characteristics, and land use. Sampling frequencies are determined by the respective half-lives of the radionuclides of interest, and their behavior in both the biological and physical environment.

The REMP began in 1981 with 24 direct radiation monitoring locations, four sediment locations, and two fish sampling locations. In 1982, collections of air, water, milk, food products, and feed/silage were started. The program was augmented in 1985 to include precipitation and soil. Although these last two media are not required by the NRC, they were incorporated into the program to expand its scope and provide additional data useful for analyzing environmental impacts of plant operation.

SAMPLING METHODS AND PROCEDURES

To ensure that the REMP data is meaningful and useful, detailed sampling methods and procedures are followed. This guarantees that samples are collected in the same manner and from the same locations each time.

All samples are packaged on site, then shipped to a vendor radiological laboratory for analyses. The vendor laboratory analyzes the samples and reports results to both the PNPP Environmental Monitoring Element and the Lake County General Health District.

Sampling Locations

REMP samples are collected at numerous locations, both onsite and up to 22 miles away from the plant. Sampling locations may be divided into two general categories: indicator and control. Indicator locations are those which would be most likely to display effects caused by plant operation. Control locations are those which should be unaffected by plant operation. Typically, they are a greater distance from the plant, in the least prevalent wind direction. Data obtained from the indicator locations are compared with data from the control locations. This comparison allows naturally occurring background radiation to be taken into account when evaluating any radiological impact PNPP has on the environment. Data from all locations are also compared with preoperational data to determine whether significant variations or trends exist. Figures 7, 8 and 9 identify the PNPP REMP sampling locations. Table 2 provides a more detailed listing of sampling locations and the types of samples collected at each.

The area around the plant is divided into sixteen radial sectors that come together at the center of the two reactor buildings. Samples are collected from each sector except those that radiate over Lake Erie without intersecting any area over land.

Table 2: REMP Sampling Locations

#	Description	Distance (Miles)	Direction	Media(1)
1	Redbird	3.4	ENE	APT, AI, TLD
2	Site boundary tree line	0.7	E	TLD
3	Meteorological tower	1.0	SE	APT, AI, TLD, PR, SO
4	Site boundary Parmly Rd	0.7	S	APT, AI, TLD, SO, PR
5	Quincy Substation	0.6	SW	APT, AI, TLD
6	Concord Service Center (Control)	11.0	SSW	APT, AI, TLD, PR, SO
7	Site boundary Lockwood Rd	0.6	NE	TLD, PR, SO, APT, AI, VG
8	Site boundary tree line	0.8	E	TLD
9	Site boundary transmission tower	0.7	ESE	TLD, SO
10	Auxiliary gate off Parmly Rd	0.8	SSE	TLD
11	SW corner Center and Parmly Rd	0.6	SSW	TLD
12	Site boundary transmission tower	0.6	WSW	TLD, PR, SO
13	Madison-on-the-Lake	4.7	ENE	TLD
14	Hubbard Rd	4.9	E	TLD
15	Madison Substation (Eagle St)	5.1	ESE	TLD
16	Dayton Rd north of I-90	5.0	SE	TLD
17	Chadwick Rd south of I-90	5.2	SSE	TLD
18	Blair Rd	5.0	S	TLD
19	Lane Rd near South Ridge Rd	5.3	SSW	TLD
20	Nursery Rd at Rt 2 overpass	5.3	SW	TLD
21	Hardy Rd at Painesville Township Pk	5.1	WSW	TLD
22	Main St across from cemetery	6.9	SW	TLD
23	Corner High St and New St	7.9	WSW	TLD
24	St. Clair Ave Substation (Control)	15.1	SW	TLD
25	Offshore at PNPP Discharge	0.6	NNW	SED, FSH
26	Offshore at Redbird	4.2	ENE	SED
27	Offshore at Fairport Harbor	7.9	WSW	SED
28	CEI Ashtabula Plant Intake	22.0	ENE	WTR
29	Waites milk farm	1.3	ESE	MLK, FS

32	Offshore at Mentor (Control)	15.8	WSW	SED, FSH
34	PNPP Intake	0.7	NW	WTR
35	Site boundary	0.6	E	APT, AI, TLD, SO, PR, VG
36	Lake County Water Plant	3.9	WSW	WTR, TLD
39	Goldings Farm Stand	1.8	SSW	PD
41	Clark Rd	1.1	SW	TLD
42	Parmly Rd	0.8	S	TLD
43	Parmly Rd	1.0	SSE	TLD
44	Parmly Rd	1.0	SSE	VG
45	Clark Rd	0.9	SSW	TLD
47	Zoldak milk farm	6.5	E	MLK, FS
51	Rettger milk farm (Control)	9.6	S	MLK, FS
53	Neff Perkins Company	0.5	WSW	TLD
54	Hale Rd School	4.6	SW	TLD
55	Center Rd	2.5	S	TLD
56	Madison High School	4.0	ESE	TLD
58	2260 Antioch Rd	0.8	ENE	TLD
59	Lake shoreline at Green Rd	4.0	ENE	WTR
60	Lake shoreline at Perry Park	1.0	WSW	WTR
61	Keller milk farm	7.4	SE	MLK, FS
62	Shreve farm	1.2	ENE	PD
63	Minor stream outlet at Lake Erie	0.08	NNE	SED
64	Northwest Drain outlet at Lake Erie	0.09	NW	SED
65	Major Stream outlet at Lake Erie	0.18	W	SED
67	Sabo Farm	2.9	E	PD
69	Rhoades Farm (Control)	18.7	SSW	MLK, FS
70	H&H Farm Stand (Control)	16.2	SSW	PD
71	Mosley Farm	7.9	SE	MLK, FS
72	Sasu Farms	2.4	SW	PD
73	West Market	2.4	SW	PD
74	Wayman Farms	4.8	E	PD
75	Old Orchard	15.7	E	PD
76	Minor Stream Lower Pool	0.08	NNE	SED

(1)

AI = Air Iodine
FS = Feed/Silage
MLK = Milk
PR = Precipitation (Snow)
SO = Soil
VL = Vegetation
WW = Wastewater

APT = Air Particulate
FSH = Fish
PD = Produce
SED = Sediment
TLD = Thermoluminescent Dosimeters
WTR = Water

Atmospheric Monitoring

Air sampling is conducted to detect any increase in the concentration of airborne radionuclides that may be inhaled by humans or serve as an external radiation source. Air sampling pumps are used to draw continuous samples at a rate of approximately one cubic foot per minute, which is roughly the same rate as human respiration. The air is drawn through glass fiber filters, to collect particulates, and charcoal cartridges, to trap iodine. The samples are collected on a weekly basis, 52 weeks a year, from each of seven air sampling stations. Six of the locations are within four miles of the plant site; the seventh is used as a control location and is eleven miles from PNPP.

Precipitation provides a mechanism to sample for radionuclide deposition from the atmosphere. Precipitation in the form of rain, snow, sleet or hail provides a surface on which airborne radionuclides can be deposited. Samples are collected from six locations using passive collection containers. Containers are removed monthly or when full, strained to remove debris, and shipped to the laboratory for analysis. There are five indicator locations and one control location, which is located eleven miles from PNPP.

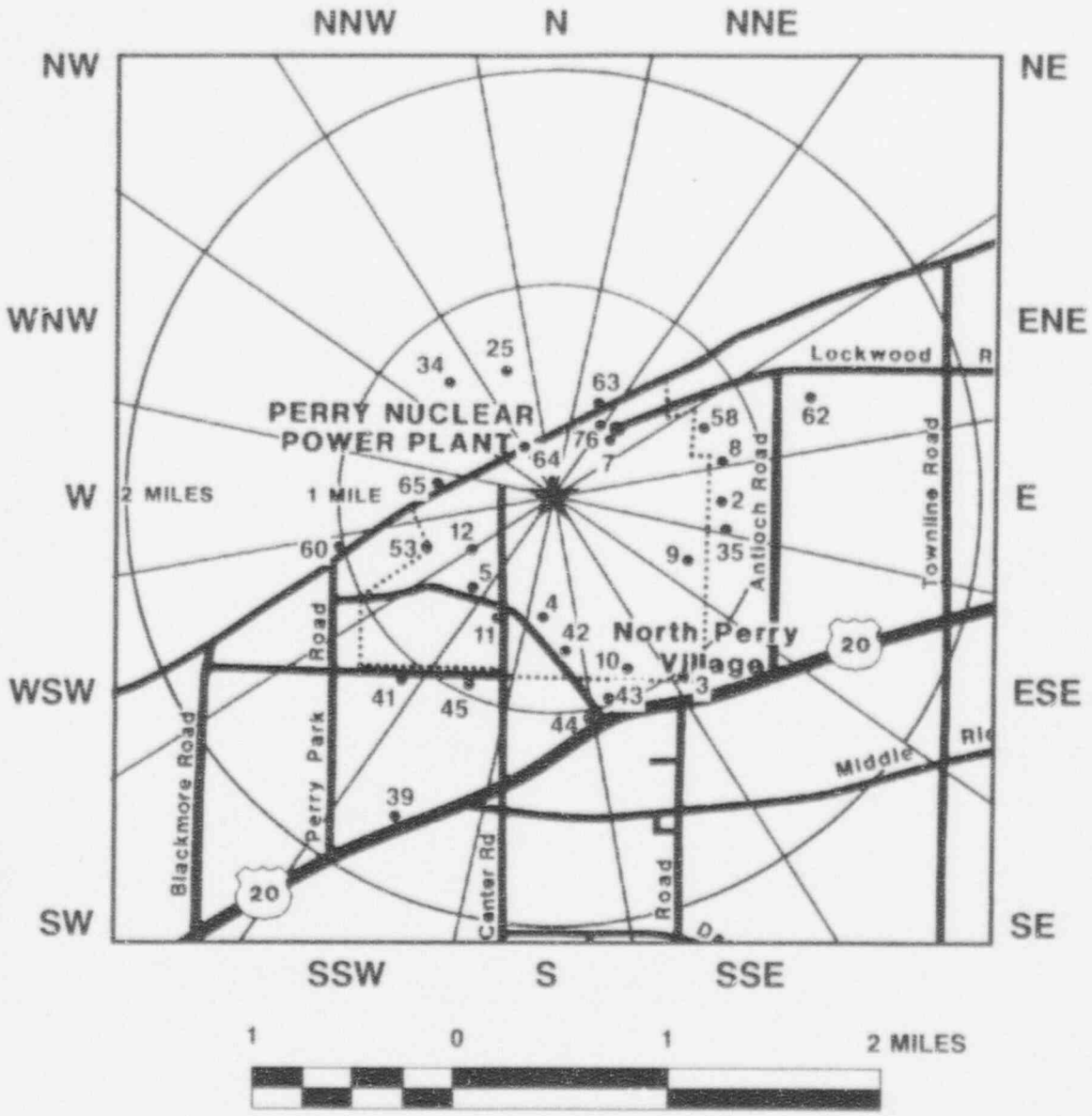
Terrestrial Monitoring

Collecting and analyzing samples of milk, food products and vegetation provides data to assess the buildup of radionuclides that may be ingested by humans. Animal feed and silage samples provide additional information on radionuclides that may be present in the food chain. The data from soil samples provides information on the deposition of radionuclides from the atmosphere.

Milk sampling is particularly important because it provides a direct basis for assessing the buildup of radionuclides in the environment that may be ingested by humans. Milk is one of the few foods consumed soon after production. The milk pathway involves the deposition of radionuclides from atmospheric releases onto forage consumed by cows or goats. The radionuclides present in the forage can become incorporated into the milk which is then consumed by humans.

Samples of milk are collected once each month from November through April, and twice each month from April through October. Sampling is increased during the summer because animals are usually outside on pasture and not on stored feed. There are two control locations for milk sampling. One is Retiger Farm, located 9.6 miles from site; the other is Rhoades' Farm, 18.7 miles from site.

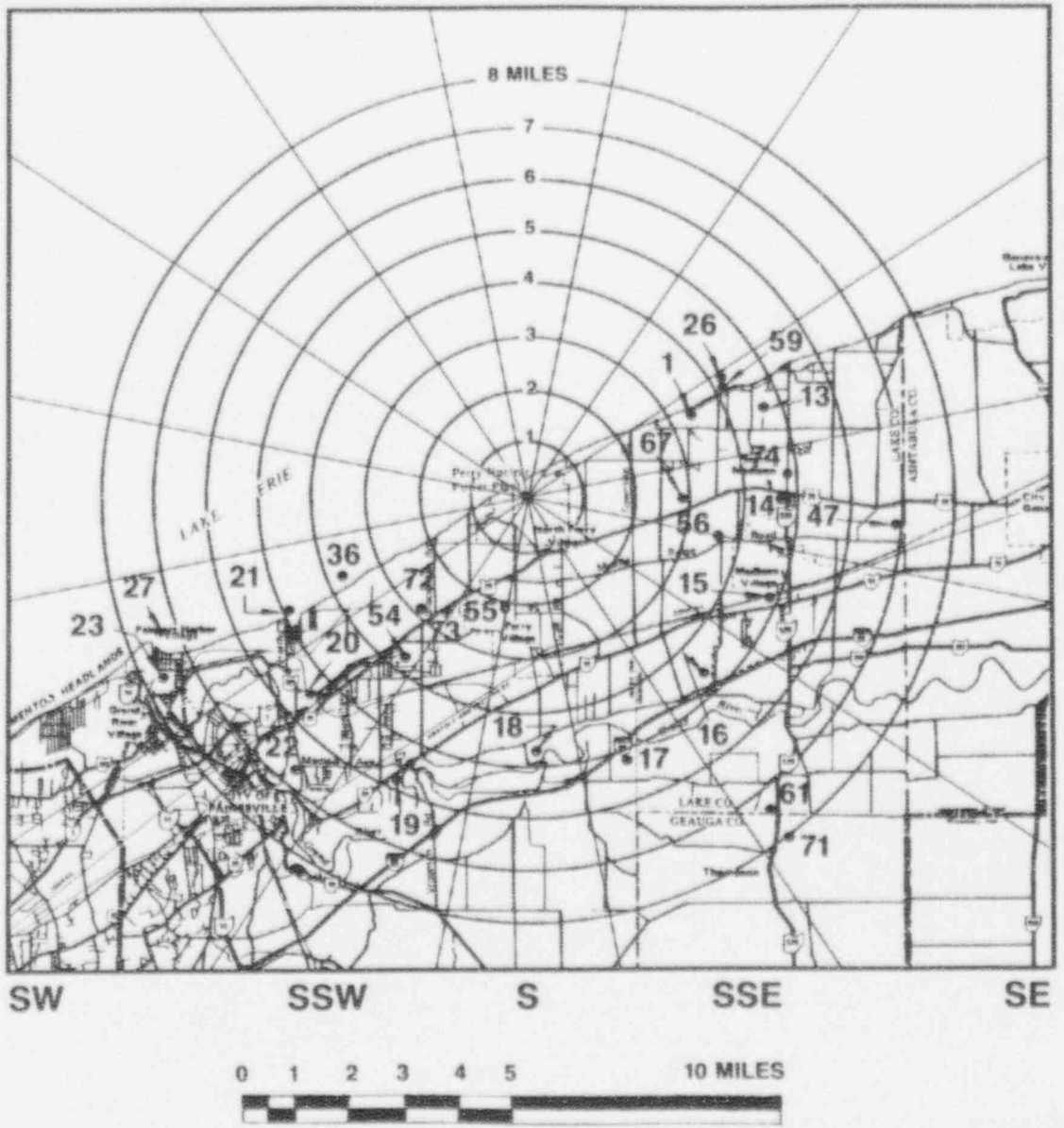
Food products can provide a direct pathway to humans by ingestion. Fruits and vegetables can become contaminated from atmospheric deposition from airborne sources or irrigation water drawn from a lake receiving airborne or liquid effluents. Also, radionuclides in the soil may be absorbed by the roots of the plants and become incorporated into the edible portions. Edible fruits and vegetables are collected monthly during the growing season from four to six farms (depending on availability) in the vicinity of PNPP. The control location for food products is 16.2 miles from PNPP.



LEGEND:

STATION NO.	MEDIA	DIRECTION
2	TLD	E
3	APT, AI, TLD, PR, SO	SE
4	APT, AI, TLD, SO, PR	S
5	APT, AI, TLD	SW
7	APT, AI, TLD, PR, SO, VG	NE
8	TLD	ENE
9	TLD, SO	ESE
10	TLD	SSE
11	TLD	SSW
12	TLD, PR, SO	WSW
25	SED, FSH	NNW
29	MILK, FEED/SILAGE	ESE
34	WTR	NW
35	APT, AI, TLD, PR, SO, VG	E
39	PD	SSW
41	TLD	SW
42	TLD	S
43	TLD	SSE
44	VG	SSE
45	TLD	SSW
53	TLD	WSW
58	TLD	ENE
60	WTR	WSW
62	PD	ENE
63	SE	NNE
64	SE	NW
65	SE	W
76	SE	NNE

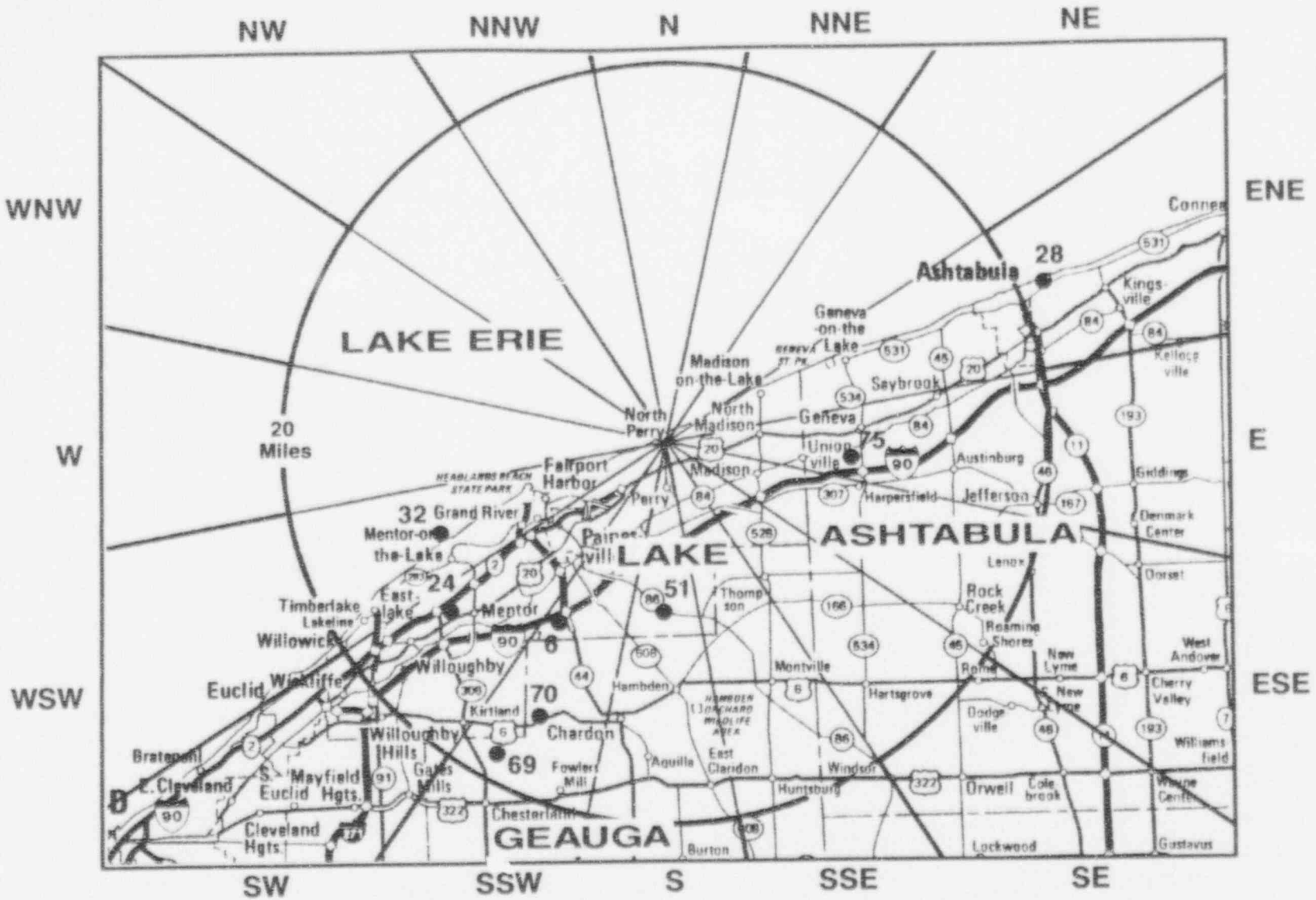
Figure 7: REMP sampling locations within two miles of the plant site.



LEGEND:

STATION NO.	MEDIA	DIRECTION
1	APT, AI, TLD	ENE
13	TLD	ENE
14	TLD	E
15	TLD	ESE
16	TLD	SE
17	TLD	SSE
18	TLD	S
19	TLD	SSW
20	TLD	SW
21	TLD	WSW
22	TLD	SW
23	TLD	WSW
26	SEDIMENT	ENE
27	SEDIMENT	WSW
36	WATER, TLD	WSW
47	MILK, FEED/SILAGE	E
54	TLD	SW
55	TLD	S
56	TLD	ESE
59	WTR	ENE
61	MILK, FEED/SILAGE	SE
67	PD	E
71	MILK, FEED/SILAGE	SE
72	PD	SW
73	PD	SW
74	PD	E

Figure 8: REMP sampling locations between two and eight miles from the plant site.



LEGEND:

STATION NO.	MEDIA	DIRECTION
6	APT, AI, TLD, PR, SO, VG	SSW
24	TLD	SW
28	WATER	ENE
32	FISH/SEDIMENT	WSW
51	MILK, FEED/SILAGE	S
69	MILK, FEED/SILAGE	SSW
70	PD	SSW
75	PD	E

Figure 9: REMP sampling locations greater than eight miles from the plant site.

Vegetation (grass) is collected monthly during the growing season from four locations. Grass is clipped from open areas using standard lawn trimming equipment. The control location for vegetation is 11 miles away.

As with vegetation and food products, samples of animal feed and silage provide an indication of airborne radionuclides deposited in the vicinity of the plant. Sample analyses also provide data for determining radionuclide concentrations in the food chain. Animal feed and silage are collected annually from milk sampling locations.

Soil samples are collected quarterly from seven to eight locations. The control location is eleven miles away. Only the top inch of soil is sampled in an effort to identify possible trends in the local environmental nuclide concentrations.

Aquatic Monitoring

Radionuclides may be present in Lake Erie from many sources including atmospheric deposition, run-off/soil erosion, and releases of radioactivity in liquid effluents from hospitals or other nuclear facilities. These sources provide two forms of potential radiation exposure, external and internal. External exposure can occur from the surface of the water, shoreline sediments, and from swimming. Internal exposure can occur from ingestion of radionuclides, either directly from drinking the water, or as a result of the transfer of radionuclides through the aquatic food chain to the eventual consumption of aquatic organisms, such as fish. To monitor these pathways, PNPP samples water, shoreline sediments, and fish.

Water is sampled from five locations along lake Erie in the vicinity of the PNPP. Samples from three locations are collected using composite sample pumps. The pumps are designed to collect water at regular intervals and composite it in a sample container. The containers are removed monthly and the samples shipped to the laboratory for analysis. Samples from two locations are collected weekly and combined. Each month the combined sample is shipped for analysis.

Sampling lake bottom sediments can provide an indication of the accumulation of undissolved radionuclides which may lead to internal exposure to humans through the ingestion of fish, through resuspension into drinking water, or as an external radiation source from shoreline exposure to fisherman and swimmers. Sediment is sampled twice each year from eight locations, two of which are also fish sampling locations.

Sediment samples from offshore are collected using a hand dredge. Near shore and stream bed samples are collected using a scoop.

Fish are analyzed primarily to quantify the dietary radionuclide intake by humans, and secondarily to serve as indicators of radioactivity in the aquatic ecosystem. Fish are collected from two locations, twice each year. Important sport and commercial species are targeted, and only the fillets are sent to the laboratory for analysis. A scientific collecting permit is obtained annually from the Ohio Department of Natural Resources for fish sampling.

Direct Radiation Monitoring

Environmental radiation is measured directly at thirty-five locations around the PNPP site. The locations are positioned in two rings around the plant as well as at the site boundary. The inner ring is within a one mile radius of the plant site; the outer ring is four to five miles from the plant. Control locations are approximately ten miles from the plant in the two least prevalent wind directions. Each location is equipped with three thermoluminescent dosimeters (TLDs). One is changed quarterly, one is changed annually, and the third acts as a backup in case of lost or stolen TLDs, or an emergency. TLDs are described in more detail in the next section, under "gamma doses".

SAMPLE ANALYSIS

When environmental samples are analyzed for radioactivity, several types of measurements may be performed to provide information about the types of radiation and radionuclides present. The major analyses that are performed include:

- *Gross beta analysis*
- *Gamma spectral analysis*
- *Iodine analysis*
- *Tritium analysis*
- *Strontium analysis*
- *Gamma dose*

Gross beta analysis measures the total amount of beta emitting radioactivity present in a sample. Beta radiation may be released by many different radionuclides. Since beta decay gives a continuous energy spectrum rather than the discreet lines or "peaks" associated with gamma radiation, identification of specific beta emitting nuclides is much more difficult. Therefore, gross beta analysis only indicates whether the sample contains normal or abnormal concentrations of beta emitting radioactivity; it does not identify specific radionuclides. Gross beta analysis primarily acts as a tool to identify samples that may require further analysis.

Gamma spectral analysis provides more specific information than does gross beta analysis. Gamma spectral analysis identifies each radionuclide present in the sample that emits gamma radiation, and the amount of radioactivity associated with each. No two radionuclides emit the same energy gamma rays. Therefore, each radionuclide has a very specific "fingerprint" that allows for accurate identification. For example, gamma spectral analysis can be used to identify the presence and amount of iodine-131 in a sample. Iodine-131 is a man-made radioactive isotope of iodine that may be present in the environment as a result of fallout from nuclear weapons testing, routine medical uses, and routine releases from nuclear power plants.

Iodine analysis measures the amount of radioiodine present in a sample. Some media (e.g. air sample charcoal cartridges), are analyzed directly. In other media (e.g. milk), iodine is extracted by chemical separation.

Tritium analysis indicates whether a sample contains the radionuclide tritium (H-3) and the amount of radioactivity present as a result. Tritium is a natural or man-made isotope of hydrogen that emits low energy beta particles.

Strontium analysis identifies the presence and amount of strontium-89 and strontium-90 in a sample. These man-made radionuclides are found in the environment as a result of fallout from nuclear weapons testing and from nuclear power plants.

Gamma doses received by thermoluminescent dosimeters (TLD) while in the field are determined by a special laboratory procedure. Thermoluminescence is a process by which ionizing radiation interacts with the sensitive material in the TLD, the phosphor. Energy is trapped in the TLD material and can be stored for months or years. This provides an excellent method to measure the dose received over long periods of time. The amount of energy that was stored in the TLD as a result of interaction 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 is directly proportional to the amount of radiation to which the TLD was exposed. The reading process zeroes the TLD and prepares it for reuse.

Table 3 provides a list of the type(s) and frequency of analyses performed on environmental samples collected for the PNPP REMP.

Sample Type	Frequency	Analyses Performed
Atmospheric Monitoring		
Airborne Particulates	Weekly	Gross Beta
	Quarterly	Gamma Spectral
Airborne Radioiodine	Weekly	Iodine-131
Precipitation	Monthly	Gross Beta
		Gamma Spectral
		Tritium
Terrestrial Monitoring		
Milk	Monthly/Bimonthly	Gamma Spectral
		Iodine-131
	Quarterly	Strontium-89
		Strontium-90
Food Products	Monthly	Gamma Spectral
Vegetation	Monthly	Gamma Spectral
Soil	Quarterly	Gamma Spectral
		Strontium-89
		Strontium-90
Animal Feed/Silage	Annually	Gamma Spectral
Aquatic Monitoring		
Water	Monthly	Gross Beta
		Gamma Spectral
		Tritium
	Quarterly	Strontium-89
	Quarterly	Strontium-90
Fish	Biannually	Gross Beta
		Gamma Spectral
Sediment	Biannually	Gamma Spectral
		Strontium-89
		Strontium-90
Direct Radiation Monitoring		
Thermoluminescent Dosimeters	Quarterly	Gamma Dose
	Annually	Gamma Dose

Table 3: Analyses performed on REMP samples

Samples often contain radioactivity that is below the lower limit of detection (LLD). The LLD is the smallest amount of activity that will show a positive result for which there can be confidence that radioactivity is present. When a measurement is reported as less than the LLD, it means that the radioactivity is so low it cannot be accurately measured with any degree of confidence. The Nuclear Regulatory Commission, as part of the PNPP Operating License, has established values for the lower limit of detection for REMP sample analysis. The vendor laboratory was able to comply with those values in 1992.

1992 SAMPLING PROGRAM

The REMP is conducted in accordance with the PNPP Operating License, Appendix A, Technical Specifications. The Environmental Technical Specifications, or REMP requirements, have been established by the Nuclear Regulatory Commission.

Many radionuclides are present in the environment due to sources such as cosmic radiation and fallout from nuclear weapons testing. Some of the radionuclides normally present include:

- *tritium*, present as a result of the interaction of cosmic radiation in the upper atmosphere.
- *beryllium-7*, present as a result of the interaction of cosmic radiation with the upper atmosphere.
- *potassium-40*, a naturally occurring radionuclide normally found in humans and throughout the environment, and
- *fallout radionuclides* from nuclear weapons testing, including tritium, cesium-137, strontium-89, and strontium-90. These radionuclides may also be released in minute amounts from nuclear facilities.

These radionuclides are expected tc be present in many of the environmental samples collected in the vicinity of PNPP.

The contribution of radionuclides from the operation of PNPP is assessed by comparing sample results with preoperational data, operational data from previous years, control location data, and the types and amounts of radioactivity normally released from the station in liquid and gaseous effluents.

The results for each sample type are discussed below and compared to historical data to determine if there are any observable trends. All results are expressed as concentration. Refer to Appendix A: 1992 Radiological Environmental Monitoring Program Data for more detailed results.

Program Changes

There were several changes to the program in 1992. These changes include the addition and deletion of sample locations as follows:

January Leaf sampling was dropped from the program for two reasons. First, construction activities (sewer line installations and housing developments) at two sample locations resulted in clear cutting the stands of trees used for sampling. Second, it had increasingly difficult to obtain adequate samples from trees continually stripped of their leaves. Food product sampling frequency was increased from annually to monthly to provide another indicator for the ingestion pathway.

May Five soil locations were dropped from the program, and four new locations selected. This was done in order to establish locations on company owned property that can be maintained and are secure. The new locations were selected from areas with no tree or brush cover, and wooden borders have been installed around all locations. This ensures that the analysis results indicate deposition on the soil rather than the effects of soil migration. The stations deleted are as follows:

#	Description	Distance (miles)	Direction
1	Redbird	3.4	ENE
2	Site boundary tree line	0.7	E
14	Hubbard Rd.	4.9	E
18	Blair Rd.	5.0	S
20	Nursery Rd. at Rt. 2 overpass	5.3	SW

The stations added include:

3	Meteorological tower	1.0	SE
7	Site boundary Lockwood Rd.	0.6	NE
9	Site boundary transmission tower	0.7	ESE
35	Site boundary	0.6	E

Also in May, milk location 57, 8.5 miles east of the plant, was dropped from the program when the milking goat died.

August Milk locations 31, 1.4 miles SSW of the plant, and 29, 1.3 miles ESE of the plant, were dropped from the program. Milking animals at both locations were sold. Program requirements state that when no milk animals are available within a 3.2 mile radius of the plant, animals within five miles should be considered. Since there are no milk animals available within the five mile radius (as identified in the Land Use Census, p. 47), the additional requirement of collecting three types of food product samples becomes effective. For this reason, four food product sampling locations were added to the program:

#	Description	Distance (miles)	Direction
72	Sasu Farms	2.4	SW
73	Wests Market	2.4	SW
74	Wayman Farm	4.8	E
75	Old Orchard (Control)	15.7	E

Every effort was made to collect three different types of food products that meet the requirement of being "broad leaf vegetation". However, only two types were available (cabbage and lettuce). Of the two types available, only one (cabbage) is grown within a ten mile radius of the plant.

September A sediment sampling location was added (number 76) 0.08 miles NNE of the plant to allow low level contamination in this area to be tracked effectively (see page 40, *SEDIMENT*, for details).

On occasion, samples cannot be collected. This can be due to equipment malfunction, animal husbandry practices, lost shipments, or vandalism. Table 4 provides a list of missed samples, the sample location, and the reason the sample was missed.

Table 4: Missed REMP samples

MEDIA	LOCATION NO.	DATE	REASON MISSED
Milk	*29, 47, 61*	*1/6/92*	*Drying period for goats(1)*
Milk	*29, 47, 61*	*2/10/92*	*Drying period for goats*
Milk	*29, 47, 61*	*3/9/92*	*Drying period for goats*
Milk	*29, 47*	*4/6/92*	*Drying period for goats*
Milk	*47*	*10/19/92*	*Goat unable to produce*

Milk	*47, 61*	*11/19/92*	*Drying period for goats*
Milk	*47, 61*	*12/14/92*	*Drying period for goats*
Lake water	*59, 60*	*2/27/92*	*Lake ice covered*
TLD(2)	*54*	*1st Qtr.*	*Lost in field*
TLD(2)	*42*	*2nd Qtr.*	*Lost in field*
TLD(2)	*24*	*Annual*	*Lost in field*
Air	*35*	*8/5/92*	*Lost at laboratory(3)*
Grass	*35*	*4/28/92*	*Insufficient to sample*

(1) The drying period for goats is an annual occurrence. Goats, unlike cows, cannot produce milk all year.

(2) Missing TLDs are frequently the result of vandalism. At locations where vandalism has been identified as a recurring problem, the TLD is relocated. Loss of the three TLD's listed above was unusual; they were not relocated as a result of this single event.

(3) The laboratory was contacted as a result of this lost sample. In addition to requesting a comprehensive search of the facility (which did not locate the sample), sample handling was reviewed to minimize the potential for recurrence.

Atmospheric Monitoring

AIR

A total of 362 of each type of air sample (particulate and iodine) was collected in 1992. The 1992 annual average gross beta activity for all sampling locations compared to 1991 and preoperational data is as follows:

YEAR	ACTIVITY (pCi/m^3) +/- 2 Sigma
1992	*18.40E-3 +/- 11.47E-3*
1991	*19.17E-3 +/- 11.33E-3*
Preoperational	*17.44E-3 +/- 13.74E-3*

The gross beta concentration ranged from 6E-3 pCi/m^3 to 36E-3 pCi/m^3. The location with the highest annual average concentration, 19.21E-3 +/- 12.11E-3 pCi/m^3, was location 3 on site, approximately one mile SE of the plant.

The comparison of annual average gross beta concentrations between indicator and control locations, expressed in pCi/m^3, is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Gross beta	*18.38E-3 +/- 11.58E-3*	*18.50E-3 +/- 10.92E-3*

There is no significant difference between the indictor and control locations.

Beryllium-7 (Be-7) which occurs naturally, was detected in all quarterly composited air samples. The 1992 and 1991 annual average concentrations for all locations (both indicator and control) are shown below, along with preoperational data. Historically, Be-7 concentrations have ranged from 30E-3 pCi/m^3 to 140E-3 pCi/m^3.

YEAR	ACTIVITY (pCi/m^3) +/- 2 Sigma
1991	*60.29E-3 +/- 12.13E-3*
1990	*52.07E-3 +/- 14.50E-3*
Preoperational	*70.90E-3 +/- 41.40E-3*

In 1992, Be-7 concentrations ranged from 44E-3 pCi/m^3 to 86E-3 pCi/m^3.

PRECIPITATION

A total of 72 precipitation samples were collected and analyzed in 1992. The annual average gross beta activity for all precipitation locations for 1992 and 1991 (no preoperational data are available) are as follows:

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*4.07 +/- 5.74*
1991	*3.81 +/- 5.08*

The gross beta activity ranged from 0.5 pCi/L to 16.6 pCi/L for all locations. The location with the highest annual average gross beta activity, 5.83 +/- 8.40 pCi/L, was location 3 on site, approximately 1.0 mile SE of the plant.

The comparison of the 1992 annual average gross beta concentration (pCi/L) in precipitation between indicator and control locations is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Gross beta	*4.27 +/- 6.05*	*3.04 +/- 3.35 pCi/L*

Although the indicator locations show a higher activity than the control location, the high standard deviation makes it difficult to draw a significant conclusion. It is also important to consider the fact that precipitation has a "washing" influence on the atmosphere. Precipitation and average monthly gross beta concentrations were compared over a three year period for PNPP. The results indicated that as precipitation increases, the gross beta concentration decreases.

A total of 72 samples were analyzed for tritium in 1992. The 1992 and 1991 (no preoperational data are available) annual average concentrations are shown below.

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*135.82 +/- 74.25*
1991	*151.5 +/- 93.9*

Tritium results in 1992 ranged from 91 pCi/L to 228 pCi/L. This is consistent with previous years.

The comparison of tritium concentration (pCi/L) between indictor and control locations in 1992 is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
H-3	*141.1 +/- 73.0*	*96.5 +/- 6.9*

Although the indicator location concentration is higher than the control location, the high standard deviation makes it difficult to draw a significant conclusion. This relationship has been reversed in past years. The location with the highest tritium activity was location 12 at the site boundary, 0.6 miles WSW of the plant. The concentration was 149.0 +/- 88.6 pCi/L.

Terrestrial Monitoring

MILK

Eighty-eight milk samples were collected and analyzed for radioiodine and by gamma spectrometry. Samples were also analyzed quarterly for strontium. The predominant radionuclide identified by gamma spectrometry was naturally occurring K-40.

The annual average concentration of K-40 in milk for all locations in 1992, 1991 and preoperational data is as follows:

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*1387 +/- 429*
1991	*1511 +/- 421*
Preoperational	*1537 +/- 546*

The concentration of K-40 in milk ranged from 1020 pCi/L to 1840 pCi/L. A contributing factor to this wide range is that goat milk naturally contains higher concentrations of K-40.

Seventeen samples were analyzed for strontium. The annual average concentrations of Sr-90 in milk for all locations in 1992, 1991 and preoperational data are shown below.

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*2.40 +/- 2.45*
1991	*2.51 +/- 1.66*
Preoperational	*1.80 +/- 2.12*

The annual average Sr-90 level in milk was at its highest in 1988, 3.24 +/- 1.94 pCi/L, and has generally decreased since then. The preoperational concentration ranged from 0.47 pCi/L to 3.5 pCi/L. The location with the highest annual average concentration, 3.70 +/- 3.97 pCi/L, is location 71, 7.9 miles SE of the plant.

The comparison between the indicator and control locations for Sr-90 concentration (pCi/L) is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Sr-90	*2.79 +/- 3.07*	*1.96 +/- 1.18*

Because of the large standard deviation, no statistical meaning can be assigned to the difference between indicator and control locations.

Strontium-90 has been detected every year since 1983. Low level, trace amounts are found uniformly throughout the area. This suggests that its source is universal, such as fallout.

FOOD PRODUCTS

A total of six different types of food products were collected from seven locations in 1992. The only two broadleaf vegetables, lettuce and cabbage, were collected when available. The predominant radionuclide found in food products sampled was naturally occurring potassium-40 (K-40). The 1992, 1991, and preoperational annual average concentrations for K-40 for all locations are as follows:

YEAR	ACTIVITY (pCi/Kg) +/- 2 Sigma
1992	*1778 +/- 1197*
1991	*1971 +/- 1226*
Preoperational	*2296 +/- 2160*

The activity ranged from 1070 pCi/Kg to 3230 pCi/Kg in 1992.

VEGETATION

A total of 23 grass samples were collected and analyzed in 1992. Two naturally occurring radionuclides were detected: beryllium-7 (Be-7) and K-40. Cesium-137 (Cs-137) was detected in one sample.

The 1992, 1991, and preoperational annual average Be-7 and K-40 concentrations for all vegetation sampling locations are shown below:

	YEAR	ACTIVITY (pCi/Kg) +/- 2 Sigma
Be-7	*1992*	*3027 +/- 2660*
	1991	*1692 +/- 2981*
	Preoperational	*2306 +/- 1688*
K-40	*1992*	*6666 +/- 10531*
	1991	*5417 +/- 2698*
	Preoperational	*4273 +/- 3949*

The concentration of Be-7 ranged from 1030 pCi/Kg to 7410 pCi/Kg in 1992; the concentration of K-40 ranged from 2281 pCi/Kg to 54360 pCi/Kg.

A very small quantity of Cs-137 (17.9 pCi/L) was detected in one sample from the control location (#6). Cs-137 had been detected in grass samples from this location in the past. Although the origin of the Cs-137 cannot be determined, the fact that this is a control location indicates that it is not the Perry Plant.

FEED/SILAGE

Feed and silage samples were collected from five milk sampling locations. Naturally occurring Be-7 and K-40 were detected.

The 1992, 1991 and preoperational annual average concentrations (pCi/Kg wet) for K-40 for all locations is shown below:

YEAR	ACTIVITY +/- 2 Sigma
1992	*7193 +/- 5298*
1991	*7281 +/- 3093*
Preoperational	*7715 +/- 8590*

The K-40 concentrations ranged from 3706 pCi/Kg to 9765 pCi/Kg in 1992.

Be-7 was detected in two indicator location feed samples. The average concentration was 3157 +/- 2877 pCi/Kg.

SOIL

Twenty-two soil samples were collected in 1992. Two naturally occurring radionuclides, K-40 and Radium-226 (Ra-226) were detected in the samples. There were also two fission product radionuclides, Cs-137 and Strontium-90 (Sr-90).

The 1992, 1991, and preoperational annual average concentrations for all locations for K-40 and Ra-226 are shown below:

	YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
K-40	*1992*	*11359 +/- 5631*
	1991	*11204 +/- 6690*
	Preoperational	*12391 +/- 6174*
Ra-226	*1992*	*799 +/- 476*
	1991	*792 +/- 668*
	Preoperational	*758 +/- 596*

The activity for K-40 ranged from 7130 pCi/Kg to 19200 pCi/Kg; the Ra-226 concentration ranged from 406 pCi/Kg to 1562 pCi/Kg.

Cs-137 was detected in all of the 22 soil samples. The average annual concentration of Cs-137 for all locations for 1992, 1991, and preoperational is shown below.

YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
1992	*319.9 +/- 404.3*
1991	*344.9 +/- 453.8*
Preoperational	*867.0 +/- 1855*

The Cs-137 activity ranged from 44 pCi/Kg to 838 pCi/Kg in 1992. This large variation was also observed in preoperational data, which ranged from 109 pCi/Kg to 3940 pCi/Kg. The following is a comparison of Cs-137 concentrations (pCi/Kg) between control and indicator locations:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Cs-137	*328.6 +/- 430.5*	*264.3 +/- 164.7*

Given the large standard deviation, it is not possible to draw conclusions from these results. Note that the indicator location result was below the control result in 1991.

The location with the highest annual average concentration, 732.7 +/- 183.0 pCi/Kg, for Cs-137 was #12, 0.6 miles WSW of the plant.

Sr-90 was detected in nineteen of the soil samples. The annual average concentration for 1992 and 1991 is as follows (no preoperational data is available):

YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
1992	*32.49 +/- 25.98*
1991	*47.99 +/- 71.80*

Activity for Sr-90 ranged from 9.5 pCi/Kg to 53.8 pCi/Kg. The lower limit of detection for Sr-90 has improved since 1988, allowing measurement of much lower quantities.

The comparison of 1992 annual average concentration (pCi/Kg) between indicator and control locations is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Sr-90	*34.4 +/- 24.5*	*16.6 +/- 19.7*

Again, because of the large standard deviation, it is not possible to draw conclusions from these results. In 1991, control location results were higher than indicator location results.

The location with the highest annual average concentration, 53.8 +/- 9.4 pCi/Kg, was #1, approximately 3.4 miles ENE of the plant.

Aquatic Monitoring

WATER
Fifty-eight water samples were collected and analyzed for gross beta activity and by gamma spectrometry. From these, three monthly samples were composited into quarterly samples and analyzed for tritium, and one monthly sample was analyzed for Sr-89, and Sr-90.

The 1992, 1991 and preoperational annual average gross beta activity (pCi/L) is as follows:

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*2.43 +/- 2.27*
1991	*2.50 +/- 0.96*
Preoperational	*5.26 +/- 6.78*

The significant difference between preoperational values and operational data has been attributed to a change in vendor laboratories in 1987/1988. A comprehensive explanation is provided in the 1987 Annual Environmental Operating Report.

The gross beta ranged from 1.4 pCi/L to 10.3 pCi/L for all locations. Location #36, 3.9 miles WSW of the plant, had the highest annual average gross beta, 3.07 +/- 4.52 pCi/L. The reason this location had the highest annual average is due to a single result from December 28, 1992. The gross beta result on that date was 10.3 pCi/L. The laboratory was requested to reanalyze the sample and perform a gamma spectrometry analysis. The result of the reanalysis indicated a gross beta count of 8.5 +/- 0.9 pCi/L. Gamma spectrometry showed no detectable isotopes.

The comparison of gross beta (pCi/L) between indicator and control locations is shown below:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Gross beta	*2.44 +/- 2.48*	*2.40 +/- 1.20*

There is no significant difference between indicator and control locations.

Fifty-eight water samples were analyzed by gamma spectroscopy in 1992. No sample result identified any isotope above the lower limit of detection.

Strontium-90 was detected in twelve of the 25 samples analyzed. The 1992 annual average for all locations was 0.62 +/- 0.22 pCi/L. The range was 0.40 pCi/L to 0.80 pCi/L. Preoperational strontium concentrations ranged from 0.55 pCi/L to 1.9 pCi/L.

Tritium (H-3) was detected in 22 composited samples. The 1992, 1991, and preoperational annual average concentrations for all locations are as follows:

YEAR	ACTIVITY (pCi/L) +/- 2 Sigma
1992	*183.8 +/- 84.1*
1991	*179.9 +/- 98.4*
Preoperational	*333.6 +/- 341.0*

The tritium values ranged from 123 pCi/L to 264 pCi/L. The location with the highest annual average value, 196 +/ - 54.9 pCi/L, was #59, 4.0 miles ENE of the plant site.

The comparison of H-3 concentrations (pCi/L) between indicator and control locations is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
H-3	*187.0 +/- 83.5*	*172.8 +/- 95.3*

These values are not significantly different.

SEDIMENT
Sixteen sediment samples were collected in 1992. The predominant radionuclide was potassium-40 (K-40) which is naturally occurring. K-40 has been detected in all samples since the program began in 1981.

The 1992, 1991, and preoperational average annual concentrations of K-40 for all locations are as follows:

YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
1992	*10394 +/- 13716*
1991	*9902 +/- 6580*
Preoperational	*13317 +/- 7914*

The K-40 concentration ranged from 1540 pCi/Kg to 21450 pCi/Kg.
Other radionuclides detected in sediment samples include Cs-137 and Sr-90, both fission products. However, these have been detected in most sediment samples since 1981, five years before PNPP began operation. In 1992, Cs-137 was detected in eight of the fourteen samples. The 1992, 1991, and preoperational annual average concentrations for Cs-137 are as follows:

YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
1992	*348 +/- 518*
1991	*197 +/- 254*
Preoperational	*243 +/- 310*

Concentration of Cs-137 ranged from 109 pCi/Kg to 864 pCi/Kg. The location with the highest annual average concentration, 827 +/- 103 pCi/Kg, was #32, the control location, 15.8 miles WSW of the plant.

The comparison of annual average concentrations (pCi/Kg) of Cs-137 between indicator and control locations is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Cs-137	*220 +/- 138*	*827 +/- 103*

In 1987, a similar relationship between indicator and control locations was noted. Based on this historical data and the normal fluctuations, the source of the Cs-137 is not the Perry Plant.

Strontium-90 was detected in nine of the samples. The 1992 and 1991 annual average concentrations for Sr-90 for all locations is shown below (no preoperational data is available).

YEAR	ACTIVITY (pCi/Kg dry) +/- 2 Sigma
1992	*19.13 +/- 16.71*
1991	*11.10 +/- 3.78*

The 1992 concentrations ranged from 11.4 pCi/Kg to 39.0 pCi/Kg. The location with the highest annual average concentration was #32, the control location.

The comparison of annual average concentrations (pCi/Kg) of Sr-90 between indicator and control locations is as follows:

RADIONUCLIDE	INDICATOR LOCATIONS	CONTROL LOCATION
Sr-90	*15.70 +/- 7.47*	*31.15 +/- 21.76*

The large standard deviation makes it difficult to draw conclusions from this data. Like Cs-137, the source of Sr-90 is not known; however, based on the comparison between results for indicator and control locations, it is not the Perry Plant.

On March 2, 1992, sediment samples collected from a small stream on the east side of the site were found to be contaminated with a small amount of Cobalt-60 (Co-60). A variety of samples were collected during the subsequent investigation; results are shown below. The ultimate source of the cobalt was determined to be the emergency service water pump house basin sediment, which had become contaminated via recirculation of routine liquid radioactive waste discharges to Lake Erie.

RADIONUCLIDE	RANGE OF RESULTS (pCi/Kg)
Co-60	*147.0 to 833.2*

Because the amount of contamination was small and the potential environmental impacts of dredging the stream were large, the material is being monitored in place. The location in the stream bed with the highest concentration of Co-60 was added to the list of REMP sample locations (#76). Samples will be collected semiannually during routine sediment collections, and the results will be documented in this report.

FISH

Thirty-three fish samples were collected in 1992 and analyzed by gamma spectroscopy. Twelve species of fish were represented, including walleye, freshwater drum, catfish, smallmouth bass, carp, white sucker, white perch, white bass, yellow perch, red horse, gizzard shad, and rainbow trout.

The 1992, 1991, and preoperational annual average for naturally occuring K-40 concentrations for all locations are shown below:

YEAR	ACTIVITY (pCi/Kg wet) +/- 2 Sigma
1992	*2374 +/- 1334*
1991	*2221 +/- 905*
Preoperational	*3722 +/- 2454*

Cesium-137 has been found periodically in fish samples since the preoperational program began in 1981. In 1992, Cs-137 was reported in one of the 33 samples.

The 1992, 1991, and preoperational annual average concentrations of Cs-137 for all locations are as follows:

YEAR	ACTIVITY (pCi/Kg wet) +/- 2 Sigma
1992	*26.8 +/- 18.7*
1991	*25.1 +/- 9.2*
Preoperational	*38.9 +/- 46.6*

The single fish sample (smallmouth bass) with Cs-137 was found offshore at the control location, 15.8 miles WSW of the plant. Since this radionuclide was found in preoperational samples and continues to be detected periodically with no substantial increases, it is suspected that this activity is the result of fallout.

Direct Radiation Monitoring

THERMOLUMINESCENT DOSIMETERS

A total of 138 thermoluminescent dosimeters (TLDs) were collected and analyzed in 1992. Two quarterly and one annual TLDs were missing when collection was attempted.

The average quarterly dose for 1992, 1991, and preoperational data (mR per standard quarter of 91 days) for all TLDs and the equivalent annual dose per year are as follows:

YEAR	AVERAGE QUARTERLY DOSE	EQUIVALENT ANNUAL DOSE
1992	*14.95 +/- 4.66 mR/Std Qtr*	*59.80 mR/Yr*
1991	*16.55 +/- 5.15 mR/Std Qtr*	*66.20 mR/Yr*
Preoperational	*18.90 +/- 6.80 mR/Std Qtr*	*75.60 mR/Yr*

The preoperational TLD results are higher than 1991 and 1992 due to a change in vendor laboratory services. A comprehensive explanation of the difference is provided in the 1988 Annual Environmental Operating Report.

The quarterly exposure rates for 1992 ranged from 11.4 mR/Std Qtr to 24.3 mR/Std Qtr. The location with the highest quarterly average for the year, 22.8 +/- 2.9 mR/Std Qtr, is #18, 5.0 miles south of the plant. This location has always had the highest average quarterly dose.

The comparison between indicator and control locations for annual average dose (mR/Std Qtr) in 1992 is as follows:

	INDICATOR LOCATIONS	CONTROL LOCATIONS
TLD	14.9 +/- 4.7	14.9 +/- 3.3

There is no difference in exposure levels between the indicator and control locations.

The sum of the quarterly TLDs compared well to the annual TLDs. These values are shown below.

ANNUAL TLD AVERAGE	SUM OF ALL QUARTERLY TLD AVERAGE
59.3 +/- 8.9 mR	*59.8 +/- 8.7 mR*

QUALITY ASSURANCE

An important part of the REMP at PNPP is quality assurance (QA). QA consists of all the planned and systematic actions that are necessary to provide adequate confidence in the results of the program. QA is a program which checks the adequacy and validity of the monitoring program through routine audits, strict adherence to written procedures, and attention to good record keeping practices.

The QA program is designed to identify possible deficiencies in the REMP so that corrective actions can be initiated promptly. PNPP's QA program also provides confidence in the REMP through:

- o performing regular audits of the REMP, including a careful examination of sample collection techniques and recordkeeping,
- o performing audits of vendor laboratories which analyze PNPP environmental samples,
- o requiring the vendor laboratory to participate in the United States Environmental Protection Agency Cross-Check Program,
- o requiring the vendor laboratory to analyze spiked samples (TLDs).

QA audits and inspections of the PNPP REMP are performed by groups such as PNPP's QA Department and representatives from the Nuclear Regulatory Commission (NRC). In addition, the NRC and Ohio Department of Health (ODH) also perform independent environmental monitoring in the vicinity of the plant. The analytical results from the different programs are compared in the Ohio Department of Health Annual Environmental Monitoring Report. This provides a valuable tool to verify the quality of both the laboratories' analytical procedures and the data generated.

The purpose of the Interlaboratory Cross-Check comparison program is to provide an independent check on the vendor laboratory's analytical procedures and to alert it to any possible problems. The vendor laboratory measures and reports the concentration of specified radionuclides. The known values are then compared to the reported values. Results consistently outside established acceptance criteria indicates a need to check instruments or procedures.

In 1992, the vendor laboratory analyzed 32 EPA samples of milk, water, or air filters, performing 86 analyses, for The Environmental Protection Agency (EPA) Cross-Check Intercomparison Program. Two (2.33%) results were outside the EPA's control limit and one sample was lost. This is a slight improvement from the 3.61% in 1991. The results of this program are shown in Table 5.

To implement the TLD spiking program, TLDs with a known dose were sent to the laboratory for analysis. The results are shown in Table 6. Results were within acceptance criteria; a comparison of the delivered (known) dose to the dose reported by the vendor laboratory shows good agreement.

CONCLUSION

No changes in radionuclide concentrations or exposure levels were detected in 1992 when compared to 1991. Atmospheric monitoring results were consistent with 1991 results for all analyses. The two prevalent radionuclides were Be-7 (in air) and tritium (in precipitation), both of which are naturally occurring.

Naturally occurring K-40 was detected in all terrestrial samples, as expected. Either or both

Sr-90 and Cs-137 were detected in milk, grass and soil, but the extremely low concentrations were either unchanged or lower than 1991. These radionuclides are products of nuclear weapons testing from the 1950's and 60's and are detectable in the environment. Naturally occurring Be-7 was detected periodically in vegetation and feed/silage in 1992.

There was no significant change in radionuclide concentrations in aquatic samples in 1992. Either or both of Sr-90 and Cs-137 were detected in water, sediment, and fish. These low concentrations were relatively unchanged from historical data. It is believed that the source of these materials is weapons testing.

Finally, direct radiation measurements are relatively consistent with 1991 data.

Table 5: EPA Cross-Check Intercomparison Program. Results are expressed in pCi/l for liquid samples, pCi/filter for filter samples, and mg/l for potassium results. Results shown in **BOLD** were outside the control limits.

DATE	SAMPLE	ANALYSIS TYPE	VENDOR RESULTS MEAN ± 2 SIGMA	EPA RESULTS MEAN ± 1 SIGMA	LIMITS
Jan.	Water	Sr-89	42.7±6.4	51.0±5.0	42.3-59.7
		Sr-90	18.3±3.1	20.0±5.0	11.3-28.7
Jan.	Water	Pu-239	16.1±0.8	16.8±1.7	13.9-19.7
Jan.	Water	Gr. alpha	23.7±9.2	30.0±8.0	16.1-43.9
		Gr. beta	27.7±4.2	30.0±5.0	21.3-38.7
Feb.	Water	I-131	60.3±4.2	59.0±6.0	48.6-69.4
Feb.	Water	Co-60	40.3±5.0	40.0±5.0	31.3-48.7
		Zn-65	148.0±15.0	150.7±6.1	122.0-174.0
		Ru-106	188.7±28.8	203.0±20.0	168.3-237.7
		Cs-134	31.7±4.2	31.0±5.0	22.3-39.7
		Cs-137	51.0±3.4	49.0±5.0	40.3-57.7
		Ba-133	79.0±3.4	76.0±8.0	62.1-89.9
Feb.	Water	H-3	7714.0±119.6	7904.0±790.0	6533.4-9274.6
Mar.	Water	Ra-226	9.0±0.4	10.1±1.5	7.5-12.7
		Ra-228	18.8±0.6	15.5±3.9	8.7-22.3
Mar.	Water	U	25.1±1.9	25.3±3.0	20.1-30.5
Mar.	Air	Gr. alpha	7.0±0.0	7.0±5.0	0.0-15.7
	Filter	Gr. beta	39.3±1.6	41.0±5.0	32.3-49.7
		Sr-90	13.7±1.6	15.0±5.0	6.3-23.7
		Cs-137	10.0±0.0	10.0±5.0	1.3-18.7
Apr.	Water				
	Sample A	Gr. alpha	35.7±6.1	40.0±10.0	22.7-57.3
		Ra-226	12.7±1.2	14.9±2.2	11.1-18.7
		Ra-228	14.5±2.1	14.0±3.5	7.9-20.1
		U	3.9±0.2	4.0±3.0	0.0-9.2
Apr.	Water				
	Sample B	Gr. beta	113.0±7.2	140.0±21.0	103.6-176.4
		Sr-89	12.3±4.2	15.0±5.0	6.3-23.7
		Sr-90	15.0±1.2	17.0±5.0	8.3-25.7

		Co-60	61.0±4.0	56.0±5.0	47.3-64.7
		Cs-134	24.3±1.2	24.0±5.0	15.3-32.7
		Cs-137	24.0±2.0	22.0±5.0	13.3-30.7
Apr.	Milk	Sr-89	25.3±7.6	38.0±5.0	29.3-46.7
		Sr-90	24.3±3.1	29.0±5.0	20.3-37.7
		I-131	78.7±9.5	78.0±8.0	64.1-91.9
		Cs-137	39.3±2.3	39.0±5.0	30.3-47.7
		K	1610.0±72.1	1710.0±86.0	1560.8-1859.2
May	Water	Sr-89	24.0±4.0	29.0±5.0	20.3-37.7
		Sr-90	6.7±1.2	8.0±5.0	0.0-16.7
May	Water	Gr. alpha	12.3±2.1	15.0±5.0	6.3-23.7
		Gr. beta	46.0±5.0	44.0±5.0	35.3-52.7
June	Water	Co-60	20.3±1.2	20.0±5.0	11.3-28.7
		Zn-65	103.3±10.6	99.0±10.0	81.7-116.3
		Ru-106	142.7±23.7	141.0±14.0	116.7-165.3
		Cs-134	14.3±2.3	15.0±5.0	6.3-23.7
		Cs-137	15.0±2.0	15.0±5.0	6.3-23.7
		Ba-133	92.7±11.0	98.0±10.0	80.7-115.3
June	Water	H-3	2153.3±144.6	2125.0±347.0	1523.0-2727.0
July	Water	Ra-226	22.3±2.2	24.9±3.7	18.5-31.3
		Ra-228	16.7±3.1	16.7±4.2	9.4-24.0
July	Water	U	3.6±0.3	4.0±3.0	0.0-9.2
Aug.	Water	I-131	47.0±3.5	45.0±6.0	34.6-55.4
Aug.	Water	Pu-239	8.5±0.9	9.0±0.9	7.4-10.6
Aug.	Air	Gr. alpha	25.7±1.2	30.0±8.0	16.1-43.9
	Filter	Gr. beta	69.0±2.0	69.0±10.0	51.7-86.3
		Sr-90	26.0±4.0	25.0±5.0	16.3-33.7
		Cs-137	16.0±0.0	13.0±5.0	9.3-26.7
Sep.	Water	Sr-89	16.0±4.0	20.0±5.0	11.3-28.7
		Sr-90	14.3±3.1	15.0±5.0	6.3-23.7
Sep.	Water	Gr. alpha	43.0±13.1	45.0±11.0	25.0-64.1
		Gr. beta	41.3±18.6	50.0±5.0	41.3-58.7
Sep.	Milk	Sr-89	11.0±3.5	15.0±5.0	6.3-23.7
		Sr-90	12.7±1.2	15.0±5.0	6.3-23.7
		I-131	109.7±19.4	100.0±10.0	82.7-117.3
		Cs-137	14.0±3.5	15.0±5.0	6.3-23.7
		K	1540.0±103.9	1750.0±88.0	1597.3-1902.7
Oct.	Water	Co-60	11.3±2.3	10.0±5.0	1.3-18.7
		Zn-65	169.7±25.0	148.0±15.0	122.0-174.0
		Ru-106	170.1±2.3	175.0±18.0	143.8-206.2
		Cs-134	9.7±2.3	8.0±5.0	0.0-16.7
		Cs-137	9.7±1.2	8.0±5.0	0.0-16.7
		Ba-133	80.3±9.0	74.0±7.0	61.9-86.1
Oct.	Water	H-3	5896.7±136.2	5962.0±596.0	4928.0-6996.0
Oct.	Water				
	Sample A	Gr. alpha	24.7±5.0	29.0±7.0	16.9-41.1
		Ra-226	7.1±0.4	7.4±1.1	5.5-9.3
		Ra-228	11.5±1.0	10.0±2.5	5.7-14.3
		U	9.7±0.5	10.2±3.0	5.0-15.4
Oct.	Water				
	Sample B	Gr. beta	42.7±8.1	53.0±10.0	35.7-70.3

		Sr-89	6.7±1.2	8.0±5.0	0.0-16.7
		Sr-90	10.0±2.0	10.0±5.0	1.3-18.7
		Co-60	15.0±2.0	15.0±5.0	6.3-23.7
		Cs-134	5.7±1.2	5.0±5.0	0.0-13.7
		Cs-137	8.0±2.0	8.0±5.0	0.0-16.7
Nov.	Water	Ra-226	7.5±0.8	7.5±1.1	5.6-9.4
		Ra-228	5.8±0.7	5.0±1.3	2.7-7.3
Nov.	Water	U	15.5±1.1	15.2±3.0	10.0-20.4

Table 6: Environmental TLD Spiking Program Results.

	SECOND QUARTER				FOURTH QUARTER		
	ACTUAL	REPORTED	PERFORMANCE		ACTUAL	REPORTED	PERFORMANCE
1.	17.6	16.8	-0.05	1.	12.9	14.1	0.09
2.	17.6	17.8	0.01	2.	12.9	15.5	0.20
3.	17.6	15.4	-0.13	3.	12.9	18.9	0.47
4.	17.6	16.1	-0.09	4.	12.9	19.2	0.49
5.	17.6	19.3	0.10	5.	12.9	14.2	0.10
6.	17.6	18.1	0.03	6.	12.9	14.7	0.14
7.	17.6	14.9	-0.15	7.	12.9	14.9	0.16
8.	17.6	16.5	-0.06	8.	12.9	14.3	0.11
9.	17.6	15.8	-0.10	9.	17.4	19.5	0.12
10.	14.0	11.7	-0.16	10.	17.4	19.4	0.11
11.	14.0	15.2	0.09	11.	17.4	20.0	0.15
12.	14.0	15.3	0.09	12.	17.4	16.8	-0.03
13.	14.0	13.8	-0.01	13.	17.4	19.2	0.10
14.	14.0	14.7	0.05	14.	17.4	19.8	0.14
15.	14.0	15.5	0.11	15.	17.4	19.6	0.13
16.	14.0	13.6	-0.03	16.	17.4	16.6	-0.05
17.	14.0	15.6	0.11				
18.	14.0	14.1	0.01				
Average Performance (P)			-0.01				0.15
Standard Deviation (S)			0.09				0.14
Performance Criteria(P+S)			0.10				0.29

The Performance Criteria is acceptable if it is below 0.30.

LAND USE CENSUS

INTRODUCTION

Each year a land use census is conducted to gather information necessary to identify exposure pathways in the environment. The Land Use Census is required by Title 10 of the Code of Federal Regulations, Part 50, Appendix I, and the PNPP Technical Specifications, Section 12. Radiological exposure pathways, as discussed in an earlier chapter, are the methods by which people may be exposed to radioactivity, and can be divided into several groups:

- o *Inhalation Pathway* - Internal exposure as a result of breathing radioactive material in the air.
- o *Plume Exposure Pathway* - External exposure directly from a plume or cloud of radioactive material.
- o *Ground Exposure Pathway* - External exposure from radioactive material deposited on the ground.
- o *Vegetation Pathway* - Internal exposure as a result of eating vegetables, fruit, etc. which have a build up of deposited radioactive material or have absorbed radionuclides through the soil.
- o *Milk Pathway* - Internal exposure as a result of drinking milk which may contain radioactive material as a result of a cow or goat grazing on a contaminated pasture.
- o *Aquatic Pathway* - Internal exposure as a result of drinking water or eating fish which may contain radioactive material.

The information gathered during the Land Use Census is used for dose assessment and input into the Radiological Environmental Monitoring Program (REMP). This ensures that these programs are as current as possible.

The Land Use Census is conducted by traveling all roads within a five-mile radius of the plant site, and recording and mapping the location of the nearest resident, milk animal, and vegetable garden in each of the meteorological sectors around the plant that are over land. (As mentioned in the REMP report, the area around the plant is divided into sixteen radial sectors that come together at the center of the reactor building).

The 1992 Census was conducted from July 29 to August 11. Nearest residences, vegetable gardens (larger than 500 square feet), and milk producing animals were recorded in addition to agricultural growers in the area.

All the information has been tabulated below; all locations identified are plotted on the map in Figure 10. Note that the W, WNW, NW, N, and NNE sectors extend over Lake Erie and therefore are not included in the survey.

DISCUSSION AND RESULTS

The following changes were recorded in the 1992 census:

- o ENE Sector - A new garden was identified at 4650 Lockwood Road.
- o E Sector - A new garden was identified at 2684 Antioch Road.
- o SSW Sector - A new garden was identified at 3735 N. Ridge Road.

Table 7 lists the nearest residence by sector and dispersion (X/Q) value. The residence with the highest dispersion value (highest possible dose) is located at 3121 Center Road, in the South sector, approximately 0.9 miles from the plant. This was the same residence identified in the 1991 Land Use Survey.

Table 7: Nearest residence by sector

Sector	Location Address	Miles from PNPP	X/Q Value (Sec/m³)	Map Locator
NE	4383 Lockwood Rd	0.8	2.17E-6	2
ENE	4602 Lockwood Rd	1.0	1.13E-6	4
E	2684 Antioch Rd	1.1	6.67E-7	17
ESE	2774 Antioch Rd	1.2	4.44E-7	26
SE	4495 N. Ridge Rd	1.2	3.89E-7	34
SSE	3119 Parmly Rd	0.9	1.89E-6	36
S	3121 Center Rd	0.9	2.25E-6	40
SSW	3850 Clark Rd	0.9	1.11E-6	46
SW	3440 Clark Rd	1.2	4.98E-7	51
WSW	2815 Perry Park	1.0	1.72E-6	57

This year there were no milk animals within a five mile radius of the plant. Both animals identified in last year's report were sold.

Table 8 lists the nearest gardens that occupy at least 500 square feet. The location with the highest deposition value was 3121 Center Road in the south sector. Three new gardens were identified in the survey this year. They are at 4560 Lockwood Road, 2684 Antioch Road, and 3735 N. Ridge Road.

Table 8: Nearest garden by sector

Sector(1)	Location Address	Miles from PNPP	D/Q Value per m_2	Map Locator
NE	4389 Lockwood Rd	0.8	1.09E-8	3
ENE	4650 Lockwood Rd*	1.1	4.77E-9	5
E	2684 Antioch Rd*	1.1	5.29E-9	18
ESE	2774 Antioch Rd	1.2	3.41E-9	26
SE	4613 N. Ridge Rd	1.2	2.90E-9	35
SSE	3119 Parmly Rd	0.9	1.23E-8	36
S	3121 Center Rd	0.9	1.31E-8	40
SSW	3735 N. Ridge Rd*	1.6	1.32E-9	47
SW	3440 Clark Rd	1.2	2.24E-9	51
WSW	3424 Parmly Rd	1.0	5.44E-9	59

* Indicates a new location for 1992.

Produce growers are listed in Table 9, and recreational areas and drinking water facilities are listed in Table 10. These were compiled to provide information for use in emergency planning.

Table 9: Produce growers within the vicinity of PNPP

Name of Facility	*Location Address*	*Sector/ Miles*	*Map Locator*
Shreve Farm	2431 Antioch Rd	ENE/1.2	6
Resident*	4762 Lockwood Rd	ENE/1.4 miles	7
Gerlica Farm	4860 Lockwood Rd	ENE/1.5	8
Rainbow Farms	Townline Rd	ENE/1.9	9
Twins Creek Farm	2299 Haines Rd	ENE/3.2	13
Resident*	1848 Hubbard Rd	ENE/5.0 miles	16
Orosz Farm	2674 Antioch Rd	E/1.2	18
Mobile stand*	McMackin & N. Ridge	E/2.5 miles	19
Forget-Me-Not Florist and Greenhouse*	N. Ridge Rd	E/2.7 miles	20
Sabo Farm	5674 N. Ridge Rd	E/2.9	21
Woodworth Farm	Middle Ridge Rd	E/4.6	22
Wayman Farm	Across from 2605 Hubbard Rd	E/4.8	23
Hub Ridge Market	Rt. 528 & Middle Ridge	E/4.8 miles	25
Resident	5009 N. Ridge Rd	ESE/1.8	27
Secor Nursery	N. Ridge Rd	ESE/1.8	28
Resident	3815 Townline Rd	ESE/2.3	29
Resident	5674 Middle Ridge Rd	ESE/3.2	30
Resident	6030 Middle Ridge Rd	ESE/3.9	31
Resident*	5964 S. Ridge Rd	ESE/4.1 miles	32
Hart's Acres*	Rt 528	ESE/5.0 miles	33
Leekala Farm	4830 Davis Rd	SSE/3.0	37
Peg's Produce*	Rt 84	SSE/3.2 miles	38
Resident*	5347 River Rd	SSE/4.3 miles	39
Resident	3269 Center Rd	S/1.2	41
Brookside Farm	Middle Ridge Rd	S/1.7	42
84 Garden Spot	South Ridge Rd	S/3.8	43
Resident	4648 Webb Rd	S/3.8	44
Garden Center	Corner Narrows Rd & North Ridge Rd	SW/3.6	46
Champion Nursery	North Ridge Rd	SSW/1.8	47

Golding Farm	North Ridge Rd Perry Park Rd	SSW/1.7 SW/1.5	48
Resident*	3576 Narrows Rd	SSW/2.8 miles	49
Resident (Ermson)	2671 Hale Rd	SSW/3.7	50
Resident (Sasu)	3191 N. Ridge Rd	SW/2.4	52
West Orchard Fruit Market	N. Ridge Rd Perry Park/Clark	SW/2.7 SW/1.6	53
Resident*	860 Park Rd	SW/4.4 miles	

* Indicates a new location for 1992.

Table 10: Recreational areas & public drinking water facilities

Name of Facility	*Location Address*	*Sector/ Miles*	*Map Locator*
North Perry Pk	Lockwood Rd	NE/0.7	1
N. Townline Pk	Townline Rd	ENE/2.3	10
Lake Metro Pk	Lockwood Rd	ENE/1.7	11
Camp Isaac Jogues	Chapel Rd	ENE/3.2	12
Tuttle Pk	Tuttle Park Rd	ENE/3.7	14
Madison C.C.	Chapel/Green Rd	ENE/4.0	15
Madison Village Water Plant	2934 Hubbard Rd	E/4.8	24
Lake County YMCA Outdoor Center	4540 River Rd	S/4.6	45
Fairway Pines Golf Course	Corner of Blase/ Nemeth and Bacon Rd	SW/4.8	56
Perry Township Pk	Perry Park Rd	WSW/1.1	58
Camp Roosevelt	Perry Park Rd	WSW/1.4	60
Lake County Water Treatment Plant	Bacon Rd	WSW/3.9	61

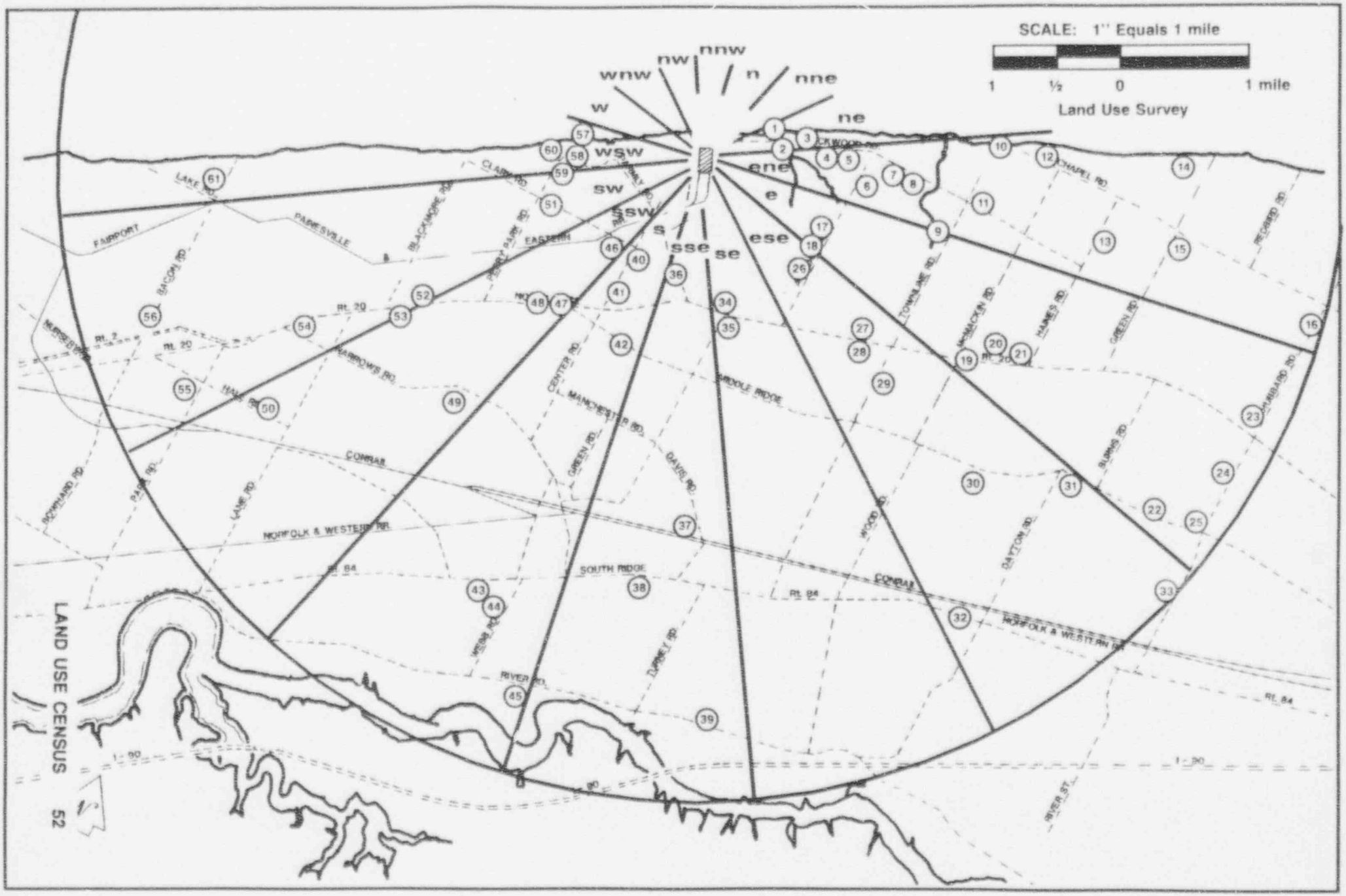


Figure 10: 1992 Land Use Census map.

CLAM/MUSSEL MONITORING

INTRODUCTION

Clam and mussel shells can clog plant piping and components that use raw water. For this reason, sampling for these benthic macroinvertebrates has been conducted in Lake Erie in the vicinity of the Perry Nuclear Power Plant (PNPP) since 1971. The clam/mussel program currently focuses on two species: *Corbicula fluminea* (Asiatic clam) and *Dreissena polymorpha* (zebra mussel).

The initial monitoring program specifically for *Corbicula* was developed by NUS Corporation for PNPP in response to an NRC bulletin and concerns of the Atomic Safety and Licensing Board. The current monitoring program was developed in conjunction with Aquatic Systems Corporation and incorporated into the Environmental Protection Plan (Operating License Appendix B) in July, 1988 by License Amendment 15. The program consists of periodic sampling of areas at both the PNPP and Eastlake Power Plants. Its purpose is to detect *Corbicula*, should it appear in the study area.

The *Dreissena* program began in 1989 with monitoring and testing. In 1990, a control program was designed and implemented. That program was continued in 1992.

CORBICULA PROGRAM

The Asiatic clam was first collected in the U.S. in 1938 in the Columbia River near Knappton, Washington. It has since spread across much of the country, infesting any suitable freshwater body. Asiatic clams have two characteristics that enhance their ability to foul power plant water systems. First, the microscopic larvae, or veliger, is easily entrained into water system piping and carried far into plant systems. Second, these clams are very hardy, their shells are extremely hard and they grow to approximately 65 mm. Clams can block the flow of water if they develop and grow inside plant piping or components.

Shortly after an Arkansas power plant experienced flow blockage related to fouling by Asiatic clams, the NRC issued Inspection and Enforcement Bulletin 81-03. This required PNPP to determine the population status of *Corbicula* in the local environment. Although no *Corbicula* were found, an ongoing monitoring program was initiated in June 1982, that called for semiannual sampling. The survey locations included the intake and discharge areas at both PNPP and the Eastlake Power Plant.

From program initiation through fall 1986, no *Corbicula* were found in any samples collected. Two *Corbicula* were found in a sample collected from the Eastlake plant in June, 1987. No *Corbicula* have been found in any other sample collected since that time. A more detailed program history can be found in the PNPP Annual Environmental Operating Reports, 1986 and 1987.

In July, 1988, the Nuclear Regulatory Commission approved a new monitoring program (License Amendment No. 15), which modified sampling locations at both plants. Samples are still collected from Lake Erie in the vicinity of the Eastlake Plant, but samples from PNPP are now collected from in-plant locations.

Monitoring

Samples were collected quarterly in 1992 from in-plant locations at PNPP shown in Figure 11, and semiannually from the vicinity of the Eastlake Power Plant at locations shown in Figure 12. Sample collection dates are listed in Table 11.

Table 11 - 1992 *Corbicula* Sampling Dates and Locations

Date	Sample Location
1/21	Service water (SW) and Emergency Service Water (ESW) forebays
4/7	Cooling Tower Basin
4/9	SW and ESW forebays and trash baskets
6/2	Lake Erie in the vicinity of the Eastlake Plant
7/7	SW and ESW forebays and trash baskets
9/14	Lake Erie in the vicinity of the Eastlake Plant
10/8	SW and ESW forebays and trash baskets
Weekly	Inspections of PNPP property shoreline, weather permitting

All samples were collected by Ponar hand dredge, hand scoop, or scraper. They were examined for bivalve shells and fragments, which were then identified to the lowest possible taxon.

In addition to sample collections, plant components that use raw water are inspected whenever open for maintenance or repair. Also, active communications were maintained with other agencies involved in benthic macroinvertebrate monitoring on Lake Erie. Representatives of other power plants were contacted as well as universities and the Ohio Department of Natural Resources.

Results

No Corbicula were found in any sample collected during the 1992 monitoring program. All bivalves collected are listed in Table 12.

Table 12 - Bivalves Collected During the 1992 *Corbicula* Monitoring Program

	PNPP	EASTLAKE
Dreissena polymorpha	X	X
Pisidium caeseratinum	X	X
Pisidium compressum	X	X
Sphaerium striatinum	X	
Sphaerium transversum	X	
Unionidae	X	
Pisidium amnicum	X	
Sphaerium corneum	X	
Sphaerium spp.		X

Conclusions

The collection in June, 1987 was the first indication that *Corbicula* are slowly spreading into the Central Basin of Lake Erie. However, it has not been demonstrated that the presence of these clams is creating any operational problems at the Eastlake Power Plant or at PNPP.

DREISSENA PROGRAM

Zebra mussels (*Dreissena polymorpha*) were introduced into Lake St. Clair in the mid-1980's. They have spread into all the Great Lakes and as far south as Vicksburg, MS. Zebra mussels have several characteristics that enhance their ability to reduce or block flow in systems that use raw water. First, the microscopic veliger stage is easily entrained into power

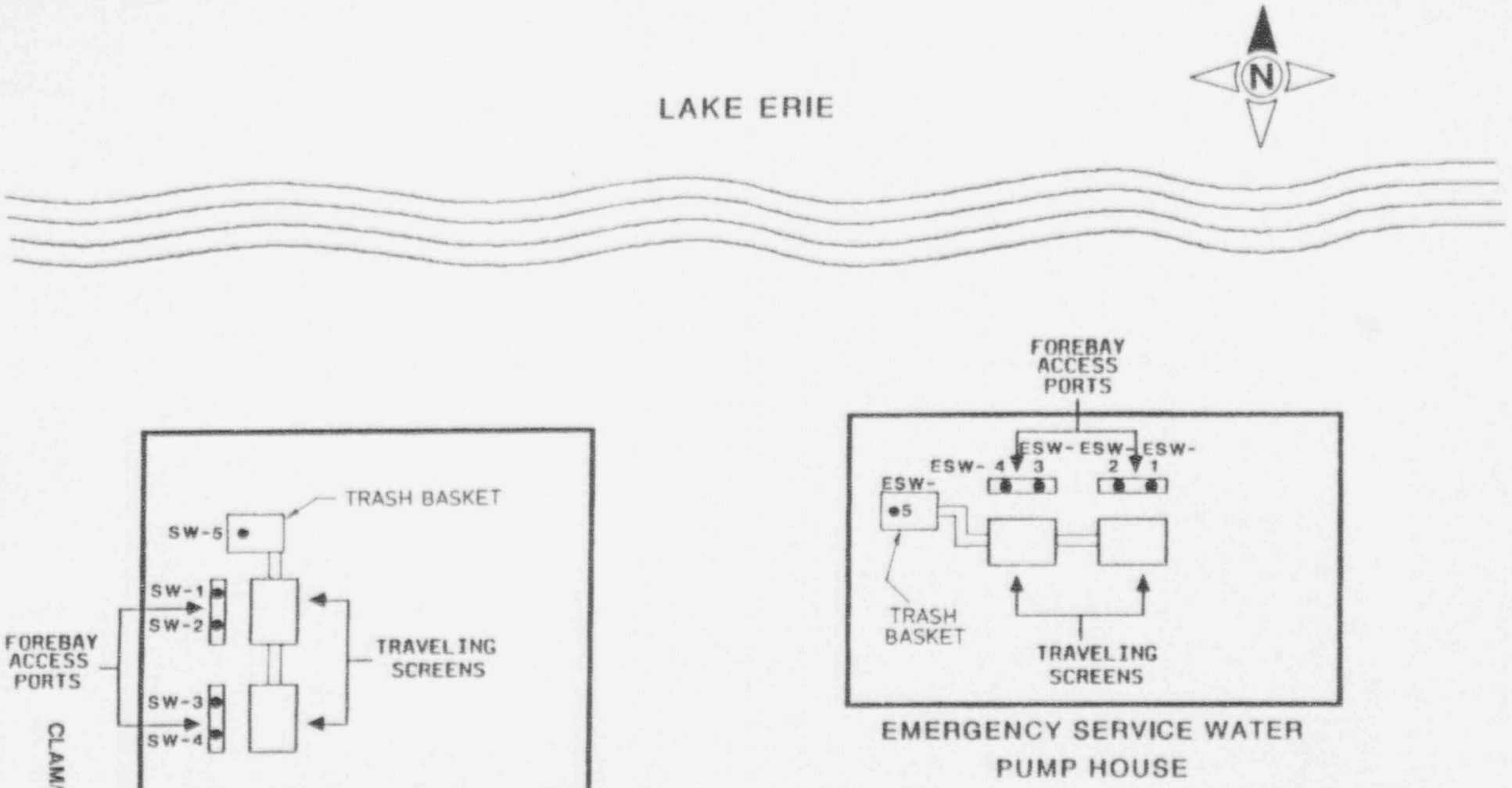
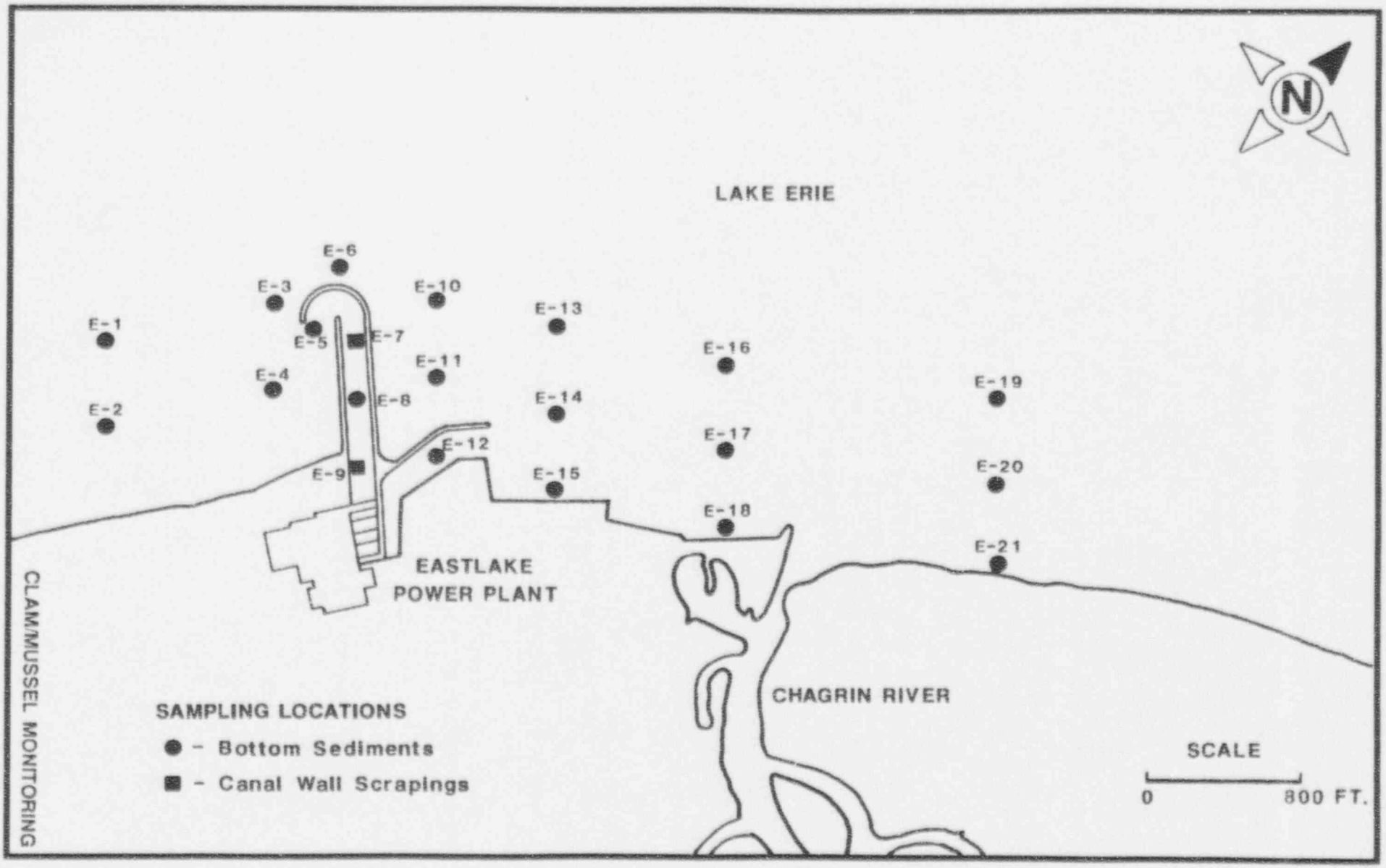


Figure 11: PNPP in-plant sampling locations.



GS16-2

Figure 12: Lake Erie sampling locations in the vicinity of the Eastlake Plant.

plant raw water systems. Second, zebra muscles develop a series of tough elastic fibers called a byssus. The byssus allows them to attach to any surface that is relatively smooth and hard, including the inner surfaces of any water system with velocities under 2 m/s (Lyakhov, 1968). Third, mussels will attach to other mussels, forming layers of accumulation up to 30 cm thick in large pipes (Clarke, 1952).

Three types of problems have been identified with zebra mussel fouling in power plant raw water systems. Initially, layers of attached mussels reduce or block flow through piping and intake trash racks. Eventually, shells or clumps of shells breaking free of their attachments block openings in downstream piping, heat exchangers, or strainers. Finally, attachment points accumulate other debris and serve as sites for corrosion.

Zebra mussels were first discovered at PNPP in September 1988. The initial collection of 19 mussels was made as part of the *Corbicula* monitoring program. Zebra mussels were found attached to the samplers which had been installed in the plant service water pumphouse. The samplers, constructed of plastic, wire mesh, and rope, were in place between May 1988 and the September collection.

By fall 1989, the zebra mussel population at PNPP had increased. Mussel densities in pumphouse forebays averaged approximately 1076/m^2. None were found on intake screens, though, and no operational problems were experienced. In February, 1990, a video was taken of the 30.5 m of the intake tunnel nearest the pumphouse. Mussel coverage was 100%, and roughly 2.5 to 3.8 cm thick. Subsequently, a zebra mussel program was implemented that included monitoring and treatment.

Monitoring

In addition to visually inspecting plant raw water systems when they are opened for maintenance or repair, monitoring methods include the use of commercial divers, artificial substrates, sidestream monitors, and plankton nets.

Commercial divers are currently used to collect mussel samples and monitor mussel infestation. They have also been used to take underwater videotapes of the water basins and intake tunnel. Artificial substrates include concrete blocks and plastic baskets suspended by rope into intakes or water basins. Substrates are kept in place all year and are designed so that they can be easily removed weekly for inspection for settlement.

Sidestream monitors are flow-through containers that receive water diverted from plant systems. PNPP uses them in four in-plant locations during the mussel season, May through October. They are fitted with slides and inspected weekly for veliger settlement. Vertical tows with a plankton net are used to obtain weekly samples of incoming service water that are subsequently examined for veligers.

Results of the veliger monitoring program for 1990 and 1991 are shown in Table 13. Samples were collected from the service water basin using vertical tows with an 80 micron mesh plankton net. Newly settled mussels were first detected in 1992 on August 14. Density at that time was 1/cm^2.

Treatment

Chemicals used for mussel control in 1992 included chlorine and a commercial molluscicide. The system provides chlorine to plant service water, emergency service water, and circulating water systems. It is important to note Sodium Sulfite is added to plant discharge water to dechlorinate it before it is discharged to Lake Erie.

Table 13 - Results of the 1992 Perry Nuclear Power Plant veliger sampling program.

Date	*#/liter*	*Temp (C)*
5/7	0	8.9
5/1	<1	11.1
5/28 to 7/2	0	8.9 to 14.4
7/9	122.6	19.4
7/16	2.2	21.1
7/23	4.4	19.4
7.30	94.7	21.1
8/6	51.6	21.0
8/13	30.1	21.4
8.20	56.6	20.9
8/27	121.6	22.5
9/3	97.6	20.4
9/10	38.7	20.6
9/17	130.5	20.6
9/24	19.9	17.8
10/01	<1	16.1
10.8	0	15.0

The use of commercial molluscicides requires approval of the Ohio Environmental Protection Agency (EPA). The chemical selected for use at Perry Nuclear Power Plant in 1992 was didecyl dimethyl ammonium chloride. A nine hour treatment was applied on Sept. 30, 1992 near the end of the settlement period. The active ingredients were detoxified by adsorption onto bentonite clay prior to discharge into Lake Erie.

Results

The effectiveness of the intermittent chlorination treatment has been determined in several ways. First, over 40 visual inspections of raw water system components were conducted in 1992. In addition, settlement monitors were inspected weekly for new settlement. No live settlement has been found in any plant component or in the settlement monitors to date.

The effectiveness of the application of the commercial molluscicide was first measured by observing mortality of mussels placed in a flow-through container of plant service water and subject to the chemical treatment. Two to three weeks after each treatment, divers inspect the service water basins and intake tunnel. Mortality observed both in the flow-through containers and in the system was 87%. To date, PNPP has had no problems related to zebra mussels.

Conclusions

Perry Nuclear Power Plant has taken the approach that the best method for avoiding problems with zebra mussels is early detection followed by preventative treatment of plant water systems. The current program of monitoring and chemical treatments will be continued to minimize the possibility that PNPP will experience problems due to zebra mussels in the future.

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AERIAL REMOTE SENSING

INTRODUCTION

Aerial remote sensing is a method of monitoring the plant area environment by examining photographs taken from an airplane. It is used in the vicinity of the Perry Plant to monitor for vegetative stress. Vegetative stress is any disturbance of the normal growth cycle of vegetation which results in changes in appearance. It can be caused by a variety of both natural and man-made factors including insect pests, disease agents, drought, pollution, mechanical damage, or salt deposition.

Salt deposition from the cooling tower plume would be the most likely cause of vegetative stress attributable to the Perry Plant. Solids (salts) dissolved in the lake water used in the cooling towers may be contained in the droplets that make up the plume from the cooling tower. As the droplets settle to the ground, the salts may accumulate either in soils or directly on foliage. Stress can then result from 1) the direct toxic effects of the salt, 2) a decrease in the availability of soil moisture to the plant, or 3) altering the mineral balance in the plant tissues.

Aerial remote sensing has been conducted at Perry regularly as a requirement of the Environmental Protection Plan (Appendix B to the Operating License). It was first conducted in 1987 and followed in 1988, 1990 and 1992. The final year of the study will be 1994.

PROGRAM

In order to determine whether the operation of the Perry Plant cooling tower has impacted the surrounding vegetation, the site and vicinity within one kilometer of the cooling towers in all directions were aerially photographed to detect and assess the significance of damage (or lack of damage). The photography was done by aerial overflight on August 5, 1992 (details are listed in Table 14, flight lines are shown in Figure 13).

Table 14: Details of the 1992 photomission

Item	*Data*
Date	5 August 1992
Time	1102 to 1157 Eastern Daylight Savings Time
Film Type	Aerochrome Infrared 2443
Weather	Clear
Altitude	914 m (3000 ft) above ground level
Camera/lens model	Jena MRB 15/2323
Camera Focal Length	152.022 mm
Filter	Yellow
Shutter Speed	1/300 second
Aperture	f 5.6
Scale	1 cm = 600 m (1 in. = 500 ft.)

Low altitude color infrared photography is used in order to allow potentially stressed vegetation to be identified. Healthy green plant tissue is a strong absorber of visible light. It appears as red on the infrared film. Stressed areas can be identified by observing different hues on the photographs as well as noting changes in patterns or textural characteristics.

Once developed, photgraphs were inspected to check for quality of color and resolution, and to identify those areas where the need for more detailed inspection was necessary. They were also compared to previous years' studies to determine whether there were any significant changes.

Areas identified for further inspection were located on maps and compared to the areas where maximum deposition was expected to occur (see Figure 14). They were then compared to previous years' data, and "ground truthed", or walked down and inspected, if necessary.

RESULTS

There has been no adverse environmental impact from the operation of the cooling tower at the Perry Plant.

Eleven areas were identified as showing variations in spectral signatures (see Figure 12). None of these locations occurred within the areas predicted to receive maximum deposition. Photos were compared to 1990 photos for all locations exibiting potential stress. Areas where a difference between 1990 and 1992 was noted were ground truthed. Historical data was used in lieu of ground truthing for for areas which had been ground truthed in previous years.

The variations in spectral signature in the eleven areas identified in the 1992 study were attributable to a variety of factors:

- stress due to wind damage and root exposure in trees along the lakeshore
- variations in species composition in the arboreal canopy (different species reflect light differently, which results in different shades on the infrared photographs)
- arboreal mortality due to over maturity
- arboreal mortality due to selective cutting
- fungal disease increased by the wet and humid weather conditions this growing season
- aphid infestation

ANALYSIS OF IMPACTS

Historically, the vegetative stress that has been observed in the vicinity of the Perry Plant has been attributable to factors unrelated to the operation of the cooling tower. This remains true for 1992.

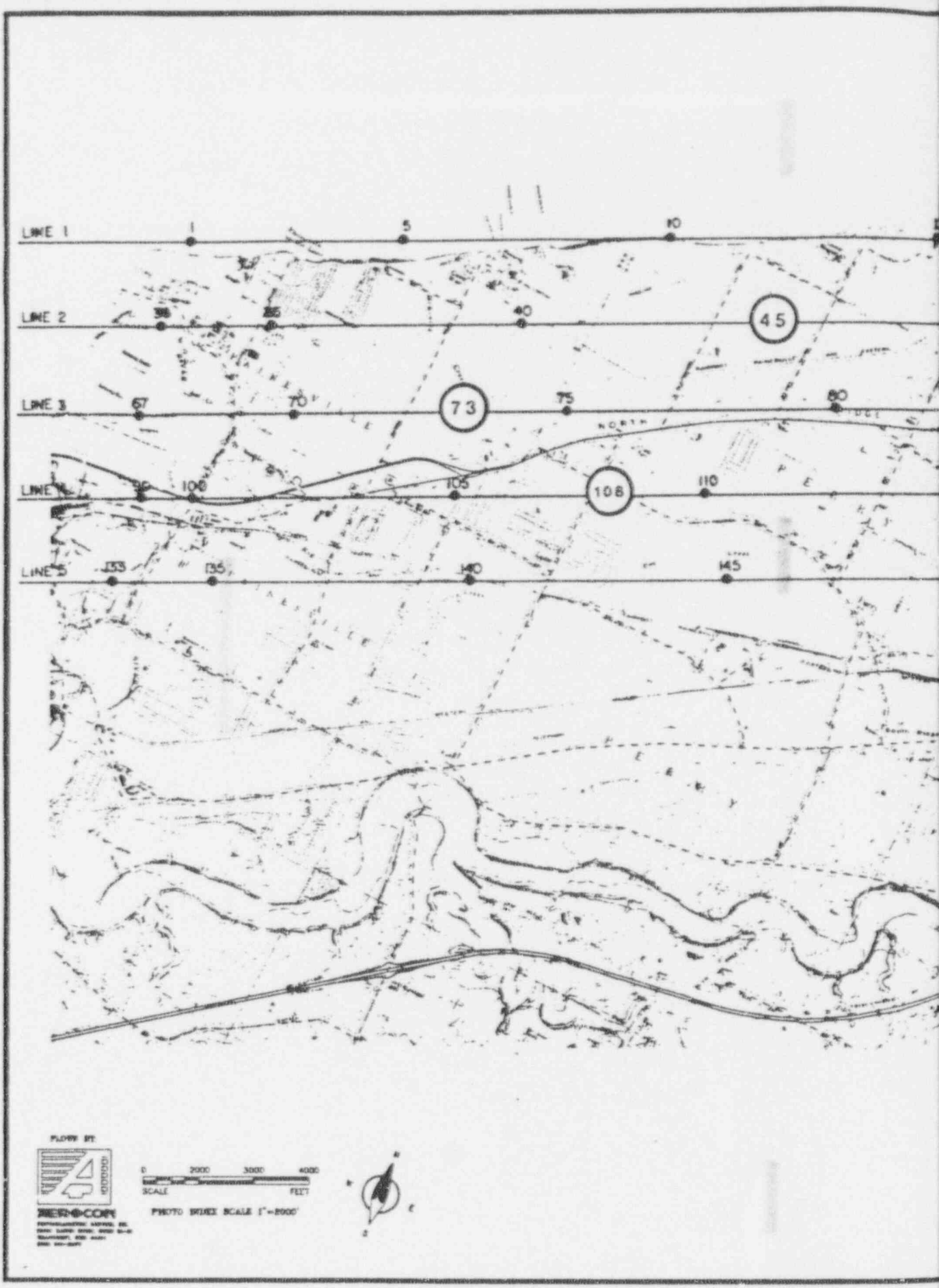
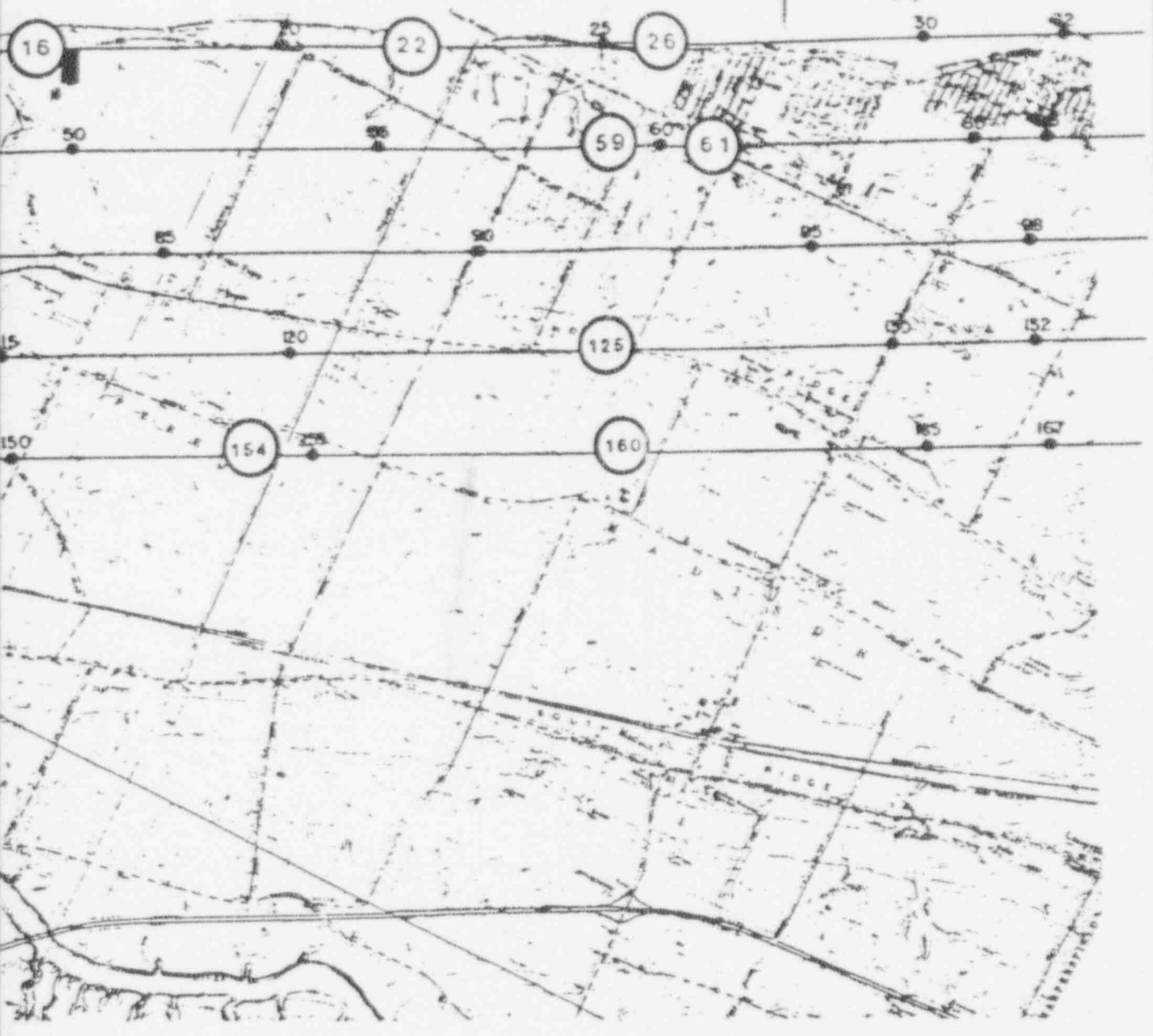


Figure 13: Flight lines and ground truthed locations for the 1992 ae



CLEVELAND ELECTRIC ILLUMINATING CO.

PERRY NUCLEAR PLANT

CAMERA USED	
FLYING HEIGHT	
PHOTOGRAPHIC SCALE	
DATE OF PHOTOGRAPHY	
FOCAL LENGTH	
PHOTO PRINT SCALE	

remote sensing program.

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
14	TLD	920110/920402	12.00+/-.40
14	TLD	920402/920701	14.20+/-.30
14	TLD	920701/921001	11.60+/-.50
14	TLD	921001/930107	15.40+/-.20
15	TLD	920110/920402	13.30+/-.40
15	TLD	920402/920701	13.60+/-.30
15	TLD	920701/921001	13.20+/-.50
15	TLD	921001/930107	14.20+/-.50
16	TLD	920110/920402	16.10+/-.40
16	TLD	920402/920701	19.90+/-1.20
16	TLD	920701/921001	17.40+/-.60
16	TLD	921001/930107	18.60+/-.40
17	TLD	920110/920402	16.20+/-.90
17	TLD	920402/920701	18.70+/-1.20
17	TLD	920701/921001	16.90+/-.50
17	TLD	921001/930107	18.60+/-.20
18	TLD	920110/920402	21.40+/-.40
18	TLD	920402/920701	23.90+/-.70
18	TLD	920701/921001	21.70+/-.40
18	TLD	921001/930107	24.30+/-.40
19	TLD	920110/920402	14.90+/-.10
19	TLD	920402/920701	16.80+/-.50
19	TLD	920701/921001	15.50+/-.70
19	TLD	921001/930107	17.50+/-.50
20	TLD	920110/920402	15.50+/-.20
20	TLD	920402/920701	16.50+/-.50
20	TLD	920701/921001	15.60+/-.40

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
20	TLD	921001/930107	19.20+/-.30
21	TLD	920110/920402	16.10+/-.50
21	TLD	920402/920701	16.50+/-.50
21	TLD	920701/921001	21.60+/-.80
21	TLD	921001/930107	17.00+/-.40
22	TLD	920110/920402	14.80+/-.50
22	TLD	920402/920701	16.50+/-.50
22	TLD	920701/921001	16.00+/-.60
22	TLD	921001/930107	17.40+/-.30
23	TLD	920110/920402	17.30+/-.90
23	TLD	920402/920701	16.20+/-.70
23	TLD	920701/921001	17.70+/-.50
23	TLD	921001/930107	17.40+/-.20
24	TLD	920110/920402	14.00+/-.50
24	TLD	920402/920701	15.40+/-.40
24	TLD	920701/921001	13.40+/-.10
24	TLD	921001/930107	17.10+/-.30
35	TLD	920110/920402	12.00+/-.30
35	TLD	920402/920701	13.20+/-.30
35	TLD	920701/921001	12.70+/-.40
35	TLD	921001/930107	14.20+/-.20
36	TLD	920110/920402	15.60+/-.20
36	TLD	920402/920701	20.00+/-.40
36	TLD	920701/921001	16.40+/-.50
36	TLD	921001/930107	18.80+/-.40

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
01	TLD	920110/920402	13.10+/-.50
01	TLD	920402/920701	14.10+/-.40
01	TLD	920701/921001	13.00+/-.70
01	TLD	921001/930107	13.90+/-.20
02	TLD	920110/920402	11.90+/-.50
02	TLD	920402/920701	13.90+/-.50
02	TLD	920701/921001	12.10+/-.50
02	TLD	921001/930107	13.80+/-.20
03	TLD	920110/920402	13.90+/-.30
03	TLD	920402/920701	15.40+/-1.10
03	TLD	920701/921001	13.40+/-.60
03	TLD	921001/930107	15.10+/-.20
04	TLD	920110/920402	14.20+/-.20
04	TLD	920402/920701	14.80+/-.40
04	TLD	920701/921001	14.40+/-.50
04	TLD	921001/930107	16.50+/-.30
05	TLD	920110/920402	13.90+/-.80
05	TLD	920402/920701	14.10+/-.50
05	TLD	920701/921001	14.20+/-.50
05	TLD	921001/930107	13.40+/-.60
06	TLD	920110/920402	12.30+/-.50
06	TLD	920402/920701	14.30+/-.40
06	TLD	920701/921001	16.60+/-.60
06	TLD	921001/930107	16.40+/-.40
07	TLD	920110/920402	14.40+/-.10
07	TLD	920402/920701	15.40+/-1.30
07	TLD	920701/921001	14.60+/-.50

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
07	TLD	921001/930107	15.10+/-.30
08	TLD	920110/920402	12.40+/-.40
08	TLD	920402/920701	12.60+/-.50
08	TLD	920701/921001	12.90+/-.60
08	TLD	921001/930107	12.40+/-.30
09	TLD	920110/920402	11.60+/-.30
09	TLD	920402/920701	12.20+/-.30
09	TLD	920701/921001	12.20+/-.40
09	TLD	921001/930107	13.10+/-.50
10	TLD	920110/920402	16.20+/-.60
10	TLD	920402/920701	16.50+/-.40
10	TLD	920701/921001	13.40+/-.40
10	TLD	921001/930107	17.70+/-.30
11	TLD	920110/920402	12.50+/-.40
11	TLD	920402/920701	12.40+/-.40
11	TLD	920701/921001	13.00+/-.50
11	TLD	921001/930107	13.10+/-.40
12	TLD	920110/920402	11.60+/-.40
12	TLD	920402/920701	14.10+/-.40
12	TLD	920701/921001	12.50+/-.60
12	TLD	921001/930107	15.00+/-.20
13	TLD	920110/920402	11.40+/-.20
13	TLD	920402/920701	14.30+/-.60
13	TLD	920701/921001	11.40+/-.50
13	TLD	921001/930107	14.80+/-.20

GAMMA SPEC REPORT OF SED
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG(DRY) +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134	CS-137	K-40	CO-58	CO-60
25	SEDIMENT	920519/920519	LT 46.8	109.0+/-21.0	14500.0+/-585.0	LT 33.7	LT 33.8
25	SEDIMENT	921020/921020	LT 38.4	168.0+/-16.0	1570.0+/-452.0	LT 33.7	LT 32.2
26	SEDIMENT	920519/920519	LT 41.5	275.0+/-23.0	16200.0+/-555.0	LT 27.9	LT 29.9
26	SEDIMENT	921022/921022	LT 29.4	317.0+/-53.0	1582.0+/-804.0	LT 43.1	LT 48.4
27	SEDIMENT	920519/920519	LT 26.2	209.0+/-15.0	15900.0+/-463.0	LT 21.4	LT 23.9
27	SEDIMENT	921022/921022	LT 37.6	289.0+/-25.0	1540.0+/-639.0	LT 26.1	LT 38.4
32	SEDIMENT	920519/920519	LT 32.8	864.0+/-30.0	15500.0+/-575.0	LT 33.5	LT 32.4
32	SEDIMENT	921022/921022	LT 29.0	790.0+/-42.0	1645.0+/-864.0	LT 46.7	LT 43.3
63	SEDIMENT	920520/920520	LT 58.4	LT 58.7	20170.0+/-1257.0	LT 67.7	LT 87.2
63	SEDIMENT	921029/921029	LT 32.7	LT 20.9	10400.0+/-476.0	LT 24.0	LT 28.7
64	SEDIMENT	920520/920520	LT 19.8	LT 20.7	9114.0+/-350.0	LT 22.2	LT 30.6
64	SEDIMENT	921029/921029	LT 21.4	LT 21.0	6383.0+/-527.0	LT 27.1	LT 30.8
65	SEDIMENT	920520/920520	LT 67.6	LT 70.9	21450.0+/-151.0	LT 82.3	LT 70.9
65	SEDIMENT	921029/921029	LT 26.0	LT 21.3	5960.0+/-441.0	LT 23.0	LT 30.7
76	SEDIMENT	920302/920302	LT 76.9	225.3+/-88.9		LT 96.2	833.2+/-153.6
76	SEDIMENT	921215/921215		165.0+/-68.0	14000.0+/-1620.0		809.0+/-120.0

STRONTIUM REPORT
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	SR-89	SR-90
25	SEDIMENT	920519/920519	LT 17.7	LT 7.3
25	SEDIMENT	921020/921020	LT 29.6	13.40+/-3.40
26	SEDIMENT	920519/920519	LT 18.4	14.40+/-5.90
26	SEDIMENT	921022/921022	LT 35.1	21.00+/-8.60
27	SEDIMENT	920519/920519	LT 31.2	18.90+/-9.00
27	SEDIMENT	921022/921022	LT 21.3	11.40+/-5.20
32	SEDIMENT	920519/920519	LT 19.7	23.30+/-6.90
32	SEDIMENT	921022/921022	LT 40.9	39.00+/-11.60
63	SEDIMENT	920520/920520	LT 31.8	LT 10.7
64	SEDIMENT	920520/920520	LT 16.0	12.00+/-4.80
65	SEDIMENT	920520/920520	LT 30.2	18.80+/-8.90

GAMMA SPEC REPORT OF FSH
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG(WET) +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CO-58 MN-54	CO-60 K-40	CS-134 ZN-65	CS-137	FE-59
25	WHITE SUCKER	920520/920520	LT 19.6 LT 15.7	LT 22.2 2310.0+/-323	LT 13.3 LT 16.1	LT 14.8	LT 52.7
25	WHITE PERCH	920520/920520	LT 21.2 LT 18.5	LT 23.5 2730.0+/-381.0	LT 17.1 LT 44.7	LT 17.4	LT 43.3
25	YELLOW PERCH	920520/920520	LT 17.1 LT 13.4	LT 14.2 2660.0+/-282.0	LT 14.7 LT 39.0	LT 13.6	LT 35.5
25	WALLEYE	920520/920520	LT 23.5 LT 20.0	LT 27.0 2893.0+/-426.0	LT 18.0 LT 58.8	LT 20.3	LT 68.0
25	SMALLMOUTH BASS	920520/920520	LT 42.2 LT 45.4	LT 35.1 1643.0+/-540.0	LT 27.7 LT 75.4	LT 31.8	LT 88.6
25	FRESHWATER DRUM	920520/920520	LT 20.8 LT 24.3	LT 22.1 2588.0+/-437.0	LT 15.9 LT 57.2	LT 20.8	LT 57.2
25	YELLOW PERCH	921022/921022	LT 32.3 LT 22.1	LT 23.3 2610.0+/-331.0	LT 19.1 LT 58.0	LT 21.1	LT 93.8
25	WHITE PERCH	921022/921022	LT 27.6 LT 17.8	LT 17.2 632.0+/-297.0	LT 13.4 LT 41.3	LT 17.6	LT 82.2
25	WHITE SUCKER	921022/921022	LT 31.2 LT 21.7	LT 19.6 2330.0+/-387.0	LT 18.8 LT 50.3	LT 17.2	LT 86.5
25	CARP	921022/921022	LT 25.1 LT 17.1	LT 20.3 2540.0+/-272.0	LT 14.4 LT 44.5	LT 14.7	LT 79.6
25	RAINBOW TROUT	921022/921022	LT 31.3 LT 20.7	LT 25.2 2020.0+/-428.0	LT 15.5 LT 59.2	LT 23.3	LT 10.3
25	SMALLMOUTH BASS	921022/921022	LT 40.1 LT 32.9	LT 29.9 3154.0+/-383.0	LT 24.4 LT 68.4	LT 29.8	LT 14.9
25	WHITE BASS	921022/921022	LT 62.0 LT 40.3	LT 33.3 772.0+/-755.0	LT 32.9 LT 89.8	LT 33.2	LT 198.1
25	SHAD	921022/921022	LT 44.1 LT 33.8	LT 34.4 2889.0+/-428.0	LT 25.6 LT 69.8	LT 27.3	LT 145.6
25	CATFISH	921022/921022	LT 17.5 LT 13.1	LT 13.7 1130.0+/-408.0	LT 11.7 LT 31.1	LT 9.6	LT 41.6
25	FRESHWATER DRUM	921022/921022	LT 41.2 LT 31.3	LT 34.1 3036.0+/-400.0	LT 25.5 LT 73.6	LT 30.4	LT 13.0
25	RED HORSE	921022/921022	LT 34.5 LT 25.6	LT 30.8 1953.0+/-435.0	LT 14.6 LT 60.6	LT 18.9	LT 12.7
25	WALLEYE	921022/921022	LT 48.9 LT 27.6	LT 29.1 2818.0+/-553.0	LT 26.1 LT 81.1	LT 34.1	LT 14.0
32	WALLEYE	920520/920520	LT 16.3 LT 13.4	LT 14.8 2950.0+/-286.0	LT 12.7 LT 36.2	LT 12.7	LT 35.0

GAMMA SPEC REPORT OF FSH
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG(WET) +/- 2 SIGMA

STATION LOCAT	SAMPLE TYPE	COLLECTION DATE	CO-58 MN-54	CO-60 K-40	CS-134 ZN-65	CS-137	FE-59
32	YELLOW PERCH	920520/920520	LT 7.7 LT 5.8	LT 5.7 2200.0+/-110.0	LT 5.8 LT 16.1	LT 5.3	LT 20.7
32	WHITE SUCKER	920520/920520	LT 17.8 LT 16.9	LT 16.1 2110.0+/-321.0	LT 15.2 LT 39.9	LT 14.6	LT 46.6
32	WHITE PERCH	920520/920520	LT 16.0 LT 17.6	LT 20.8 2440.0+/-367.0	LT 16.0 LT 52.2	LT 18.5	LT 52.6
32	SMALLMOUTH BASS	920520/920520	LT 29.6 LT 30.8	LT 33.1 3659.0+/-472.0	LT 25.8 LT 65.6	26.8+/-18.7	LT 78.4
32	FRESHWATER DRUM	920520/920520	LT 16.7 LT 14.6	LT 16.6 2000.0+/-270.0	LT 11.7 LT 39.6	LT 16.8	LT 51.9
32	RAINBOW TROUT	921022/921022	LT 37.0 LT 25.3	LT 26.4 1830.0+/-322.0	LT 21.5 LT 58.4	LT 22.5	LT 103.0
32	WALLEYE	921022/921022	LT 33.5 LT 23.1	LT 23.1 2977.0+/-510.0	LT 18.2 LT 62.6	LT 24.0	LT 115.9
32	CARP	921022/921022	LT 9.6 LT 8.1	LT 7.9 2280.0+/-374.0	LT 6.7 LT 22.3	LT 7.4	LT 38.0
32	WHITE PERCH	921022/921022	LT 31.7 LT 17.1	LT 25.2 2715.0+/-451.0	LT 14.3 LT 50.4	LT 15.4	LT 81.4
32	WHITE SUCKER	921022/921022	LT 41.9 LT 20.6	LT 18.1 2949.0+/-527.0	LT 21.2 LT 61.0	LT 20.7	LT 129.9
32	YELLOW PERCH	921022/921022	LT 47.8 LT 34.6	LT 35.3 3237.0+/-478.0	LT 24.3 LT 74.3	LT 28.6	LT 16.1
32	FRESHWATER DRUM	921022/921022	LT 37.3 LT 27.9	LT 27.3 1600.0+/-316.0	LT 22.5 LT 63.6	LT 23.7	LT 110.0
32	WHITE BASS	921022/921022	LT 22.6 LT 16.9	LT 23.8 2460.0+/-340.0	LT 15.1 LT 46.0	LT 14.9	LT 72.2
32	RED HORSE	921022/921022	LT 29.0 LT 15.6	LT 23.9 2230.0+/-313.0	LT 15.0 LT 50.2	LT 15.7	LT 80.2

TRITIUM REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	H3
28	WATER	911230/920326	234.00+/-97.00
28	WATER	920326/920625	187.00+/-92.00
28	WATER	920625/920925	123.00+/-63.00
28	WATER	920925/921228	147.00+/-62.00
34	WATER	911230/920326	211.00+/-96.00
34	WATER	920326/920625	175.00+/-91.00
34	WATER	920625/920925	LT 168.00
34	WATER	920925/921228	162.00+/-88.00
36	WATER	911230/920326	221.00+/-68.00
36	WATER	920326/920625	143.00+/-90.00
36	WATER	920625/920925	142.00+/-89.00
36	WATER	920925/921228	LT 164.00
59	WATER	920102/920326	255.00+/-97.00
59	WATER	920402/920625	187.00+/-92.00
59	WATER	920702/920925	217.00+/-92.00
59	WATER	921001/921228	125.00+/-87.00
60	WATER	920102/920326	264.00+/-98.00
60	WATER	920402/920625	153.00+/-90.00
60	WATER	920702/920925	199.00+/-92.00
60	WATER	921001/921228	164.00+/-88.00

GAMMA SPEC REPORT OF STRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	SR-89	SR-90
28	WATER	920227/920326	LT .8	LT .5
28	WATER	920326/920430	LT .8	LT .5
28	WATER	920430/920528	LT 1.0	LT .6
28	WATER	920730/920827	LT .7	LT .3
28	WATER	921130/921130	LT .7	LT .5
34	WATER	920227/920326	LT .7	LT .4
34	WATER	920326/920430	LT .7	.50+/-.30
34	WATER	920430/920528	LT .9	LT .5
34	WATER	920730/920827	LT .6	.50+/-.20
34	WATER	921030/921130	LT .6	.60+/-.30
36	WATER	920227/920326	LT .6	.70+/-.30
36	WATER	920326/920430	LT .8	.60+/-.30
36	WATER	920430/920528	LT 1.0	LT .6
36	WATER	920730/920827	LT 1.0	LT .5
36	WATER	921030/921130	LT .7	.70+/-.30
59	WATER	920312/920326	LT .5	LT .5
59	WATER	920402/920430	LT .6	.40+/-.20
59	WATER	920507/920528	LT .9	.60+/-.40
59	WATER	920806/920827	LT 1.5	LT .5
59	WATER	921105/921130	LT .7	.60+/-.30
60	WATER	920312/920326	LT .7	LT .4
60	WATER	920402/920430	LT .8	.80+/-.40
60	WATER	920507/920528	LT .8	.70+/-.40
60	WATER	920806/920827	LT 1.1	LT .5
60	WATER	921105/921130	LT .7	.70+/-.30

GAMMA SPEC REPORT OF WTRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
59	WATER	920102/920130	LT 23.70 LT 9.40 LT 8.30	LT 5.10 LT 6.00	LT 4.60 LT 4.50	LT 4.40 LT 5.00	LT 4.40 LT 10.20
59	WATER	920312/920326	LT 27.80 LT 8.40 LT 8.90	LT 4.30 LT 8.10	LT 4.30 LT 4.70	LT 4.30 LT 5.20	LT 4.30 LT 11.10
59	WATER	920402/920430	LT 25.00 LT 10.40 LT 8.80	LT 5.20 LT 9.00	LT 4.30 LT 4.60	LT 4.60 LT 6.30	LT 4.20 LT 11.40
59	WATER	920507/920528	LT 33.60 LT 8.40 LT 8.00	LT 4.20 LT 10.00	LT 3.70 LT 3.50	LT 3.50 LT 5.20	LT 3.60 LT 8.40
59	WATER	920604/920625	LT 28.80 LT 9.50 LT 7.90	LT 4.80 LT 9.60	LT 4.50 LT 4.50	LT 5.40 LT 5.50	LT 4.60 LT 10.80
59	WATER	920702/920730	LT 29.40 LT 9.30 LT 6.90	LT 4.50 LT 8.20	LT 3.80 LT 3.50	LT 4.40 LT 4.70	LT 3.80 LT 8.70
59	WATER	920806/920827	LT 30.90 LT 13.30 LT 6.80	LT 5.20 LT 6.90	LT 4.10 LT 5.30	LT 4.10 LT 5.90	LT 4.30 LT 10.40
59	WATER	920903/920925	LT 43.30 LT 12.80 LT 8.60	LT 5.00 LT 9.50	LT 4.60 LT 5.20	LT 3.90 LT 6.20	LT 4.10 LT 10.20
59	WATER	921001/921030	LT 35.00 LT 10.30 LT 9.20	LT 5.60 LT 9.30	LT 4.30 LT 4.70	LT 5.60 LT 6.10	LT 4.40 LT 10.50
59	WATER	921105/921130	LT 28.10 LT 8.30 LT 6.90	LT 3.80 LT 9.70	LT 4.00 LT 4.00	LT 4.30 LT 4.70	LT 3.60 LT 9.10
59	WATER	921204/921228	LT 38.20 LT 10.80 LT 7.90	LT 4.50 LT 9.80	LT 4.50 LT 3.80	LT 3.50 LT 6.20	LT 4.80 LT 7.70
60	WATER	920102/920130	LT 14.10 LT 5.70 LT 4.80	LT 2.70 LT 4.20	LT 2.60 LT 2.80	LT 2.60 LT 2.80	LT 2.50 LT 5.60

GAMMA SPEC REPORT OF WTRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
60	WATER	920312/920326	LT 14.10 LT 8.70 LT 8.20	LT 4.80 LT 4.40	LT 4.40 LT 4.60	LT 4.10 LT 4.90	LT 4.50 LT 10.50
60	WATER	920402/920430	LT 24.80 LT 10.80 LT 8.80	LT 5.20 LT 7.20	LT 6.00 LT 4.80	LT 4.70 LT 5.40	LT 5.20 LT 10.80
60	WATER	920507/920528	LT 22.90 LT 5.80 LT 4.90	LT 2.50 LT 6.70	LT 2.20 LT 2.20	LT 2.20 LT 3.20	LT 2.20 LT 5.00
60	WATER	920604/920625	LT 29.40 LT 10.70 LT 8.90	LT 4.80 LT 6.80	LT 5.80 LT 5.20	LT 3.60 LT 5.40	LT 4.90 LT 10.40
60	WATER	920702/920730	LT 18.60 LT 12.70 LT 7.00	LT 4.50 LT 5.40	LT 3.90 LT 4.30	LT 3.60 LT 5.00	LT 3.80 LT 6.30
60	WATER	920806/920827	LT 28.60 LT 10.40 LT 7.90	LT 4.60 LT 10.40	LT 4.40 LT 4.40	LT 4.10 LT 5.30	LT 4.20 LT 9.60
60	WATER	920903/920925	LT 38.00 LT 11.50 LT 8.90	LT 4.50 LT 7.80	LT 4.20 LT 4.50	LT 3.70 LT 6.50	LT 3.50 LT 9.90
60	WATER	921001/921030	LT 33.20 LT 12.10 LT 8.60	LT 4.50 LT 6.80	LT 3.80 LT 5.10	LT 3.80 LT 5.90	LT 3.70 LT 8.80
60	WATER	921105/921130	LT 29.00 LT 9.00 LT 5.70	LT 3.70 LT 10.20	LT 3.80 LT 3.40	LT 4.00 LT 4.30	LT 3.60 LT 9.50
60	WATER	921204/921228	LT 29.50 LT 10.70 LT 9.40	LT 4.70 LT 9.60	LT 5.20 LT 4.70	LT 4.10 LT 5.20	LT 4.30 LT 10.70

GAMMA SPEC REPORT OF WTRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
34	WATER	911230/920130	LT 16.30 LT 8.30 LT 6.20	LT 3.40 LT 6.40	LT 4.00 LT 3.60	LT 3.20 LT 3.90	LT 3.30 LT 9.30
34	WATER	920130/920227	LT 26.10 LT 8.40 LT 9.30	LT 5.00 LT 7.90	LT 4.50 LT 4.40	LT 4.60 LT 5.20	LT 5.00 LT 8.30
34	WATER	920227/920326	LT 26.80 LT 8.70 LT 8.00	LT 4.60 LT 6.20	LT 3.90 LT 4.60	LT 3.30 LT 4.70	LT 3.30 LT 8.10
34	WATER	920326/920430	LT 28.60 LT 9.60 LT 7.50	LT 4.70 LT 5.20	LT 3.60 LT 4.40	LT 3.80 LT 4.90	LT 3.40 LT 7.20
34	WATER	920430/920528	LT 19.90 LT 6.20 LT 4.40	LT 2.50 LT 8.40	LT 2.90 LT 2.20	LT 2.00 LT 3.00	LT 2.20 LT 5.50
34	WATER	920528/920625	LT 27.50 LT 10.80 LT 7.20	LT 4.70 LT 6.60	LT 2.70 LT 4.40	LT 3.50 LT 4.60	LT 4.60 LT 8.60
34	WATER	920625/920730	LT 29.00 LT 11.60 LT 8.40	LT 4.50 LT 9.60	LT 4.00 LT 4.00	LT 4.50 LT 5.40	LT 4.40 LT 10.70
34	WATER	920730/920827	LT 30.40 LT 10.90 LT 9.30	LT 4.80 LT 7.80	LT 3.90 LT 4.90	LT 4.10 LT 5.30	LT 4.00 LT 10.00
34	WATER	920827/920925	LT 31.70 LT 12.10 LT 8.80	LT 4.30 LT 7.00	LT 4.00 LT 5.10	LT 3.50 LT 5.30	LT 3.90 LT 8.20
34	WATER	920925/921030	LT 31.40 LT 9.80 LT 8.20	LT 4.70 LT 9.00	LT 4.00 LT 4.40	LT 4.40 LT 5.20	LT 4.20 LT 9.60
34	WATER	921030/921130	LT 36.30 LT 10.70 LT 8.50	LT 4.10 LT 9.40	LT 3.40 LT 3.00	LT 3.40 LT 4.80	LT 3.80 LT 7.50
34	WATER	921130/921228	LT 21.40 LT 5.50 LT 4.40	LT 2.50 LT 7.00	LT 2.50 LT 2.30	LT 2.20 LT 2.90	LT 2.20 LT 4.80

GAMMA SPEC REPORT OF WTRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
36	WATER	911230/920130	LT 20.10 LT 8.00 LT 8.10	LT 3.90 LT 4.50	LT 3.00 LT 3.90	LT 3.60 LT 4.30	LT 3.90 LT 7.70
36	WATER	920130/920227	LT 24.60 LT 8.30 LT 8.20	LT 5.20 LT 6.40	LT 4.40 LT 4.60	LT 4.60 LT 4.80	LT 4.80 LT 10.90
36	WATER	920227/920326	LT 24.10 LT 8.10 LT 7.30	LT 4.70 LT 7.30	LT 4.30 LT 4.30	LT 4.60 LT 4.20	LT 4.20 LT 10.70
36	WATER	920326/920430	LT 24.60 LT 9.50 LT 8.60	LT 4.50 LT 7.10	LT 5.20 LT 4.60	LT 4.20 LT 4.80	LT 4.70 LT 9.80
36	WATER	920430/920528	LT 22.60 LT 7.50 LT 4.60	LT 2.80 LT 5.20	LT 2.50 LT 2.70	LT 1.90 LT 2.80	LT 2.40 LT 5.00
36	WATER	920528/920625	LT 28.20 LT 9.60 LT 8.90	LT 5.60 LT 5.40	LT 4.10 LT 5.10	LT 4.00 LT 5.40	LT 4.70 LT 8.40
36	WATER	920625/920730	LT 32.60 LT 10.50 LT 7.80	LT 4.30 LT 9.20	LT 3.80 LT 4.50	LT 4.70 LT 5.30	LT 4.50 LT 8.70
36	WATER	920730/920827	LT 40.10 LT 11.00 LT 8.30	LT 4.90 LT 3.60	LT 4.30 LT 5.30	LT 3.60 LT 6.20	LT 3.90 LT 8.80
36	WATER	920827/920925	LT 40.20 LT 13.50 LT 10.10	LT 4.80 LT 9.40	LT 3.70 LT 5.50	LT 3.60 LT 6.10	LT 3.60 LT 9.80
36	WATER	920925/921030	LT 35.00 LT 13.40 LT 10.80	LT 6.20 LT 9.50	LT 4.30 LT 4.20	LT 4.20 LT 5.50	LT 4.80 LT 7.20
36	WATER	921030/921130	LT 31.00 LT 9.40 LT 7.50	LT 4.10 LT 9.60	LT 4.40 LT 4.00	LT 3.90 LT 5.00	LT 4.10 LT 9.40
36	WATER	921130/921228	LT 29.90 LT 10.00 LT 7.80	LT 3.80 LT 6.50	LT 3.30 LT 3.50	LT 3.40 LT 4.20	LT 4.10 LT 7.30

G-BETA WATER REPORT
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

COLLECTION PERIOD	STATION LOCATIONS				
	28	34	36	59	60
JAN 911230 TO 920130	01.50+/-.60	01.60+/-.60	01.90+/-.60	01.90+/-.60	02.50+/-.70
FEB 920130 TO 920227	03.10+/-.70	02.20+/-.60	02.80+/-.70		
MAR 920227 TO 920326	03.60+/-.40	02.10+/-.20	02.90+/-.40	02.70+/-.30	02.80+/-.40
APR 920326 TO 920430	02.20+/-.50	01.40+/-.40	02.40+/-.50	02.20+/-.50	02.40+/-.50
MAY 920430 TO 920528	01.80+/-.60	02.20+/-.60	02.60+/-.60	01.60+/-.50	01.70+/-.60
JUN 920528 TO 920625	02.40+/-.70	01.80+/-.70	02.10+/-.70	02.50+/-.70	02.00+/-.70
JUL 920625 TO 920730	02.30+/-.70	02.20+/-.60	01.80+/-.60	01.90+/-.60	02.60+/-.60
AUG 920730 TO 920827	01.90+/-.60	02.60+/-.60	02.20+/-.60	02.70+/-.60	01.50+/-.70
SEP 920827 TO 920925	02.80+/-.60	02.00+/-.60	02.30+/-.60	01.90+/-.50	01.80+/-.60
OCT 920925 TO 921030	02.10+/-.60	01.90+/-.60	02.90+/-.60	02.20+/-.60	01.80+/-.60
NOV 921030 TO 921130	02.10+/-.60	02.70+/-.60	02.60+/-.60	02.30+/-.60	02.40+/-.60
DEC 921130 TO 921228	03.00+/-.70	03.10+/-.70	10.30+/-1.40	03.10+/-.70	03.20+/-.80

GAMMA SPEC REPORT OF WTRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
28	WATER	911230/920130	LT 26.8 LT 12.20 LT 8.70	LT 5.4 LT 6.10	LT 5.50 LT 5.40	LT 4.60 LT 5.10	LT 5.00 LT 8.70
28	WATER	920130/920227	LT 22.70 LT 11.00 LT 7.80	LT 4.70 LT 7.70	LT 4.90 LT 4.30	LT 3.90 LT 4.70	LT 4.10 LT 9.40
28	WATER	920227/920326	LT 27.60 LT 11.30 LT 9.20	LT 5.60 LT 7.30	LT 6.80 LT 4.60	LT 5.40 LT 6.00	LT 6.00 LT 13.00
28	WATER	920326/920430	LT 20.20 LT 6.80 LT 6.10	LT 3.80 LT 5.60	LT 3.60 LT 3.70	LT 3.60 LT 3.80	LT 3.40 LT 7.50
28	WATER	920430/920528	LT 37.80 LT 9.40 LT 7.70	LT 4.00 LT 11.00	LT 3.80 LT 3.70	LT 4.00 LT 5.20	LT 3.80 LT 8.40
28	WATER	920528/920625	LT 28.70 LT 12.00 LT 8.80	LT 5.00 LT 8.40	LT 5.00 LT 4.70	LT 5.80 LT 5.50	LT 4.60 LT 11.40
28	WATER	920625/920730	LT 32.40 LT 11.40 LT 8.30	LT 4.40 LT 8.20	LT 3.90 LT 4.10	LT 4.50 LT 5.00	LT 3.90 LT 10.90
28	WATER	920730/920827	LT 26.90 LT 11.10 LT 8.50	LT 5.10 LT 10.80	LT 6.20 LT 4.10	LT 4.30 LT 5.10	LT 4.30 LT 9.20
28	WATER	920925/920925	LT 24.50 LT 8.80 LT 6.70	LT 3.70 LT 8.70	LT 3.80 LT 3.80	LT 3.70 LT 4.30	LT 3.80 LT 8.00
28	WATER	920925/921030	LT 29.20 LT 9.80 LT 7.50	LT 4.20 LT 8.20	LT 3.90 LT 3.80	LT 4.60 LT 4.40	LT 4.00 LT 9.60
28	WATER	921130/921130	LT 37.70 LT 10.20 LT 6.00	LT 3.90 LT 10.60	LT 4.10 LT 4.40	LT 3.00 LT 5.30	LT 3.90 LT 7.60
28	WATER	921211/921228	LT 22.70 LT 6.70 LT 4.60	LT 2.40 LT 4.60	LT 2.80 LT 2.30	LT 2.20 LT 2.80	LT 2.60 LT 4.80

STRONTIUM REPORT
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	SR-89	SR-90
01	SOIL	920225/920225	LT 18.9	53.80+/-9.40
02	SOIL	920225/920525	LT 9.6	27.70+/-6.50
03	SOIL	920527/920527	LT 27.0	26.20+/-7.60
03	SOIL	921017/921017	LT 22.2	42.70+/-10.20
04	SOIL	920225/920225	LT 11.6	18.60+/-6.00
04	SOIL	920527/920527	LT 34.3	14.60+/-7.80
04	SOIL	921017/921017	LT 22.8	LT 9.9
06	SOIL	920225/920225	LT 10.5	23.70+/-8.20
06	SOIL	920527/920527	LT 24.8	LT 8.4
06	SOIL	921017/921017	LT 16.3	9.50+/-4.90
07	SOIL	920527/920527	LT 10.5	27.20+/-5.30
07	SOIL	921017/921017	LT 18.1	35.50+/-7.60
09	SOIL	920527/920527	LT 32.3	42.90+/-11.30
09	SOIL	921017/921017	LT 27.6	28.00+/-9.50
12	SOIL	920225/920225	LT 12.0	42.80+/-9.00
12	SOIL	920527/920527	LT 21.0	39.80+/-6.90
12	SOIL	921017/921017	LT 28.3	46.90+/-11.50
14	SOIL	920225/920225	LT 16.1	LT 8.9
18	SOIL	920225/920225	LT 17.8	37.00+/-10.20

STRONTIUM REPORT
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	SR-89	SR-90
20	SOIL	920225/920225	LT 12.8	9.70+/-5.40
35	SOIL	920527/920527	LT 30.7	48.40+/-10.60
35	SOIL	921017/921017	LT 26.5	42.30+/-11.40

GAMMA SPEC REPORT OF SOIL
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG(DRY) +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-60	CS-137	K-40	RA-226	CO-58
01	SOIL	920225/920225	LT 26.0 LT 36.5	328.0+/-34.0	7221.0+/-672.0	503.0+/-82.0	LT 33.3
02	SOIL	920225/920225	LT 22.6 LT 28.8	246.0+/-35.0	9250.0+/-618.0	549.0+/-70.0	LT 29.2
03	SOIL	920527/920527	LT 33.7 LT 35.1	282.0+/-25.0	10100.0+/-536.0	658.0+/-48.0	LT 30.2
03	SOIL	921017/921017	LT 35.5 LT 35.2	312.0+/-26.0	10900.0+/-561.0	689.0+/-51.0	LT 31.9
04	SOIL	920225/920225	LT 23.7 LT 36.6	129.0+/-26.0	14000.0+/-632.0	907.0+/-73.0	LT 27.9
04	SOIL	920527/920527	LT 36.1 LT 28.7	126.0+/-17.0	13600.0+/-522.0	922.0+/-55.0	LT 27.5
04	SOIL	921017/921017	LT 22.4 LT 33.3	89.0+/-31.0	12870.0+/-706.0	929.0+/-81.0	LT 40.9
06	SOIL	920225/920225	LT 26.0 LT 37.3	267.0+/-33.0	11850.0+/-708.0	979.0+/-142.0	LT 34.5
06	SOIL	920527/920527	LT 21.5 LT 30.5	347.0+/-39.0	16790.0+/-603.0	1562.0+/-92.0	LT 31.8
06	SOIL	921017/921017	LT 38.6 LT 35.0	179.0+/-23.0	9600.0+/-544.0	593.0+/-54.0	LT 33.7
07	SOIL	920527/920527	LT 26.6 LT 37.6	448.0+/-46.0	12390.0+/-710.0	1000.0+/-86.0	LT 39.5
07	SOIL	921017/921017	LT 21.8 LT 17.9	293.0+/-16.0	7570.0+/-298.0	585.0+/-33.0	LT 18.5
09	SOIL	920527/920527	LT 19.8 LT 30.8	560.0+/-37.0	11040.0+/-565.0	741.0+/-59.0	LT 28.0
09	SOIL	921017/921017	LT 42.6 LT 35.2	359.0+/-34.0	9990.0+/-636.0	689.0+/-62.0	LT 38.2

GAMMA SPEC REPORT OF SOIL
SAMPLE FREQUENCY IS : SEM-ANNUAL
RESULTS IN PCI/KG(DRY) +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-60	CS-137	K-40	RA-226	CO-58
12	SOIL	920225/920225	LT 18.3 LT 27.4	838.0+/-38.0	10300.0+/-465.0	727.0+/-56.0	LT 21.1
12	SOIL	920527/920527	LT 24.7 LT 21.9	660.0+/-24.0	11250.0+/-356.0	815.0+/-44.0	LT 18.1
12	SOIL	921017/921017	LT 19.8 LT 25.3	700.0+/-41.0	10750.0+/-489.0	942.0+/-70.0	LT 24.9
14	SOIL	920225/920225	LT 21.9 LT 22.6	44.0+/-12.0	7130.0+/-330.0	406.0+/-27.0	LT 19.8
18	SOIL	920225/920225	LT 37.3 LT 38.7	153.0+/-25.0	19200.0+/-739.0	996.0+/-59.0	LT 33.5
20	SOIL	920225/920225	LT 40.5 LT 32.4	230.0+/-25.0	13000.0+/-610.0	940.0+/-63.0	LT 29.3
35	SOIL	920527/920527	LT 38.6 LT 31.6	218.0+/-23.0	11100.0+/-535.0	756.0+/-56.0	LT 27.2
35	SOIL	921017/921017	LT 38.0 LT 29.3	229.0+/-26.0	10000.0+/-491.0	685.0+/-52.0	LT 29.5

GAMMA SPEC REPORT OF FP
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-58	CS-137 CO-60	I-131	K-40	BE-7
44	GRASS	920428/920428	LT 20.20 LT 22.70	LT 21.20 LT 18.20	LT 42.70	4001.0+/-405.0	7410.0+/-405.0
44	GRASS	920527/920527	LT 16.40 LT 18.30	LT 15.70 LT 19.50	LT 42.40	5730.0+/-395.0	1030.0+/-131.0
44	GRASS	920624/920624	LT 15.90 LT 19.70	LT 17.30 LT 17.00	LT 44.00	54360.0+/-187.0	5258.0+/-342.0
44	GRASS	920721/920721	LT 27.00 LT 27.00	LT 26.20 LT 30.00	LT 44.40	4490.0+/-407.0	3860.0+/-245.0
44	GRASS	920818/920818	LT 24.30 LT 26.40	LT 22.60 LT 27.70	LT 40.10	3600.0+/-484.0	3010.0+/-292.0
44	GRASS	920922/920922	LT 9.50 LT 9.80	LT 13.10 LT 11.40	LT 23.20	2281.0+/-295.0	2755.0+/-295.0

GAMMA SPEC REPORT OF FP
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-58	CS-137 CO-60	I-131	K-40	BE-7
47	FEED	920921/920921	LT 10.60 LT 12.40	LT 11.20 LT 12.20	LT 37.00	4937.0+/-273.0	2119.0+/-164.0
51	FEED	920921/920921	LT 13.80 LT 17.40	LT 16.50 LT 15.90	LT 35.50	8367.0+/-444.0	4195.0+/-254.0
61	FEED	920918/920921	LT 15.70 LT 17.00	LT 14.50 LT 17.70	LT 37.40	9765.0+/-342.0	LT 119.00
69	FEED	920921/920921	LT 17.60 LT 20.20	LT 18.10 LT 20.80	LT 41.60	9190.0+/-528.0	LT 153.00
71	FEED	920921/920921	LT 10.80 LT 13.20	LT 12.10 LT 14.90	LT 38.10	3706.0+/-290.0	LT 127.80

GAMMA SPEC REPORT OF PP
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-58	CS-137 CO-60	I-131	K-40	BE-7
74	ZUCCHINI	920724/920724	LT 8.30 LT 9.00	LT 9.40 LT 13.30	LT 11.90	1070.0+/-171.0	LT 66.90
74	BEETS	920818/920818	LT 12.20 LT 17.80	LT 13.20 LT 20.90	LT 18.70	1660.0+/-192.0	LT 111.00
74	CABBAGE	920924/920924	LT 11.50 LT 14.20	LT 14.00 LT 19.40	LT 19.00	1640.0+/-255.0	LT 101.00
75	LETTUCE	920727/920727	LT 16.30 LT 17.40	LT 16.40 LT 18.20	LT 26.90	1960.0+/-306.0	LT 137.00
75	CABBAGE	920727/920727	LT 9.70 LT 13.10	LT 9.90 LT 9.00	LT 17.30	1762.0+/-274.0	LT 100.80

GAMMA SPEC REPORT OF FP
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-58	CS-137 CO-60	I-131	K-40	BE-7
06	GRASS	920428/920428	LT 13.10 LT 15.90	LT 17.10 LT 15.10	LT 23.30	4437.0+/-409.0	1931.0+/-221.0
06	GRASS	920527/920527	LT 9.40 LT 12.80	LT 9.60 LT 10.30	LT 35.70	5613.0+/-260.0	3136.0+/-260.0
06	GRASS	920624/920624	LT 7.90 LT 11.20	17.9+/-8.6 LT 9.90	LT 17.70	5134.0+/-263.0	3604.0+/-175.0
06	GRASS	920721/920721	LT 20.50 LT 27.20	LT 21.90 LT 27.70	LT 42.50	10520.0+/-685.0	4362.0+/-428.0
06	GRASS	920818/920818	LT 25.20 LT 32.80	LT 29.30 LT 35.10	LT 38.40	5070.0+/-626.0	2650.0+/-306.0
06	GRASS	920922/920922	LT 9.40 LT 11.00	LT 10.20 LT 110.00	LT 34.10	3455.0+/-268.0	2146.0+/-184.0
07	GRASS	920428/920428	LT 20.30 LT 22.60	LT 26.10 LT 28.00	LT 34.40	4460.0+/-458.0	1830.0+/-205.0
07	GRASS	920527/920527	LT 14.40 LT 15.00	LT 10.80 LT 11.50	LT 34.00	4791.0+/-334.0	3281.0+/-205.0
07	GRASS	920624/920624	LT 4.20 LT 5.70	LT 5.20 LT 4.80	LT 13.00	2489.0+/-194.0	2545.0+/-129.0
07	GRASS	920721/920721	LT 20.80 LT 23.40	LT 24.60 LT 24.20	LT 33.00	4830.0+/-649.0	3540.0+/-435.0
07	GRASS	920818/920818	LT 21 40 LT 23.70	LT 20.50 LT 23.20	LT 33.20	3270.0+/-429.0	2990.0+/-270.0
07	GRASS	920922/920922	LT 9.50 LT 9.60	LT 9.20 LT 10.90	LT 21.70	3090.0+/-235.0	1770.0+/-125.0
35	GRASS	920527/920527	LT 12.60 LT 12.80	LT 21.10 LT 12.80	LT 37.10	5280.0+/-218.0	3000.0+/-130.0
35	GRASS	920624/920624	LT 8.30 LT 7.60	LT 7.50 LT 7.20	LT 15.50	4360.0+/-187.0	1400.0+/-86.0
35	GRASS	920721/920721	LT 23.20 LT 27.70	LT 26.70 LT 11.20	LT 43.00	5845.0+/-649.0	2926.0+/-394.0
35	GRASS	920818/920818	LT 21.00 LT 19.40	LT 19.70 LT 22.00	LT 32.20	3750.0+/-396.0	3190.0+/-271.0
35	GRASS	920922/920922	LT 10.30 LT 12.50	LT 16.20 LT 13.70	LT 29.70	2470.0+/-334.0	1992.0+/-236.0

GAMMA SPEC REPORT OF MLKI
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
71	MILK	920418/920421	LT .17
71	MILK	920501/920504	LT .21
71	MILK	920515/920518	LT .23
71	MILK	920605/920608	LT .24
71	MILK	920619/920622	LT .21
71	MILK	920710/920713	LT .24
71	MILK	920724/920727	LT .28
71	MILK	920807/920810	LT .38
71	MILK	920821/920824	LT .25
71	MILK	920904/920908	LT .40
71	MILK	920918/920921	LT .42
71	MILK	921002/921005	LT .30
71	MILK	921016/921019	LT .25
71	MILK	921106/921109	LT .21
71	MILK	921211/921214	LT .34

GAMMA SPEC REPORT OF FP
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	CS-134 CO-58	CS-137 CO-60	I-131	K-40	BE-7
39	CABBAGE	920818/920818	LT 16.20 LT 19.00	LT 14.70 LT 17.50	LT 28.30	1190.0+/-256.0	LT 140.00
39	CABBAGE	920924/920924	LT 16.60 LT 16.90	LT 16.40 LT 16.80	LT 28.90	1120.0+/-253.0	LT 134.00
62	CABBAGE	920825/920825	LT 12.60 LT 13.60	LT 13.10 LT 19.50	LT 18.10	1585.0+/-177.0	LT 105.00
62	BROCCOLI	920825/920825	LT 12.30 LT 11.90	LT 12.00 LT 12.30	LT 20.70	3230.0+/-286.0	LT 99.40
70	CABBAGE	920818/920818	LT 12.50 LT 14.40	LT 13.50 LT 16.30	LT 28.10	2010.0+/-270.0	LT 114.00
70	BEETS	920818/920818	LT 21.60 LT 22.00	LT 22.60 LT 23.80	LT 31.60	3200.0+/-449.0	LT 166.70
70	BROCCOLI	920818/920818	LT 17.40 LT 18.30	LT 16.50 LT 17.40	LT 26.80	1650.0+/-282.0	LT 142.00
70	ZUCCHINI	920924/920924	LT 10.90 LT 10.50	LT 9.80 LT 10.50	LT 19.30	1560.0+/-191.0	LT 100.00
70	CABBAGE	920924/920924	LT 17.20 LT 16.10	LT 16.40 LT 16.90	LT 26.90	1650.0+/-283.0	LT 117.00
72	CORN	920724/920724	LT 18.80 LT 16.30	LT 16.00 LT 17.60	LT 28.20	2440.0+/-357.0	LT 153.00
72	ZUCCHINI	920724/920724	LT 10.60 LT 12.00	LT 10.60 LT 12.40	LT 17.60	1110.0+/-202.0	LT 90.40
72	CABBAGE	920724/920724	LT 11.10 LT 12.90	LT 10.90 LT 15.30	LT 16.10	2270.0+/-274.0	LT 89.60
72	CABBAGE	920818/920818	LT 15.80 LT 14.50	LT 12.70 LT 13.20	LT 21.00	2160.0+/-259.0	LT 103.00
73	ZUCCHINI	920724/920724	LT 8.00 LT 9.40	LT 9.50 LT 12.10	LT 12.60	1270.0+/-176.0	LT 66.5
73	CABBAGE	920818/920818	LT 16.10 LT 18.20	LT 14.00 LT 17.00	LT 28.30	1420.0+/-280.0	LT 126.00
73	CABBAGE	920924/920924	LT 11.00 LT 12.40	LT 11.00 LT 10.20	LT 18.80	1380.0+/-174.0	LT 98.40

GAMMA SPEC REPORT OF MLKI
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
29	MILK	920418/920421	LT .18
29	MILK	920501/920504	LT .19
29	MILK	920515/920518	LT .22
29	MILK	920605/920608	LT .23
29	MILK	920619/920622	LT .26
47	MILK	920418/920421	LT .17
47	MILK	920501/920504	LT .20
47	MILK	920515/920518	LT .22
47	MILK	920605/920608	LT .28
47	MILK	920619/920622	LT .22
47	MILK	920710/920713	LT .29
47	MILK	920724/920727	LT .28
47	MILK	920807/920810	LT .23
47	MILK	920821/920824	LT .30
47	MILK	920904/920908	LT .40
47	MILK	920918/920921	LT .35
47	MILK	921002/921005	LT .40
51	MILK	920103/920106	LT .30
51	MILK	920207/920210	LT .20
51	MILK	920306/920309	LT .63
51	MILK	920403/920406	LT .20
51	MILK	920418/920421	LT .19
51	MILK	920501/920504	LT .20
51	MILK	920515/920518	LT .28
51	MILK	920605/920608	LT .23
51	MILK	920619/920622	LT .24
51	MILK	920710/920713	LT .27
51	MILK	920724/920727	LT .44
51	MILK	920807/920810	LT .23
51	MILK	920821/920824	LT .33
51	MILK	920904/920908	LT .40
51	MILK	920918/920921	LT .44
51	MILK	921002/921005	LT .35
51	MILK	921016/921019	LT .24
51	MILK	921106/921109	LT .22
51	MILK	921211/921214	LT .32

GAMMA SPEC REPORT OF MLKI
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
61	MILK	920403/920406	LT .21
61	MILK	920418/920421	LT .17
61	MILK	920501/920504	LT .23
61	MILK	920515/920518	LT .29
61	MILK	920605/920608	LT .24
61	MILK	920619/920622	LT .22
61	MILK	920710/920713	LT .28
61	MILK	920724/920727	LT .40
61	MILK	920807/920810	LT .21
61	MILK	920821/920824	LT .30
61	MILK	920904/920908	LT .43
61	MILK	920918/920921	LT .47
61	MILK	921002/921005	LT .38
61	MILK	921016/921019	LT .15
69	MILK	920103/920106	LT .28
69	MILK	920207/920210	LT .20
69	MILK	920306/920309	LT .57
69	MILK	920403/920406	LT .17
69	MILK	920418/920421	LT .17
69	MILK	920501/920504	LT .22
69	MILK	920515/920518	LT .23
69	MILK	920605/920608	LT .23
69	MILK	920619/920622	LT .20
69	MILK	920710/920713	LT .30
69	MILK	920724/920727	LT .29
69	MILK	920807/920810	LT .20
69	MILK	920821/920824	LT .27
69	MILK	920904/920908	LT .37
69	MILK	920918/920921	LT .48
69	MILK	921002/921005	LT .27
69	MILK	921016/921019	LT .25
69	MILK	921106/921109	LT .22
69	MILK	921211/921214	LT .33
71	MILK	920103/920106	LT .43
71	MILK	920207/920210	LT .21
71	MILK	920306/920309	LT .29
71	MILK	920403/920406	LT .24

GAMMA SPEC REPORT OF MLKG
SAMPLE FREQUENCY IS : BI-MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140	CS-134	CS-137	K-40	LA-140
71	MILK	920419/920421	LT 20.7	LT 5.4	LT 5.8	1080.0+/-120.0	LT 7.2
71	MILK	920501/920504	LT 26.6	LT 5.5	LT 6.6	1210.0+/-120.0	LT 8.2
71	MILK	920515/920518	LT 30.6	LT 3.0	LT 3.5	1240.0+/-100.0	LT 8.3
71	MILK	920605/920608	LT 39.1	LT 6.4	LT 6.8	1210.0+/-120.0	LT 10.7
71	MILK	920619/920622	LT 23.8	LT 3.3	LT 4.9	1200.0+/-120.0	LT 6.0
71	MILK	920710/920713	LT 37.5	LT 6.5	LT 6.3	1230.0+/-140.0	LT 8.4
71	MILK	920724/920727	LT 42.5	LT 3.0	LT 3.9	1220.0+/-110.0	LT 11.0
71	MILK	920807/920810	LT 28.7	LT 4.8	LT 4.9	1170.0+/-110.0	LT 7.7
71	MILK	920821/920824	LT 28.0	LT 4.3	LT 4.7	1200.0+/-110.0	LT 7.0
71	MILK	920904/920908	LT 16.8	LT 2.0	LT 1.9	1370.0+/-50.0	LT 4.1
71	MILK	920918/920921	LT 28.0	LT 3.9	LT 3.7	1130.0+/-80.0	LT 6.7
71	MILK	921002/921005	LT 35.3	LT 6.1	LT 6.5	1130.0+/-130.0	LT 10.4
71	MILK	921016/921019	LT 29.9	LT 6.9	LT 6.9	1030.0+/-140.0	LT 10.6
71	MILK	921106/921109	LT 23.9	LT 3.8	LT 4.9	1110.0+/-120.0	LT 3.7
71	MILK	921211/921214	LT 26.9	LT 5.3	LT 5.8	1370.0+/-220.0	LT 8.8

GAMMA SPEC REPORT OF STRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	SR-89	SR-90
29	MILK	920518/920518	LT .7	2.20+/-.50
47	MILK	920518/920518	LT .7	2.60+/-.50
47	MILK	920921/920921	LT 1.0	2.30+/-.70
51	MILK	920329/920329	LT .5	2.40+/-.50
51	MILK	920518/920518	LT .6	2.90+/-.50
51	MILK	920921/920921	LT 1.2	2.20+/-.70
51	MILK	921109/921215	LT 1.0	1.30+/-.40
61	MILK	920518/920518	LT .9	2.10+/-.50
61	MILK	920921/920921	LT .9	1.10+/-.50
69	MILK	920309/920309	LT .6	1.60+/-.40
69	MILK	920518/920518	LT 1.0	2.40+/-.60
69	MILK	920921/920921	LT .8	1.20+/-.50
69	MILK	921109/921109	LT 1.1	1.70+/-.50
71	MILK	920309/920309	LT .5	2.60+/-.50
71	MILK	920518/920518	LT .7	3.80+/-.60
71	MILK	920921/920921	LT 1.1	1.90+/-.40
71	MILK	921109/921109	LT 1.0	6.50+/-.80

GAMMA SPEC REPORT OF MLKG
SAMPLE FREQUENCY IS : BI-MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140	CS-134	CS-137	K-40	LA-140
29	MILK	920419/920421	LT 23.1	LT 4.3	LT 4.6	1640.0+/-120.0	LT 3.8
29	MILK	920501/920504	LT 29.7	LT 4.3	LT 5.3	1610.0+/-130.0	LT 5.7
29	MILK	920515/920518	LT 42.9	LT 5.2	LT 5.0	1740.0+/-120.0	LT 9.7
29	MILK	920605/920608	LT 34.9	LT 6.6	LT 5.6	1740.0+/-140.0	LT 9.3
29	MILK	920619/920622	LT 21.7	LT 3.3	LT 4.2	1600.0+/-110.0	LT 3.8
47	MILK	920419/920421	LT 19.6	LT 4.6	LT 4.8	1520.0+/-100.0	LT 5.3
47	MILK	920501/920504	LT 31.4	LT 5.5	LT 6.3	1460.0+/-140.0	LT 8.9
47	MILK	920515/920518	LT 40.0	LT 4.9	LT 4.4	1410.0+/-110.0	LT 10.4
47	MILK	920605/920608	LT 31.5	LT 3.9	LT 5.1	1650.0+/-150.0	LT 9.8
47	MILK	920619/920622	LT 35.1	LT 6.4	LT 7.2	1650.0+/-180.0	LT 9.2
47	MILK	920710/920713	LT 36.8	LT 7.0	LT 6.[illegible]	1650.0+/-170.0	LT 10.2
47	MILK	920724/920727	LT 42.2	LT 5.9	LT 6.4	1590.0+/-160.0	LT 11.0
47	MILK	920807/920810	LT 26.5	LT 5.2	LT 4.9	1600.0+/-120.0	LT 6.3
47	MILK	920821/920824	LT 34.6	LT 5.7	LT 6.2	1800.0+/-170.0	LT 5.8
47	MILK	920904/920908	LT 32.5	LT 2.0	LT 1.8	1580.0+/-50.0	LT 7.9
47	MILK	920918/920921	LT 31.0	LT 4.0	LT 4.9	1760.0+/-120.0	LT 7.3
47	MILK	921002/921005	LT 30.7	LT 4.5	LT 5.1	1700.0+/-140.0	LT 6.2
51	MILK	920103/920106	LT 20.1	LT 4.1	LT 5.3	1300.0+/-140.0	LT 5.3
51	MILK	920207/920210	LT 21.3	LT 4.5	LT 5.6	1260.0+/-120.0	LT 4.8
51	MILK	920306/920309	LT 20.5	LT 4.3	LT 4.5	1150.0+/-100.0	LT 6.5
51	MILK	920403/920406	LT 28.0	LT 4.8	LT 4.8	1250.0+/-110.0	LT 6.2
51	MILK	920419/920421	LT 22.2	LT 5.1	LT 5.1	1200.0+/-110.0	LT 6.5
51	MILK	920501/920504	LT 22.9	LT 2.3	LT 2.6	1330.0+/-60.0	LT 6.7
51	MILK	920515/920518	LT 28.2	LT 4.6	LT 4.4	1440.0+/-80.0	LT 7.0
51	MILK	920605/920608	LT 27.1	LT 4.3	LT 4.7	1020.0+/-100.0	LT 10.6
51	MILK	920619/920622	LT 24.6	LT 4.5	LT 5.0	1430.0+/-110.0	LT 6.1
51	MILK	920710/920713	LT 35.1	LT 7.0	LT 7.8	1240.0+/-150.0	LT 9.8
51	MILK	920724/920727	LT 35.5	LT 4.2	LT 4.7	1300.0+/-140.0	LT 10.2
51	MILK	920807/920810	LT 24.9	LT 4.2	LT 5.6	1150.0+/-140.0	LT 5.3
51	MILK	920821/920824	LT 31.3	LT 3.7	LT 4.6	1400.0+/-120.0	LT 5.4
51	MILK	920904/920908	LT 23.0	LT 4.5	LT 3.8	1210.0+/-140.0	LT 5.6
51	MILK	920918/920921	LT 27.6	LT 3.7	LT 3.9	1270.0+/-120.0	LT 7.9
51	MILK	921002/921005	LT 27.6	LT 4.8	LT 4.8	1280.0+/-120.0	LT 7.8
51	MILK	921016/921019	LT 17.4	LT 4.6	LT 4.5	1120.0+/-130.0	LT 5.8
51	MILK	921106/921109	LT 25.4	LT 4.2	LT 4.7	1340.0+/-110.0	LT 4.2
51	MILK	921211/921214	LT 26.3	LT 4.3	LT 4.5	1270.0+/-120.0	LT 7.9

GAMMA SPEC REPORT OF MLKG
SAMPLE FREQUENCY IS : BI-MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140	CS-134	CS-137	K-40	LA-140
61	MILK	920403/920406	LT 34.8	LT 6.4	LT 7.7	1540.0+/-160.0	LT 8.5
61	MILK	920419/920421	LT 21.9	LT 4.1	LT 6.1	1640.0+/-160.0	LT 5.3
61	MILK	920501/920504	LT 33.2	LT 6.0	LT 7.3	1680.0+/-160.0	LT 9.7
61	MILK	920515/920518	LT 41.1	LT 3.9	LT 4.2	1840.0+/-90.0	LT 6.8
61	MILK	920605/920608	LT 30.9	LT 4.6	LT 5.0	1780.0+/-120.0	LT 6.8
61	MILK	920619/920622	LT 24.0	LT 3.8	LT 5.3	1760.0+/-130.0	LT 5.1
61	MILK	920710/920713	LT 37.9	LT 7.1	LT 7.7	1660.0+/-130.0	LT 10.3
61	MILK	920724/920727	LT 42.3	LT 5.5	LT 5.3	1600.0+/-130.0	LT 10.0
61	MILK	920807/920810	LT 29.2	LT 5.6	LT 5.2	1600.0+/-130.0	LT 7.0
61	MILK	920821/920824	LT 28.7	LT 5.0	LT 5.1	1770.0+/-140.0	LT 6.9
61	MILK	920904/920908	LT 32.:	LT 4.1	LT 4.4	1600.0+/-120.0	LT 5.9
61	MILK	920918/920921	LT 35.4	LT 5.0	LT 5.1	1440.0+/-110.0	LT 7.5
61	MILK	921002/921005	LT 24.2	LT 4.1	LT 6.1	1600.0+/-170.0	LT 4.5
61	MILK	921016/921019	LT 29.6	LT 6.9	LT 6.8	1560.0+/-170.0	LT 8.5
69	MILK	920103/920106	LT 22.3	LT 3.9	LT 5.1	1400.0+/-110.0	LT 4.2
69	MILK	920207/920210	LT 18.7	LT 3.5	LT 4.8	1620.0+/-130.0	LT 3.7
69	MILK	920306/920309	LT 18.5	LT 3.8	LT 4.9	1290.0+/-100.0	LT 4.1
69	MILK	920403/920406	LT 24.2	LT 4.4	LT 4.2	1400.0+/-120.0	LT 4.5
69	MILK	920419/920421	LT 26.3	LT 5.5	LT 7.0	1280.0+/-140.0	LT 6.5
69	MILK	920501/920504	LT 23.0	LT 4.2	LT 4.3	1260.0+/-100.0	LT 6.0
69	MILK	920515/920518	LT 36.1	LT 4.3	LT 4.0	1290.0+/-100.0	LT 10.0
69	MILK	920605/920608	LT 33.9	LT 5.9	LT 5.9	1080.0+/-120.0	LT 10.6
69	MILK	920619/920622	LT 19.7	LT 3.8	LT 5.5	1200.0+/-140.0	LT 8.2
69	MILK	920710/920713	LT 37.5	LT 7.0	LT 6.6	1180.0+/-150.0	LT 10.7
69	MILK	920724/920727	LT 44.5	LT 3.4	LT 3.7	1260.0+/-100.0	LT 9.0
69	MILK	920807/920810	LT 35.4	LT 5.9	LT 5.6	1290.0+/-120.0	LT 7.6
69	MILK	920821/920824	LT 32.7	LT 4.6	LT 4.5	1180.0+/-110.0	LT 6.6
69	MILK	920904/920909	LT 33.4	LT 1.6	LT 1.7	1340.0+/-50.0	LT 6.9
69	MILK	920918/920921	LT 33.5	LT 4.1	LT 4.7	1350.0+/-140.0	LT 7.2
69	MILK	921002/921005	LT 27.8	LT 4.0	LT 5.3	1110.0+/-130.0	LT 8.2
69	MILK	921016/921019	LT 27.4	LT 4.1	LT 4.6	1350.0+/-160.0	LT 6.0
69	MILK	921106/921109	LT 12.8	LT 3.3	LT 3.8	1380.0+/-110.0	LT 5.1
69	MILK	921211/921215	LT 23.0	LT 4.8	LT 5.1	1570.0+/-130.0	LT 8.9
71	MILK	920103/920106	LT 26.8	LT 4.6	LT 5.0	1160.0+/-80.0	LT 6.1
71	MILK	920207/920210	LT 22.4	LT 4.1	LT 4.6	1020.0+/-130.0	LT 2.2
71	MILK	920306/920309	LT 13.7	LT 2.9	LT 3.0	1180.0+/-70.0	LT 3.2
71	MILK	920403/920406	LT 26.6	LT 4.5	LT 6.8	1280.0+/-150.0	LT 3.0

TRITIUM REPORT
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	H3
06	PR	921125/921230	LT 172.00
07	PR	911231/920129	LT 166.00
07	PR	920129/920226	LT 180.00
07	PR	920226/920325	LT 172.00
07	PR	920325/920429	182.00+/-96.00
07	PR	920429/920527	120.00+/-88.00
07	PR	920527/920624	98.00+/-88.00
07	PR	920624/920729	LT 179.00
07	PR	920729/920826	LT 185.00
07	PR	920826/920930	LT 181.00
07	PR	920930/921028	LT 164.00
07	PR	921028/921125	LT 178.00
07	PR	921125/921230	LT 172.00
12	PR	911231/920129	LT 166.00
12	PR	920129/920226	199.00+/-97.00
12	PR	920226/920325	LT 172.00
12	PR	920325/920429	111.00+/-93.00
12	PR	920429/920527	137.00+/-88.00
12	PR	920527/920624	LT 170.00
12	PR	920624/920729	LT 178.00
12	PR	920729/920826	LT 185.00
12	PR	920826/920930	LT 181.00
12	PR	920930/921028	LT 164.00
12	PR	921028/921125	LT 178.00
12	PR	921125/921230	LT 172.00
35	PR	911231/920129	LT 166.00
35	PR	920129/920226	147.00+/-95.00
35	PR	920226/920325	LT 172.00
35	PR	920325/920429	LT 169.00
35	PR	920429/920527	134.00+/-88.00
35	PR	920527/920624	LT 170.00
35	PR	920624/920729	LT 178.00
35	PR	920729/920826	LT 185.00

TRITIUM REPORT
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	H3
35	PR	920826/920930	LT 181.00
35	PR	920930/921028	LT 164.00
35	PR	921028/921125	LT 178.00
35	PR	921125/921230	LT 172.00

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
35	PR	911231/920129	LT 23.80 LT 10.80 LT 8.60	LT 5.30 LT 6.90	LT 4.50 LT 5.20	LT 4.60 LT 5.20	LT 4.90 LT 10.60
35	PR	920129/920226	LT 19.00 LT 10.90 LT 7.80	LT 4.10 LT 5.20	LT 5.20 LT 4.00	LT 3.80 LT 4.40	LT 4.20 LT 9.40
35	PR	920226/920325	LT 28.90 LT 13.00 LT 9.80	LT 5.60 LT 9.50	LT 6.50 LT 6.00	LT 5.40 LT 7.30	LT 5.90 LT 14.20
35	PR	920325/920429	LT 20.60 LT 8.60 LT 6.20	LT 3.20 LT 7.50	LT 3.00 LT 3.00	LT 2.40 LT 3.70	LT 3.00 LT 5.10
35	PR	920429/920527	LT 30.70 LT 13.70 LT 9.00	LT 5.10 LT 9.40	LT 4.70 LT 4.90	LT 4.00 LT 5.40	LT 4.60 LT 8.30
35	PR	920527/920624	LT 30.80 LT 7.80 LT 6.50	LT 3.40 LT 8.60	LT 3.00 LT 3.20	LT 3.00 LT 4.10	LT 2.90 LT 6.90
35	PR	920624/920729	LT 27.00 LT 13.30 LT 11.60	LT 6.70 LT 10.40	LT 7.90 LT 6.60	LT 5.40 LT 6.80	LT 5.70 LT 13.80
35	PR	920729/920826	LT 39.80 LT 10.50 LT 8.60	LT 5.60 LT 9.70	LT 4.90 LT 4.40	LT 5.50 LT 5.90	LT 4.40 LT 9.20
35	PR	920826/920930	LT 20.80 LT 10.10 LT 8.30	LT 4.80 LT 10.00	LT 5.60 LT 5.00	LT 5.10 LT 5.30	LT 4.60 LT 12.50
35	PR	920930/921028	LT 31.40 LT 14.50 LT 12.30	LT 6.60 LT 11.00	LT 5.80 LT 4.90	LT 5.90 LT 7.10	LT 6.50 LT 14.60
35	PR	921028/921125	LT 26.30 LT 12.10 LT 9.80	LT 6.20 LT 8.80	LT 4.80 LT 5.60	LT 6.40 LT 6.20	LT 5.50 LT 14.00
35	PR	921125/921230	LT 34.40 LT 12.70 LT 7.10	LT 3.20 LT 5.20	LT 4.00 LT 3.10	LT 3.80 LT 4.60	LT 3.80 LT 7.20

TRITIUM REPORT
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/KG +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	H3
03	PR	911231/920129	LT 166.00
03	PR	920129/920226	LT 180.00
03	PR	920226/920325	LT 172.00
03	PR	920325/920429	228.00+/-98.00
03	PR	920429/920527	115.00+/-88.00
03	PR	920527/920624	91.00+/-88.00
03	PR	920624/920729	LT 179.00
03	PR	920729/920826	LT 185.00
03	PR	920826/920930	LT 181.00
03	PR	920930/921028	LT 163.00
03	PR	921028/921125	LT 178.00
03	PR	921125/921230	LT 172.00
04	PR	911231/920129	128.00+/-88.00
04	PR	920129/920226	134.00+/-95.00
04	PR	920226/920325	LT 172.00
04	PR	920325/920429	153.00+/-95.00
04	PR	920429/920527	139.00+/-89.00
04	PR	920527/920624	LT 170.00
04	PR	920624/920729	LT 178.00
04	PR	920729/920826	LT 185.00
04	PR	920826/920930	LT 181.00
04	PR	920930/921028	LT 163.00
04	PR	921028/921125	LT 178.00
04	PR	921125/921230	LT 172.00
06	PR	911231/920129	LT 166.00
06	PR	920129/920226	94.00+/-66.00
06	PR	920226/920325	LT 172.00
06	PR	920325/920429	LT 169.00
06	PR	920429/920527	99.00+/-87.00
06	PR	920527/920624	LT 170.00
06	PR	920624/920729	LT 178.00
06	PR	920729/920826	LT 185.00
06	PR	920826/920930	LT 181.00
06	PR	920930/921028	LT 164.00
06	PR	921028/921125	LT 178.00

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
07	PR	911231/920129	LT 22.50 LT 8.80 LT 8.70	LT 5.00 LT 7.10	LT 5.40 LT 5.00	LT 5.00 LT 5.20	LT 4.90 LT 11.20
07	PR	920129/920226	LT 28.10 LT 9.80 LT 9.30	LT 5.80 LT 7.60	LT 5.20 LT 5.20	LT 5.30 LT 6.30	LT 5.20 LT 11.10
07	PR	920226/920325	LT 25.30 LT 8.60 LT 7.70	LT 4.80 LT 6.70	LT 4.00 LT 4.10	LT 4.50 LT 4.70	LT 4.30 LT 9.80
07	PR	920325/920429	LT 28.40 LT 10.10 LT 8.80	LT 4.90 LT 9.20	LT 5.60 LT 4.40	LT 4.00 LT 5.40	LT 5.00 LT 9.10
07	PR	920429/920527	LT 30.40 LT 12.20 LT 8.10	LT 4.50 LT 8.70	LT 5.00 LT 5.00	LT 3.40 LT 5.40	LT 4.20 LT 8.40
07	PR	920527/920624	LT 43.40 LT 11.20 LT 8.60	LT 5.80 LT 8.40	LT 3.30 LT 4.90	LT 3.60 LT 6.20	LT 4.20 LT 8.20
07	PR	920624/920729	LT 32.50 LT 13.40 LT 11.90	LT 6.80 LT 10.90	LT 6.40 LT 7.00	LT 6.60 LT 7.40	LT 6.20 LT 14.60
07	PR	920729/920826	LT 34.10 LT 11.50 LT 8.50	LT 4.10 LT 7.40	LT 4.20 LT 5.40	LT 4.20 LT 4.60	LT 4.20 LT 9.80
07	PR	920826/920930	LT 32.10 LT 13.30 LT 11.80	LT 5.80 LT 10.40	LT 6.40 LT 6.20	LT 6.30 LT 7.40	LT 6.40 LT 11.80
07	PR	920930/921028	LT 19.00 LT 12.40 LT 11.60	LT 5.50 LT 9.50	LT 7.20 LT 5.50	LT 5.90 LT 7.10	LT 5.80 LT 13.90
07	PR	921028/921125	LT 22.20 LT 8.40 LT 7.40	LT 4.00 LT 5.40	LT 3.90 LT 3.70	LT 4.40 LT 4.60	LT 4.40 LT 8.90
07	PR	921125/921230	LT 32.60 LT 9.90 LT 8.30	LT 4.40 LT 10.50	LT 4.50 LT 4.40	LT 4.60 LT 5.00	LT 4.10 LT 8.90

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
12	PR	911231/920129	LT 28.90 LT 10.60 LT 10.70	LT 6.60 LT 8.20	LT 6.40 LT 5.00	LT 6.10 LT 6.90	LT 6.40 LT 12.20
12	PR	920129/920226	LT 14.20 LT 6.70 LT 5.80	LT 3.10 LT 4.80	LT 3.00 LT 3.20	LT 3.00 LT 3.20	LT 3.00 LT 7.10
12	PR	920226/920325	LT 25.20 LT 8.90 LT 7.60	LT 4.10 LT 5.10	LT 4.20 LT 4.80	LT 3.70 LT 4.70	LT 3.70 LT 8.50
12	PR	920325/920429	LT 35.60 LT 11.40 LT 7.70	LT 4.70 LT 6.90	LT 3.80 LT 5.30	LT 4.00 LT 5.90	LT 4.10 LT 9.90
12	PR	920429/920527	LT 40.00 LT 12.90 LT 10.80	LT 6.50 LT 8.00	LT 5.00 LT 6.40	LT 4.70 LT 7.10	LT 5.10 LT 11.40
12	PR	920527/920624	LT 29.90 LT 10.80 LT 7.00	LT 3.80 LT 10.90	LT 3.90 LT 3.70	LT 3.20 LT 4.80	LT 3.40 LT 7.90
12	PR	920624/920729	LT 25.10 LT 12.20 LT 9.50	LT 5.20 LT 10.00	LT 7.10 LT 4.70	LT 5.00 LT 6.00	LT 5.70 LT 11.80
12	PR	920729/920826	LT 41.20 LT 12.60 LT 9.10	LT 4.50 LT 8.60	LT 4.90 LT 5.40	LT 4.50 LT 6.80	LT 4.10 LT 9.40
12	PR	920826/920930	LT 20.60 LT 12.40 LT 8.20	LT 5.00 LT 9.90	LT 5.70 LT 5.40	LT 4.20 LT 5.00	LT 4.60 LT 12.70
12	PR	920930/921028	LT 26.10 LT 13.30 LT 9.40	LT 5.70 LT 10.90	LT 7.00 LT 5.30	LT 5.10 LT 5.60	LT 5.40 LT 14.50
12	PR	921028/921125	LT 16.50 LT 9.80 LT 7.00	LT 4.80 LT 4.20	LT 3.60 LT 4.20	LT 3.80 LT 4.40	LT 4.10 LT 7.60
12	PR	921125/921230	LT 27.30 LT 8.60 LT 7.90	LT 3.80 LT 10.10	LT 4.20 LT 4.00	LT 4.40 LT 4.70	LT 4.30 LT 10.10

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
04	PR	911231/920129	LT 22.50 LT 8.30 LT 7.40	LT 4.60 LT 6.70	LT 4.40 LT 4.30	LT 4.40 LT 4.40	LT 4.00 LT 9.20
04	PR	920129/920226	LT 26.40 LT 10.80 LT 9.30	LT 5.50 LT 7.70	LT 5.30 LT 5.00	LT 5.10 LT 6.00	LT 5.20 LT 11.50
04	PR	920226/920325	LT 28.00 LT 9.50 LT 9.50	LT 4.40 LT 6.90	LT 2.90 LT 4.80	LT 3.80 LT 4.80	LT 3.70 LT 6.90
04	PR	920325/920429	LT 35.20 LT 10.60 LT 8.80	LT 5.40 LT 9.70	LT 4.90 LT 4.30	LT 4.30 LT 5.20	LT 4.30 LT 10.30
04	PR	920429/920527	LT 26.50 LT 10.10 LT 8.60	LT 4.70 LT 8.80	LT 4.60 LT 4.60	LT 4.30 LT 5.40	LT 4.30 LT 9.80
04	PR	920527/920624	LT 32.60 LT 13.40 LT 8.20	LT 4.70 LT 9.20	LT 5.30 LT 5.00	LT 4.10 LT 5.90	LT 4.10 LT 9.80
04	PR	920624/920729	LT 29.40 LT 13.80 LT 10.50	LT 6.70 LT 10.90	LT 7.80 LT 6.40	LT 5.50 LT 6.20	LT 5.80 LT 14.50
04	PR	920729/920826	LT 27.90 LT 14.70 LT 7.80	LT 4.00 LT 7.60	LT 4.60 LT 4.50	LT 3.70 LT 4.20	LT 4.60 LT 9.80
04	PR	920826/920930	LT 16.20 LT 8.80 LT 7.10	LT 3.90 LT 6.30	LT 4.50 LT 3.70	LT 3.60 LT 4.10	LT 3.80 LT 9.30
04	PR	920930/921028	LT 27.80 LT 10.90 LT 11.70	LT 6.00 LT 6.80	LT 6.00 LT 6.30	LT 5.90 LT 6.40	LT 5.60 LT 12.80
04	PR	921028/921125	LT 20.00 LT 9.20 LT 7.20	LT 4.00 LT 5.70	LT 4.20 LT 3.80	LT 3.80 LT 4.10	LT 3.60 LT 9.40
04	PR	921125/921230	LT 26.70 LT 7.60 LT 6.20	LT 3.40 LT 8.60	LT 3.40 LT 3.10	LT 3.10 LT 4.10	LT 3.10 LT 6.90

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
06	PR	911231/920129	LT 27.90 LT 13.20 LT 9.60	LT 6.00 LT 8.50	LT 7.40 LT 6.10	LT 6.20 LT 6.00	LT 6.50 LT 11.00
06	PR	920129/920226	LT 26.30 LT 12.40 LT 10.00	LT 6.00 LT 8.80	LT 6.70 LT 5.60	LT 5.80 LT 6.60	LT 7.00 LT 12.80
06	PR	920226/920325	LT 30.30 LT 12.50 LT 10.00	LT 6.60 LT 8.80	LT 7.70 LT 6.20	LT 5.70 LT 7.80	LT 7.00 LT 13.30
06	PR	920325/920429	LT 37.30 LT 11.20 LT 9.10	LT 5.50 LT 8.50	LT 3.90 LT 5.00	LT 4.40 LT 5.90	LT 5.10 LT 9.90
06	PR	920429/920527	LT 23.00 LT 7.80 LT 7.30	LT 3.70 LT 7.50	LT 3.60 LT 3.60	LT 3.60 LT 4.40	LT 3.40 LT 8.70
06	PR	920527/920624	LT 40.10 LT 11.40 LT 9.20	LT 4.70 LT 9.40	LT 4.50 LT 4.80	LT 3.60 LT 4.80	LT 4.40 LT 8.20
06	PR	920624/920729	LT 31.10 LT 12.90 LT 12.10	LT 6.60 LT 11.00	LT 6.80 LT 6.20	LT 5.90 LT 6.60	LT 6.00 LT 14.20
06	PR	920729/920826	LT 33.30 LT 10.40 LT 9.70	LT 5.40 LT 7.60	LT 4.60 LT 4.60	LT 4.80 LT 6.40	LT 4.90 LT 10.40
06	PR	920826/920930	LT 26.60 LT 12.30 LT 9.10	LT 5.40 LT 8.30	LT 5.00 LT 5.70	LT 5.10 LT 5.50	LT 5.30 LT 10.50
06	PR	920930/921028	LT 33.10 LT 15.60 LT 10.90	LT 7.20 LT 10.30	LT 8.20 LT 7.00	LT 7.00 LT 7.50	LT 6.60 LT 17.30
06	PR	921028/921125	LT 29.90 LT 9.80 LT 11.40	LT 5.50 LT 10.30	LT 6.40 LT 5.80	LT 6.20 LT 6.00	LT 5.20 LT 10.30
06	PR	921125/921230	LT 26.90 LT 8.30 LT 7.40	LT 4.40 LT 9.20	LT 4.00 LT 3.80	LT 4.10 LT 4.50	LT 3.80 LT 9.60

G-BETA PR REPORT
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

COLLECTION PERIOD	STATION LOCATIONS					
	03	04	06	07	12	35
JAN 911231 TO 920129	03.80+/-.40	01.60+/-.30	01.60+/-.30	00.50+/-.20	02.70+/-.30	01.30+/-.30
FEB 920129 TO 920226	04.20+/-.40	04.20+/-.30	04.60+/-.60	02.40+/-.30	02.90+/-.30	03.30+/-.30
MAR 920226 TO 920325	05.20+/-.30	05.10+/-.30	01.10+/-.20	03.60+/-.30	03.40+/-.40	02.60+/-.20
APR 920325 TO 920429	09.20+/-.50	04.70+/-.40	03.60+/-.30	05.50+/-.30	06.20+/-.30	06.80+/-.40
MAY 920429 TO 920527	06.90+/-.80	06.20+/-.60	02.40+/-.50	05.20+/-.70	11.60+/-1.10	13.10+/-.90
JUN 920527 TO 920624	10.10+/-.50	02.00+/-.30	02.50+/-.30	02.90+/-.30	06.70+/-.40	02.40+/-.30
JUL 920624 TO 920729	02.10+/-.30	00.80+/-.20	01.90+/-.30	01.80+/-.30	01.80+/-.30	01.40+/-.30
AUG 920729 TO 920826	02.60+/-.30	03.20+/-.30	02.60+/-.30	01.90+/-.30	03.50+/-.30	02.70+/-.30
SEP 920826 TO 920930	02.40+/-.30	01.20+/-.30	04.20+/-.60	01.40+/-.20	01.70+/-.20	01.40+/-.20
OCT 920930 TO 921028	04.10+/-.40	02.10+/-.30	03.00+/-.30	03.80+/-.30	04.00+/-.40	06.70+/-.40
NOV 921028 TO 921125	02.80+/-.40	03.50+/-.40	01.70+/-.40	04.80+/-.50	02.30+/-.40	06.30+/-.60
DEC 921125 TO 921230	16.60+/-.60	06.20+/-.40	07.30+/-.40	06.10+/-.40	08.40+/-.50	02.50+/-.30

GAMMA SPEC REPORT OF PRG
SAMPLE FREQUENCY IS : MONTHLY
RESULTS IN PCI/L +/- 2 SIGMA

Precipitation

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BA-140 FE-59 ZR-95	CO-58 LA-140	CO-60 MN-54	CS-134 NB-95	CS-137 ZN-65
03	PR	911231/920129	LT 16.20 LT 7.00 LT 5.90	LT 3.20 LT .62	LT 3.70 LT 3.20	LT 3.00 LT 3.50	LT 3.00 LT 7.30
03	PR	920129/920226	LT 27.80 LT 13.60 LT 9.60	LT 6.20 LT 8.60	LT 6.90 LT 5.40	LT 5.70 LT 6.30	LT 5.40 LT 14.10
03	PR	920226/920325	LT 22.70 LT 11.50 LT 7.60	LT 4.30 LT 7.10	LT 4.90 LT 4.60	LT 3.80 LT 4.70	LT 4.20 LT 7.90
03	PR	920325/920429	LT 22.40 LT 7.40 LT 6.10	LT 3.40 LT 6.60	LT 3.00 LT 3.20	LT 3.10 LT 3.80	LT 3.10 LT 6.90
03	PR	920429/920527	LT 43.40 LT 14.40 LT 10.70	LT 6.40 LT 8.40	LT 5.20 LT 6.60	LT 5.00 LT 7.40	LT 5.00 LT 11.70
03	PR	920527/920624	LT 27.80 LT 12.60 LT 8.40	LT 4.40 LT 10.30	LT 4.40 LT 3.70	LT 3.30 LT 5.50	LT 3.50 LT 8.50
03	PR	920624/920729	LT 32.50 LT 10.80 LT 10.20	LT 6.10 LT 10.80	LT 5.90 LT 5.70	LT 5.40 LT 5.90	LT 5.10 LT 11.60
03	PR	920729/920826	LT 31.50 LT 10.90 LT 9.20	LT 4.60 LT 5.90	LT 3.60 LT 4.10	LT 4.60 LT 5.60	LT 4.70 LT 10.70
03	PR	920826/920930	LT 25.90 LT 12.00 LT 9.30	LT 5.90 LT 10.20	LT 6.00 LT 5.60	LT 5.00 LT 5.30	LT 5.60 LT 11.80
03	PR	920930/921028	LT 30.70 LT 13.20 LT 11.00	LT 5.70 LT 8.80	LT 5.60 LT 6.30	LT 6.10 LT 6.50	LT 5.90 LT 14.70
03	PR	921028/921125	LT 27.40 LT 11.40 LT 10.60	LT 6.00 LT 11.00	LT 6.20 LT 6.00	LT 5.50 LT 6.70	LT 6.10 LT 13.60
03	PR	921125/921230	LT 29.90 LT 9.40 LT 7.90	LT 4.00 LT 10.10	LT 3.90 LT 4.00	LT 4.10 LT 4.80	LT 4.20 LT 9.80

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
07	AIR	921021/921028	LT 23.00
07	AIR	921028/921104	LT 30.00
07	AIR	921104/921111	LT 13.00
07	AIR	921111/921118	LT 8.00
07	AIR	921118/921125	LT 14.00
07	AIR	921125/921202	LT 23.00
07	AIR	921202/921209	LT 10.00
07	AIR	921209/921216	LT 19.00
07	AIR	921216/921223	LT 19.00
07	AIR	921223/921230	LT 19.00
35	AIR	920101/920108	LT 35.00
35	AIR	920108/920115	LT 16.00
35	AIR	920115/920122	LT 18.00
35	AIR	920122/920129	LT 22.00
35	AIR	920129/920205	LT 15.00
35	AIR	920205/920212	LT 21.00
35	AIR	920212/920219	LT 15.00
35	AIR	920219/920226	LT 16.00
35	AIR	920226/920304	LT 21.00
35	AIR	920304/920311	LT 15.00
35	AIR	920311/920318	LT 36.00
35	AIR	920318/920325	LT 23.00
35	AIR	920325/920401	LT 22.00
35	AIR	920401/920408	LT 14.00
35	AIR	920408/920415	LT 13.00
35	AIR	920415/920422	LT 10.00
35	AIR	920422/920429	LT 13.00
35	AIR	920429/920506	LT 17.00
35	AIR	920506/920513	LT 12.00
35	AIR	920513/920520	LT 13.00
35	AIR	920520/920527	LT 11.00
35	AIR	920527/920603	LT 12.00
35	AIR	920603/920610	LT 5.00
35	AIR	920610/920617	LT 19.00
35	AIR	920617/920624	LT 12.00
35	AIR	920624/920701	LT 22.00
35	AIR	920701/920708	LT 12.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
35	AIR	920708/920715	LT 19.00
35	AIR	920715/920722	LT 11.00
35	AIR	920722/920729	LT 18.00
35	AIR	920805/920812	LT 21.00
35	AIR	920812/920819	LT 21.00
35	AIR	920819/920826	LT 24.00
35	AIR	920826/920902	LT 23.00
35	AIR	920902/920909	LT 14.00
35	AIR	920909/920916	LT 10.00
35	AIR	920916/920923	LT 16.00
35	AIR	920923/920930	LT 24.00
35	AIR	920930/921007	LT 26.00
35	AIR	921007/921014	LT 17.00
35	AIR	921014/921021	LT 26.00
35	AIR	921021/921028	LT 13.00
35	AIR	921028/921104	LT 14.00
35	AIR	921104/921111	LT 13.00
35	AIR	921111/921118	LT 16.00
35	AIR	921118/921125	LT 12.00
35	AIR	921125/921202	LT 16.00
35	AIR	921202/921209	LT 14.00
35	AIR	921209/921216	LT 12.00
35	AIR	921216/921223	LT 15.00
35	AIR	921223/921230	LT 20.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
06	AIR	920506/920513	LT 13.00
06	AIR	920513/920520	LT 14.00
06	AIR	920520/920527	LT 12.00
06	AIR	920527/920603	LT 13.00
06	AIR	920603/920610	LT 10.00
06	AIR	920610/920617	LT 12.00
06	AIR	920617/920624	LT 13.00
06	AIR	920624/920701	LT 24.00
06	AIR	920701/920708	LT 11.00
06	AIR	920708/920715	LT 15.00
06	AIR	920715/920722	LT 14.00
06	AIR	920722/920729	LT 13.00
06	AIR	920729/920805	LT 11.00
06	AIR	920805/920812	LT 13.00
06	AIR	920812/920819	LT 24.00
06	AIR	920819/920826	LT 14.00
06	AIR	920826/920902	LT 16.00
06	AIR	920902/920909	LT 27.00
06	AIR	920909/920916	LT 14.00
06	AIR	920916/920923	LT 15.00
06	AIR	920923/920930	LT 14.00
06	AIR	920930/921007	LT 15.00
06	AIR	921007/921014	LT 31.00
06	AIR	921014/921021	LT 15.00
06	AIR	921021/921028	LT 25.00
06	AIR	921028/921104	LT 31.00
06	AIR	921104/921111	LT 14.00
06	AIR	921111/921118	LT 8.00
06	AIR	921118/921125	LT 15.00
06	AIR	921125/921202	LT 24.00
06	AIR	921202/921209	LT 11.00
06	AIR	921209/921216	LT 18.00
06	AIR	921216/921223	LT 18.00
06	AIR	921223/921230	LT 18.00
07	AIR	920101/920108	LT 35.00
07	AIR	920108/920115	LT 17.00
07	AIR	920115/920122	LT 18.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
07	AIR	920122/920129	LT 21.00
07	AIR	920129/920205	LT 14.00
07	AIR	920205/920212	LT 19.00
07	AIR	920212/920219	LT 13.00
07	AIR	920219/920226	LT 15.00
07	AIR	920226/920304	LT 19.00
07	AIR	920304/920311	LT 14.00
07	AIR	920311/920318	LT 32.00
07	AIR	920318/920325	LT 20.00
07	AIR	920325/920401	LT 19.00
07	AIR	920401/920408	LT 12.00
07	AIR	920408/920415	LT 11.00
07	AIR	920415/920422	LT 11.00
07	AIR	920422/920429	LT 13.00
07	AIR	920429/920506	LT 12.00
07	AIR	920506/920513	LT 12.00
07	AIR	920513/920520	LT 13.00
07	AIR	920520/920527	LT 12.00
07	AIR	920527/920603	LT 12.00
07	AIR	920603/920610	LT 9.00
07	AIR	920610/920617	LT 11.00
07	AIR	920617/920624	LT 12.00
07	AIR	920624/920701	LT 23.00
07	AIR	920701/920708	LT 10.00
07	AIR	920708/920715	LT 14.00
07	AIR	920715/920722	LT 13.00
07	AIR	920722/920729	LT 12.00
07	AIR	920729/920805	LT 10.00
07	AIR	920805/920812	LT 12.00
07	AIR	920812/920819	LT 23.00
07	AIR	920819/920826	LT 15.00
07	AIR	920826/920902	LT 18.00
07	AIR	920902/920909	LT 26.00
07	AIR	920909/920916	LT 14.00
07	AIR	920916/920923	LT 14.00
07	AIR	920923/920930	LT 15.00
07	AIR	920930/921007	LT 16.00
07	AIR	921007/921014	LT 28.00
07	AIR	921014/921021	LT 13.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
04	AIR	921202/921209	LT 12.00
04	AIR	921209/921216	LT 17.00
04	AIR	921216/921223	LT 17.00
04	AIR	921223/921230	LT 17.00
05	AIR	920101/920108	LT 36.00
05	AIR	920108/920115	LT 17.00
05	AIR	920115/920122	LT 19.00
05	AIR	920122/920129	LT 22.00
05	AIR	920129/920205	LT 15.00
05	AIR	920205/920212	LT 20.00
05	AIR	920212/920219	LT 14.00
05	AIR	920219/920226	LT 15.00
05	AIR	920226/920304	LT 20.00
05	AIR	920304/920311	LT 14.00
05	AIR	920311/920318	LT 33.00
05	AIR	920318/920325	LT 20.00
05	AIR	920325/920401	LT 20.00
05	AIR	920401/920408	LT 13.00
05	AIR	920408/920415	LT 11.00
05	AIR	920415/920422	LT 11.00
05	AIR	920422/920429	LT 12.00
05	AIR	920429/920506	LT 12.00
05	AIR	920506/920513	LT 12.00
05	AIR	920513/920520	LT 13.00
05	AIR	920520/920527	LT 12.00
05	AIR	920527/920603	LT 12.00
05	AIR	920603/920610	LT 9.00
05	AIR	920610/920617	LT 11.00
05	AIR	920617/920624	LT 12.00
05	AIR	920624/920701	LT 23.00
05	AIR	920701/920708	LT 10.00
05	AIR	920708/920715	LT 14.00
05	AIR	920715/920722	LT 13.00
05	AIR	920722/920729	LT 12.00
05	AIR	920729/920805	LT 10.00
05	AIR	920805/920812	LT 12.00
05	AIR	920812/920819	LT 23.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
05	AIR	920819/920826	LT 14.00
05	AIR	920826/920902	LT 15.00
05	AIR	920902/920909	LT 25.00
05	AIR	920909/920916	LT 14.00
05	AIR	920916/920923	LT 14.00
05	AIR	920923/920930	LT 14.00
05	AIR	920930/921007	LT 14.00
05	AIR	921007/921014	LT 30.00
05	AIR	921014/921021	LT 14.00
05	AIR	921021/921028	LT 26.00
05	AIR	921028/921104	LT 32.00
05	AIR	921104/921111	LT 14.00
05	AIR	921111/921118	LT 8.00
05	AIR	921118/921125	LT 15.00
05	AIR	921125/921202	LT 23.00
05	AIR	921202/921209	LT 11.00
05	AIR	921209/921216	LT 18.00
05	AIR	921216/921223	LT 19.00
05	AIR	921223/921230	LT 19.00
06	AIR	920101/920108	LT 37.00
06	AIR	920108/920115	LT 18.00
06	AIR	920115/920122	LT 19.00
06	AIR	920122/920129	LT 22.00
06	AIR	920129/920205	LT 15.00
06	AIR	920205/920212	LT 20.00
06	AIR	920212/920219	LT 14.00
06	AIR	920219/920226	LT 16.00
06	AIR	920226/920304	LT 20.00
06	AIR	920304/920311	LT 14.00
06	AIR	920311/920318	LT 34.00
06	AIR	920318/920325	LT 21.00
06	AIR	920325/920401	LT 20.00
06	AIR	920401/920408	LT 14.00
06	AIR	920408/920415	LT 11.00
06	AIR	920415/920422	LT 12.00
06	AIR	920422/920429	LT 14.00
06	AIR	920429/920506	LT 13.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
03	AIR	920617/920624	LT 12.00
03	AIR	920624/920701	LT 23.00
03	AIR	920701/920708	LT 10.00
03	AIR	920708/920715	LT 14.00
03	AIR	920715/920722	LT 13.00
03	AIR	920722/920729	LT 11.00
03	AIR	920729/920805	LT 9.00
03	AIR	920805/920812	LT 11.00
03	AIR	920812/920819	LT 21.00
03	AIR	920819/920826	LT 13.00
03	AIR	920826/920902	LT 13.00
03	AIR	920902/920909	LT 22.00
03	AIR	920909/920916	LT 12.00
03	AIR	920916/920923	LT 12.00
03	AIR	920923/920930	LT 13.00
03	AIR	920930/921007	LT 14.00
03	AIR	921007/921014	LT 24.00
03	AIR	921014/921021	LT 13.00
03	AIR	921021/921028	LT 25.00
03	AIR	921028/921104	LT 33.00
03	AIR	921104/921111	LT 14.00
03	AIR	921111/921118	LT 9.00
03	AIR	921118/921125	LT 16.00
03	AIR	921125/921202	LT 25.00
03	AIR	921202/921209	LT 12.00
03	AIR	921209/921216	LT 17.00
03	AIR	921216/921223	LT 17.00
03	AIR	921223/921230	LT 17.00
04	AIR	920101/920108	LT 34.00
04	AIR	920108/920115	LT 16.00
04	AIR	920115/920122	LT 18.00
04	AIR	920122/920129	LT 21.00
04	AIR	920129/920205	LT 14.00
04	AIR	920205/920212	LT 19.00
04	AIR	920212/920219	LT 13.00
04	AIR	920219/920226	LT 15.00
04	AIR	920226/920304	LT 19.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
04	AIR	920304/920311	LT 14.00
04	AIR	920311/920318	LT 32.00
04	AIR	920318/920325	LT 20.00
04	AIR	920325/920401	LT 19.00
04	AIR	920401/920408	LT 12.00
04	AIR	920408/920415	LT 11.00
04	AIR	920415/920422	LT 11.00
04	AIR	920422/920429	LT 13.00
04	AIR	920429/920506	LT 12.00
04	AIR	920506/920513	LT 12.00
04	AIR	920513/920520	LT 13.00
04	AIR	920520/920527	LT 12.00
04	AIR	920527/920603	LT 12.00
04	AIR	920603/920610	LT 9.00
04	AIR	920610/920617	LT 11.00
04	AIR	920617/920624	LT 12.00
04	AIR	920624/920701	LT 23.00
04	AIR	920701/920708	LT 10.00
04	AIR	920708/920715	LT 14.00
04	AIR	920715/920722	LT 13.00
04	AIR	920722/920729	LT 12.00
04	AIR	920729/920805	LT 10.00
04	AIR	920805/920812	LT 12.00
04	AIR	920812/920819	LT 23.00
04	AIR	920819/920826	LT 14.00
04	AIR	920826/920902	LT 15.00
04	AIR	920902/920909	LT 26.00
04	AIR	920909/920916	LT 14.00
04	AIR	920916/920923	LT 14.00
04	AIR	920923/920930	LT 14.00
04	AIR	920930/921007	LT 14.00
04	AIR	921007/921014	LT 31.00
04	AIR	921014/921021	LT 15.00
04	AIR	921021/921028	LT 27.00
04	AIR	921028/921104	LT 34.00
04	AIR	921104/921111	LT 15.00
04	AIR	921111/921118	LT 8.00
04	AIR	921118/921125	LT 16.00
04	AIR	921125/921202	LT 25.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
01	AIR	920101/920108	LT 37.00
01	AIR	920108/920115	LT 18.00
01	AIR	920115/920122	LT 19.00
01	AIR	920122/920129	LT 23.00
01	AIR	920129/920205	LT 16.00
01	AIR	920205/920212	LT 21.00
01	AIR	920212/920219	LT 14.00
01	AIR	920219/920226	LT 16.00
01	AIR	920226/920304	LT 20.00
01	AIR	920304/920311	LT 15.00
01	AIR	920311/920318	LT 34.00
01	AIR	920318/920325	LT 21.00
01	AIR	920325/920401	LT 21.00
01	AIR	920401/920408	LT 14.00
01	AIR	920408/920415	LT 12.00
01	AIR	920415/920422	LT 12.00
01	AIR	920422/920429	LT 14.00
01	AIR	920429/920506	LT 13.00
01	AIR	920506/920513	LT 13.00
01	AIR	920513/920520	LT 14.00
01	AIR	920520/920527	LT 13.00
01	AIR	920527/920603	LT 13.00
01	AIR	920603/920610	LT 10.00
01	AIR	920610/920617	LT 12.00
01	AIR	920617/920624	LT 13.00
01	AIR	920624/920701	LT 25.00
01	AIR	920701/920708	LT 11.00
01	AIR	920708/920715	LT 15.00
01	AIR	920715/920722	LT 14.00
01	AIR	920722/920729	LT 13.00
01	AIR	920729/920805	LT 11.00
01	AIR	920805/920812	LT 13.00
01	AIR	920812/920819	LT 26.00
01	AIR	920819/920826	LT 16.00
01	AIR	920826/920902	LT 16.00
01	AIR	920902/920909	LT 28.00
01	AIR	920909/920916	LT 15.00
01	AIR	920916/920923	LT 15.00
01	AIR	920923/920930	LT 14.00

I-131 REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	I-131
01	AIR	920930/921007	LT 14.00
01	AIR	921007/921014	LT 29.00
01	AIR	921014/921021	LT 14.00
01	AIR	921021/921028	LT 24.00
01	AIR	921028/921104	LT 30.00
01	AIR	921104/921111	LT 13.00
01	AIR	921111/921118	LT 8.00
01	AIR	921118/921125	LT 14.00
01	AIR	921125/921202	LT 22.00
01	AIR	921202/921209	LT 10.00
01	AIR	921209/921216	LT 19.00
01	AIR	921216/921223	LT 19.00
01	AIR	921223/921230	LT 19.00
03	AIR	920101/920108	LT 41.00
03	AIR	920108/920115	LT 20.00
03	AIR	920115/920122	LT 22.00
03	AIR	920122/920129	LT 25.00
03	AIR	920129/920205	LT 18.00
03	AIR	920205/920212	LT 23.00
03	AIR	920212/920219	LT 16.00
03	AIR	920219/920226	LT 18.00
03	AIR	920226/920304	LT 23.00
03	AIR	920304/920311	LT 16.00
03	AIR	920311/920318	LT 39.00
03	AIR	920318/920325	LT 24.00
03	AIR	920325/920401	LT 23.00
03	AIR	920401/920408	LT 15.00
03	AIR	920408/920415	LT 13.00
03	AIR	920415/920422	LT 11.00
03	AIR	920422/920429	LT 12.00
03	AIR	920429/920506	LT 12.00
03	AIR	920506/920513	LT 12.00
03	AIR	920513/920520	LT 13.00
03	AIR	920520/920527	LT 12.00
03	AIR	920527/920603	LT 12.00
03	AIR	920603/920610	LT 9.00
03	AIR	920610/920617	LT 11.00

G-BETA AIR REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN E-03 PCI/CU.M. +/- 2 SIGMA

COLLECTION PERIOD			STATION LOCATIONS
			35
	920819	TO 920826	023.00+/-4.00
SEP	920826	TO 920902	017.00+/-4.00
	920902	TO 920909	026.00+/-5.00
	920909	TO 920916	023.00+/-5.00
	920916	TO 920923	018.00+/-4.00
	920923	TO 920930	011.00+/-4.00
OCT	920930	TO 921007	022.00+/-4.00
	921007	TO 921014	024.00+/-4.00
	921014	TO 921021	023.00+/-4.00
	921021	TO 921028	028.00+/-4.00
NOV	921028	TO 921104	017.00+/-4.00
	921104	TO 921111	014.00+/-4.00
	921111	TO 921118	015.00+/-4.00
	921118	TO 921125	011.00+/-4.00
DEC	921125	TO 921202	025.00+/-4.00
	921202	TO 921209	020.00+/-4.00
	921209	TO 921216	014.00+/-4.00
	921216	TO 921223	030.00+/-5.00
	921223	921230	034.00+/-5.00

GAMMA SPEC REPORT OF APTG
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN E-03 PCI/CU.M. +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	BE-7	CS-134	CS-137	CO-58	CO-60
01	AIR	920101/920401	48.00+/-10.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
01	AIR	920401/920701	78.00+/-18.00	LT 1.00	LT 1.00	LT 1.00	LT 2.00
01	AIR	920701/921001	68.00+/-38.00	LT 2.00	LT 4.00	LT 4.00	LT 3.00
01	AIR	921007/921230	52.00+/-10.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
03	AIR	920101/920401	64.00+/-12.00	LT 1.00	LT 1.00	LT 2.00	LT 1.00
03	AIR	920401/920701	72.00+/-31.00	LT 2.00	LT 2.00	LT 2.00	LT 3.00
03	AIR	920701/921001	75.00+/-28.00	LT 2.00	LT 3.00	LT 3.00	LT 2.00
03	AIR	921007/921230	54.00+/-16.00	LT 2.00	LT 2.00	LT 3.00	LT 3.00
04	AIR	920101/920401	48.00+/-8.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
04	AIR	920401/920701	62.00+/-13.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
04	AIR	920701/921001	76.00+/-21.00	LT 1.00	LT 2.00	LT 2.00	LT 2.00
04	AIR	921007/921230	51.00+/-10.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
05	AIR	920101/920401	48.00+/-10.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
05	AIR	920401/920701	66.00+/-28.00	LT 1.00	LT 2.00	LT 2.00	LT 2.00
05	AIR	920701/921001	69.00+/-28.00	LT 1.00	LT 3.00	LT 4.00	LT 3.00
05	AIR	921007/921230	49.00+/-10.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
06	AIR	920101/920401	49.00+/-9.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
06	AIR	920401/920701	75.00+/-17.00	LT 1.00	LT 2.00	LT 2.00	LT 1.00
06	AIR	920701/921001	67.00+/-23.00	LT 2.00	LT 1.00	LT 3.00	LT 2.00
06	AIR	921007/921230	44.00+/-13.00	LT 2.00	LT 1.00	LT 2.00	LT 2.00
07	AIR	920101/920401	53.00+/-21.00	LT 1.00	LT 2.00	LT 2.00	LT 2.00
07	AIR	920401/920701	60.00+/-23.00	LT 1.00	LT 1.00	LT 2.00	LT 1.00
07	AIR	920701/921001	51.00+/-15.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
07	AIR	921007/921230	44.00+/-19.00	LT 3.00	LT 3.00	LT 4.00	LT 4.00
35	AIR	920101/920401	86.00+/-11.00	LT 1.00	LT 1.00	LT 1.00	LT 1.00
35	AIR	920401/920701	65.00+/-27.00	LT 1.00	LT 2.00	LT 4.00	LT 2.00
35	AIR	920701/921001	70.00+/-28.00	LT 2.00	LT 3.00	LT 3.00	LT 2.00
35	AIR	921007/921230	44.00+/-11.00	LT 1.00	LT 1.00	LT 1.00	LT 2.00

G-BETA AIR REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN E-03 PCI/CU.M. +/- 2 SIGMA

	COLLECTION PERIOD	STATION LOCATIONS				
		01	03	04	05	06
	920812 TO 920819	015.00+/-4.00	022.00+/-4.00	013.00+/-4.00	014.00+/-4.00	016.00+/-4.00
	920819 TO 920826	024.00+/-5.00	025.00+/-4.00	025.00+/-4.00	023.00+/-4.00	023.00+/-4.00
SEP	920826 TO 920902	016.00+/-4.00	016.00+/-4.00	017.00+/-4.00	018.00+/-4.00	015.00+/-4.00
	920902 TO 920909	021.00+/-5.00	022.00+/-4.00	025.00+/-4.00	028.00+/-4.00	025.00+/-5.00
	920909 TO 920916	019.00+/-5.00	021.00+/-4.00	022.00+/-5.00	021.00+/-4.00	023.00+/-5.00
	920916 TO 920923	018.00+/-4.00	018.00+/-4.00		022.00+/-4.00	017.00+/-4.00
	920923 TO 920930	014.00+/-4.00	015.00+/-4.00	012.00+/-4.00	014.00+/-4.00	015.00+/-4.00
OCT	920930 TO 921007	021.00+/-4.00	024.00+/-4.00	016.00+/-4.00	020.00+/-4.00	020.00+/-4.00
	921007 TO 921014	021.00+/-4.00	022.00+/-3.00	020.00+/-4.00	022.00+/-4.00	021.00+/-4.00
	921014 TO 921021	022.00+/-4.00	026.00+/-4.00	022.00+/-4.00	028.00+/-4.00	023.00+/-4.00
	921021 TO 921028	024.00+/-4.00	027.00+/-4.00	025.00+/-4.00	028.00+/-4.00	023.00+/-4.00
NOV	921028 TO 921104	016.00+/-4.00	018.00+/-4.00	022.00+/-5.00	011.00+/-4.00	016.00+/-4.00
	921104 TO 921111	014.00+/-4.00	015.00+/-4.00	017.00+/-5.00	015.00+/-4.00	014.00+/-4.00
	921111 TO 921118	017.00+/-4.00	018.00+/-5.00	020.00+/-5.00	016.00+/-4.00	012.00+/-4.00
	921118 TO 921125	011.00+/-4.00	012.00+/-4.00	009.00+/-4.00	012.00+/-4.00	011.00+/-4.00
DEC	921125 TO 921202	024.00+/-4.00	022.00+/-5.00	024.00+/-4.00	027.00+/-4.00	022.00+/-4.00
	921202 TO 921209	016.00+/-4.00	022.00+/-5.00	020.00+/-5.00	018.00+/-4.00	020.00+/-4.00
	921209 TO 921216	011.00+/-4.00	007.00+/-4.00	013.00+/-4.00	017.00+/-4.00	011.00+/-4.00
	921216 TO 921223	035.00+/-5.00	032.00+/-5.00	031.00+/-5.00	030.00+/-5.00	034.00+/-5.00
	921223 TO 921230	029.00+/-4.00	032.00+/-5.00	033.00+/-5.00	027.00+/-4.00	032.00+/-4.00

G-BETA AIR REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN E-03 PCI/CU.M. +/- 2 SIGMA

COLLECTION PERIOD	STATION LOCATIONS
	35
JAN 920101 TO 920108	025.00+/-5.00
920108 TO 920115	020.00+/-4.00
920115 TO 920122	028.00+/-5.00
920122 TO 920129	027.00+/-5.00
FEB 920129 TO 920205	030.00+/-5.00
920205 TO 920212	021.00+/-4.00
920212 TO 920219	028.00+/-5.00
920219 TO 920226	020.00+/-5.00
MAR 920226 TO 920304	022.00+/-5.00
920304 TO 920311	018.00+/-5.00
920311 TO 920318	025.00+/-5.00
920318 TO 920325	022.00+/-6.00
APR 920325 TO 920401	015.00+/-5.00
920401 TO 920408	018.00+/-5.00
920408 TO 920415	024.00+/-5.00
920415 TO 920422	006.00+/-4.00
920422 TO 920429	010.00+/-4.00
MAY 920429 TO 920506	014.00+/-6.00
920506 TO 920513	009.00+/-4.00
920513 TO 920520	016.00+/-4.00
920520 TO 920527	012.00+/-4.00
JUN 920527 TO 920603	012.00+/-4.00
920603 TO 920610	011.00+/-4.00
920610 TO 920617	014.00+/-4.00
920617 TO 920624	008.00+/-4.00
JUL 920624 TO 920701	019.00+/-4.00
920701 TO 920708	009.00+/-4.00
920708 TO 920715	022.00+/-4.00
920715 TO 920722	007.00+/-4.00
920722 TO 920729	010.00+/-4.00
AUG 920805 TO 920812	023.00+/-5.00
920812 TO 920819	016.00+/-4.00

APPENDIX B: 1992 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM DATA

G-BETA AIR REPORT
SAMPLE FREQUENCY IS : WEEKLY
RESULTS IN E-03 PCI/CU.M. +/- 2 SIGMA

COLLECTION PERIOD	STATION LOCATIONS				
	01	03	04	05	06
JAN 920101 TO 920108	022.00+/-5.00	022.00+/-5.00	022.00+/-5.00	020.00+/-5.00	026.00+/-5.00
920108 TO 920115	025.00+/-5.00	023.00+/-5.00	023.00+/-4.00	020.00+/-4.00	023.00+/-5.00
920115 TO 920122	027.00+/-5.00	031.00+/-6.00	023.00+/-5.00	027.00+/-5.00	028.00+/-5.00
920122 TO 920129	023.00+/-5.00	028.00+/-5.00	028.00+/-5.00	023.00+/-5.00	026.00+/-5.00
FEB 920129 TO 920205	024.00+/-5.00	027.00+/-6.00	025.00+/-5.00	018.00+/-5.00	026.00+/-5.00
920205 TO 920212	020.00+/-4.00	020.00+/-5.00	023.00+/-4.00	019.00+/-4.00	020.00+/-4.00
920212 TO 920219	020.00+/-5.00	028.00+/-6.00	022.00+/-5.00	023.00+/-5.00	023.00+/-5.00
920219 TO 920226	018.00+/-5.00	023.00+/-6.00	016.00+/-4.00	020.00+/-5.00	019.00+/-5.00
MAR 920226 TO 920304	018.00+/-5.00	020.00+/-5.00	021.00+/-5.00	020.00+/-5.00	021.00+/-5.00
920304 TO 920311	014.00+/-5.00	022.00+/-5.00	018.00+/-4.00	017.00+/-4.00	022.00+/-5.00
920311 TO 920318	023.00+/-5.00	024.00+/-6.00	019.00+/-4.00	023.00+/-5.00	019.00+/-5.00
920318 TO 920325	019.00+/-5.00	020.00+/-6.00	017.00+/-5.00	021.00+/-5.00	017.00+/-5.00
APR 920325 TO 920401	019.00+/-5.00	016.00+/-5.00	013.00+/-4.00	016.00+/-5.00	013.00+/-5.00
920401 TO 920408	016.00+/-4.00	017.00+/-5.00	013.00+/-4.00	019.00+/-4.00	016.00+/-4.00
920408 TO 920415	022.00+/-5.00	021.00+/-5.00	016.00+/-4.00	021.00+/-5.00	017.00+/-4.00
920415 TO 920422	010.00+/-4.00	014.00+/-4.00	012.00+/-4.00	015.00+/-4.00	013.00+/-4.00
920422 TO 920429	010.00+/-4.00	014.00+/-4.00	013.00+/-4.00	014.00+/-4.00	015.00+/-4.00
MAY 920429 TO 920506	014.00+/-4.00	014.00+/-3.00	012.00+/-4.00	013.00+/-4.00	014.00+/-4.00
920506 TO 920513	012.00+/-4.00	010.00+/-4.00	010.00+/-4.00	011.00+/-4.00	013.00+/-4.00
920513 TO 920520	012.00+/-4.00	020.00+/-4.00	016.00+/-4.00	014.00+/-4.00	017.00+/-4.00
920520 TO 920527	010.00+/-5.00	013.00+/-4.00	010.00+/-4.00	014.00+/-4.00	011.00+/-5.00
JUN 920527 TO 920603	009.00+/-4.00	010.00+/-4.00	015.00+/-4.00	011.00+/-4.00	011.00+/-4.00
920603 TO 920610	014.00+/-4.00	010.00+/-4.00	010.00+/-4.00	011.00+/-4.00	013.00+/-4.00
920610 TO 920617	014.00+/-5.00	016.00+/-4.00	016.00+/-4.00	016.00+/-4.00	018.00+/-5.00
920617 TO 920624	011.00+/-4.00	009.00+/-4.00	009.00+/-4.00	010.00+/-4.00	009.00+/-4.00
JUL 920624 TO 920701	020.00+/-5.00	019.00+/-4.00	019.00+/-4.00	019.00+/-4.00	022.00+/-4.00
920701 TO 920708	008.00+/-4.00	010.00+/-4.00	008.00+/-4.00	008.00+/-4.00	013.00+/-4.00
920708 TO 920715	022.00+/-5.00	023.00+/-4.00	021.00+/-4.00	020.00+/-4.00	018.00+/-4.00
920715 TO 920722	011.00+/-5.00	013.00+/-4.00	009.00+/-4.00	011.00+/-4.00	012.00+/-4.00
920722 TO 920729	012.00+/-4.00	010.00+/-4.00	014.00+/-4.00	013.00+/-4.00	016.00+/-5.00
AUG 920729 TO 920805	018.00+/-5.00	016.00+/-4.00	018.00+/-4.00	019.00+/-4.00	016.00+/-4.00
920805 TO 920812	023.00+/-5.00	020.00+/-4.00	026.00+/-5.00	020.00+/-4.00	022.00+/-5.00

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Sediment

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
STRONTIUM PCI/KG(DRY)	SR-89 11		LLD	-	-	-	-
	SR-90 11		19.13 (0009/0011) 11.40-39.00	15.70 (0007/0009) 11.40-21.00	32 15.8 WSW	31.15 (0002/0002) 23.30-39.00	31.15 (0002/0002) 23.30-39.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

TLD - Direct Radiation

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
TLD MR/STD.QTR	DIRECT 138		14.95 (0138/0138) 11.40-24.30	14.95 (0130/0130) 11.40-24.30	18 05.0 S	22.83 (0004/0004) 21.40-24.30	14.94 (0008/0008) 12.30-17.10

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Fish - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
FSH PCI/KG(WET)	ZN-65 33	260	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Sediment - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
SED PCI/KG(DRY)	CO-58 15		LLD	-	-	-	-
	CO-60 16		821.10 (0002/0016) 809.00-833.20	821.10 (0002/0014) 809.00-833.20	76 00.1 NNE	821.10 (0002/0002) 809.00-833.20	0.00 (0000/0002) 0.00-0.00
	CS-134 15	150	LLD	-	-	-	-
	CS-137 16	180	341.13 (0010/0016) 109.00-864.00	219.66 (0008/0014) 109.00-317.00	32 15.8 WSW	827.00 (0002/0002) 790.00-864.00	827.00 (0002/0002) 790.00-864.00
	K-40 15		10394.27 (0015/0015) 1540.00-21450.00	10674.54 (0013/0013) 1540.00-21450.00	63 00.0 NNE	15285.00 (0002/0002) 10400.00-20170.00	8572.50 (0002/0002) 1645.00-15500.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Water

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
STRONTIUM PCI/L	SR-89 25		LLD	-	-	-	-
	SR-90 25		0.62 (0012/0025) 0.40-0.80	0.62 (0012/0020) 0.40-0.80	60 01.0 WSW	0.73 (0003/0005) 0.70-0.80	0.00 (0000/0005) 0.00-0.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Fish - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
FSH PCI/KG(WET)	CO-58 33	130	LLD	-	-	-	-
	CO-60 33	130	LLD	-	-	-	-
	CS-134 33	130	LLD	-	-	-	-
	CS-137 33	150	26.80 (0001/0033) 26.80-26.80	0.00 (0000/0018) 0.00-0.00	32 15.8 WSW	26.80 (0001/0015) 26.80-26.80	26.80 (0001/0015) 26.80-26.80
	FE-59 33	260	LLD	-	-	-	-
	K-40 33		2374.09 (0033/0033) 632.00-3659.00	2261.56 (0018/0018) 632.00-3154.00	32 15.8 WSW	2509.13 (0015/0015) 1600.00-3659.00	2509.13 (0015/0015) 1600.00-3659.00
	MN-54 33	130	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Water - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
WTRG PCI/L	MN-54 58	15	LLD	-	-	-	-
	NB-95 58	15	LLD	-	-	-	-
	ZN-65 58	30	LLD	-	-	-	-
	ZR-95 58	30	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Water

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
TRITIUM PCI/L	H3 20		183.83 (0018/0020) 123.00-264.00	187.00 (0014/0016) 125.00-264.00	59 04.0 ENE	196.00 (0004/0004) 125.00-255.00	172.75 (0004/0004) 123.00-234.00

1 - The ratio of positive results to the number of samples analysed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Water - Beta

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
WTRB PCI/L	G-BETA 58		2.43 (0058/0058) 1.40-10.30	2.44 (0046/0046) 1.40-10.30	36 03.9 WSW	3.07 (0012/0012) 1.80-10.30	2.40 (0012/0012) 1.50-3.60

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Water - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
TRG PCI/L	BA-140 58	60	LLD	-	-	-	-
	CO-58 58	15	LLD	-	-	-	-
	CO-60 58	15	LLD	-	-	-	-
	CS-134 58	15	LLD	-	-	-	-
	CS-137 58	18	LLD	-	-	-	-
	FE-59 58	30	LLD	-	-	-	-
	LA-140 58	15	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Soil - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
SOIL PCI/KG(DRY)	CO-58 22		LLD	-	-	-	-
	CO-60 22		LLD	-	-	-	-
	CS-134 22		LLD	-	-	-	-
	CS-137 22		319.86 (0022/0022) 44.00-838.00	328.63 (0019/0019) 44.00-838.00	12 00.6 WSW	732.67 (0003/0003) 660.00-838.00	264.33 (0003/0003) 179.00-347.00
	K-40 22		11359.14 (0022/0022) 7130.00-19200.00	11140.05 (0019/0019) 7130.00-19200.00	18 05.0 S	19200.00 (0001/0001) 19200.00-19200.00	12746.67 (0003/0003) 9600.00-16790.00
	RA-226 22		798.77 (0022/0022) 406.00-1562.00	759.95 (0019/0019) 406.00-1000.00	6 11.0 SSW	1044.67 (0003/0003) 593.00-1562.00	1044.67 (0003/0003) 593.00-1562.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Soil - Strontium

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
STRONTIUM PCI/KG(DRY)	SR-89 22		LLD	-	-	-	-
	SR-90 22		32.49 (0019/0022) 9.50-53.80	34.36 (0017/0019) 9.70-53.80	1 03.4 ENE	53.80 (0001/0001) 53.80-53.80	16.60 (0002/0003) 9.50-23.70

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Grass - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
FP PCI/KG	BE-7 23		3026.78 (0023/0023) 1030.00-7410.00	3046.29 (0017/0017) 1030.00-7410.00	44 01.0 SSE	3887.17 (0006/0006) 1030.00-7410.00	2971.50 (0006/0006) 1931.00-4362.00
	CO-58 23		LLD	-	-	-	-
	CO-60 23		LLD	-	-	-	-
	CS-134 23	60	LLD	-	-	-	-
	CS-137 23	80	17.90 (0001/0023) 17.90-17.90	0.00 (0000/0017) 0.00-0.00	6 11.0 SSW	17.90 (0001/0006) 17.90-17.90	17.90 (0001/0006) 17.90-17.90
	I-131 23	60	LLD	-	-	-	-
	K-40 23		6666.35 (0023/0023) 2281.00-54360.00	7005.71 (0017/0017) 2281.00-54360.00	44 01.0 SSE	12410.33 (0006/0006) 2281.00-54360.00	5704.83 (0006/0006) 3455.00-10520.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Feed - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
FP PCI/KG	BE-7 5		3157.00 (0002/0005) 2119.00-4195.00	2119.00 (0001/0003) 2119.00-2119.00	51 09.2 S	4195.00 (0001/0001) 4195.00-4195.00	4195.00 (0001/0002) 4195.00-4195.00
	CO-58 5		LLD	-	-	-	-
	CO-60 5		LLD	-	-	-	-
	CS-134 5	60	LLD	-	-	-	-
	CS-137 5	80	LLD	-	-	-	-
	I-131 5	60	LLD	-	-	-	-
	K-40 5		7193.00 (0005/0005) 3706.00-9765.00	6136.00 (0003/0003) 3706.00-9765.00	61 07.4 SE	9765.00 (0001/0001) 9765.00-9765.00	8778.50 (0002/0002) 8367.00-9190.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Milk - Iodine

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
MLKI PCI/L	I-131 88	1	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Food Products (vegetables) - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
FP PCI/KG	BE-7 21		LLD	-	-	-	-
	CO-58 21		LLD	-	-	-	-
	CO-60 21		LLD	-	-	-	-
	CS-134 21	60	LLD	-	-	-	-
	CS-137 21	80	LLD	-	-	-	-
	I-131 21	60	LLD	-	-	-	-
	K-40 21		1777.95 (0021/0021) 1070.00-3230.00	1681.79 (0014/0014) 1070.00-3230.00	62 01.2 E	2407.50 (0002/0002) 1585.00-3230.00	1970.29 (0007/0007) 1560.00-3200.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Milk - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
MLKG PCI/L	BA-140 88	60	LLD	-	-	-	-
	CS-134 88	15	LLD	-	-	-	-
	CS-137 88	18	LLD	-	-	-	-
	K-40 88		1387.50 (0088/0088) 1020.00-1840.00	1466.20 (0050/0050) 1020.00-1840.00	29 01.4 ESE	1666.00 (0005/0005) 1600.00-1740.00	1283.95 (0038/0038) 1020.00-1620.00
	LA-140 88	15	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Milk

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
STRONTIUM PCI/L	SR-89 17		LLD		-	-	-
	SR-90 17		2.40 (0017/0017) 1.10-6.50	2.79 (0009/0009) 1.10-6.50	71 07.9 SE	3.70 (0004/0004) 1.90-6.50	1.96 (0008/0008) 1.20-2.90

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Precipitation - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
PRG PCI/L	BA-140 72		LLD	-	-	-	-
	CO-58 72		LLD	-	-	-	-
	CO-60 72		LLD	-	-	-	-
	CS-134 72		LLD	-	-	-	-
	CS-137 72		LLD	-	-	-	-
	FE-59 72		LLD	-	-	-	-
	LA-140 72		LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Precipitation

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
TRITIUM PCI/L	H3 72		135.82 (0017/0072) 91.00-228.00	141.07 (0015/0060) 91.00-228.00	12 00.6 WSW	149.00 (0003/0012) 111.00-199.00	96.50 (0002/0012) 94.00-99.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Precipitation - Beta

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
PRB PCI/L	G-BETA 72		4.07 (0072/0072) 0.50-16.60	4.27 (0060/0060) 0.50-16.60	3 01.0 SE	5.83 (0012/0012) 2.10-16.60	3.04 (0012/0012) 1.10-7.30

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Precipitation - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
PRG PCI/L	MN-54 72		LLD	-	-	-	-
	NB-95 72		LLD	-	-	-	-
	ZN-65 72		LLD	-	-	-	-
	ZR-95 72		LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Air - Gamma

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean Dist. Direct	Location with Highest Annual Mean Mean (1) (Range)	All Control Locations Mean (1) (Range)
APTG E-03 PCI/CU.M	BE-7 28		60.29 (0028/0028) 44.00-86.00	60.54 (0024/0024) 44.00-86.00	3 01.0 SE	66.25 (0004/0004) 54.00-75.00	58.75 (0004/0004) 44.00-75.00
	CO-58 28		LLD	-	-	-	-
	CO-60 28		LLD	-	-	-	-
	CS-134 28	.005	LLD	-	-	-	-
	CS-137 28	.006	LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Air - Iodine

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean		All Control Locations Mean (1) (Range)
					Dist. Direct	Mean (1) (Range)	
AI PCI/CU.M.	I-131 363		LLD	-	-	-	-

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

APPENDIX A: 1992 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM DATA SUMMARY

Name of Facility: PERRY NUCLEAR POWER PLANT Docket no. : 50-440/50-441

Location of Facility : Lake County Ohio Reporting period : 1992

Air-Beta

Medium and Measurement	Type and Tot. (n) Analysis Performed	Lower Limit (LLD)	All Locations (Indicator & Control) Mean (1) (Range)	All Indicator Locations Mean (1) (Range)	Location with Highest Annual Mean: Dist. Direct	Location with Highest Annual Mean: Mean (1) (Range)	All Control Locations Mean (1) (Range)
APTB E-03 PCI/CU.M	G-BETA 362		18.40 (0362/0362) 6.00-36.00	18.38 (0310/0310) 6.00-36.00	3 01.0 SE	19.21 (0052/0052) 7.00-32.00	18.50 (0052/0052) 9.00-34.00

1 - The ratio of positive results to the number of samples analyzed for the parameter of interest.
LLD - Lower Limit of Detection.

SPECIAL REPORTS

NONCOMPLIANCES

NPDES Permit Noncompliances

The National Pollutant Discharge Elimination System, or NPDES permit, is issued by the Ohio Environmental Protection Agency (OEPA). It establishes monitoring requirements and limits for discharges from the plant. It also specifies the locations from which the plant is allowed to discharge. Although there were no NPDES noncompliances in 1992, there was one notification made to the OEPA.

On December 8, 1992, a leak of turbine lubricating oil was identified, resulting in a release of oil to Lake Erie via the plant discharge. No NPDES permit limitation was exceeded, and there was no visible sheen of oil present on Lake Erie. The leak was stopped by removing the faulty component from service. This event was reported to the OEPA by phone on December 8, 1992 and followed with a confirmation letter on December 11, 1992 (PY-CEI/OEPA-0619L).

EPP Noncompliances

The Environmental Protection Plan, or EPP, is a part of the PNPP Operating License. It requires non-radiological environmental monitoring programs and reporting. There were no EPP noncompliances in 1992.

UNREVIEWED ENVIRONMENTAL QUESTIONS

All proposed changes in plant design or operation, as well as tests or experiments conducted during 1992 were reviewed for potential environmental impact in accordance with the EPP and administrative quality assurance procedures. The reviews ensured that no changes were performed which could cause an adverse environmental impact. Therefore, there were no potentially significant unreviewed environmental questions in 1992.

NONROUTINE REPORTS

There were no nonroutine reports in 1992.

HERBICIDE USAGE

Because the PNPP site is home to several special habitat areas, like that for the spotted turtle, herbicides and pesticides are used sparingly on site. An application must be made to the PNPP Environmental Monitoring Element prior to spraying to ensure that only approved chemicals are being used, and only in approved areas.

Table 15 provides a compilation of herbicide usage at the PNPP for 1992. All usage was in compliance with Ohio Environmental Protection Agency regulations. No adverse environmental impacts as a result of this usage were noted during weekly site environmental inspections. Surflan AS and Round Up were used in equal portions to make up the total quantity except where noted.

Table 15 - Herbicide Usage

Date Applied	*Location*	*Total Acres*	*Gallons*
5/19	Unit #1 gravelled areas	5.0	10.0
5/20	Cable reel storage yard	3.3	6.6
5/20	Parking lot	4.8	9.6
5/21	Fire training ground	6.9	13.8
9/14	Training Center grounds (Malathion)	1.5	0.63

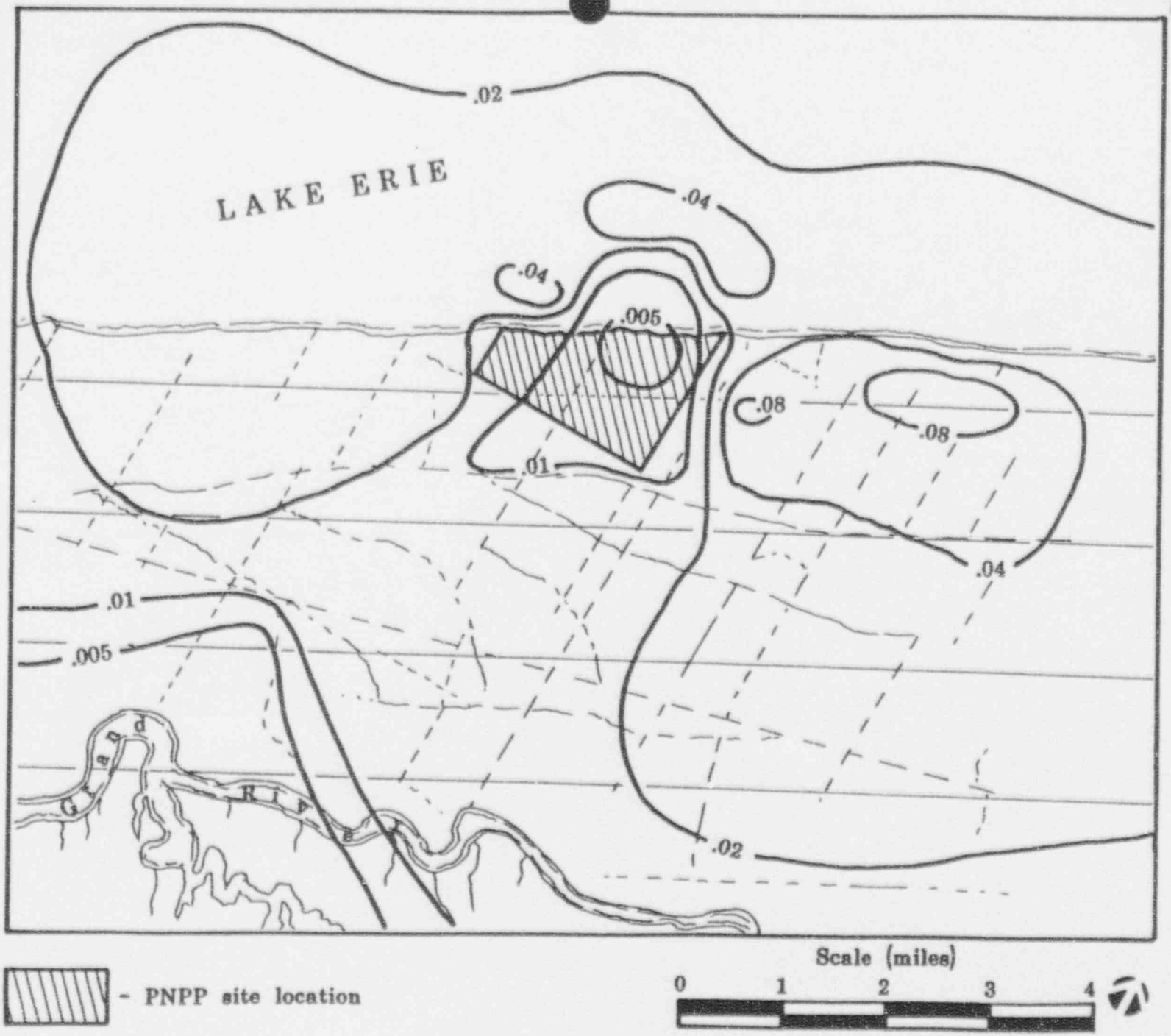


Figure 14: Predicted annual deposition of dissolved solids (lb./acre/yr.) from cooling tower drift.

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
41	TLD	920110/920402	13.00+/-.30
41	TLD	920402/920701	13.00+/-.40
41	TLD	920701/921001	14.10+/-.60
41	TLD	921001/930107	14.40+/-.20
42	TLD	920110/920402	13.90+/-.30
42	TLD	920701/921001	14.20+/-.50
42	TLD	921001/930107	15.00+/-.30
43	TLD	920110/920402	12.90+/-.30
43	TLD	920402/920701	12.90+/-.50
43	TLD	920701/921001	13.40+/-.60
43	TLD	921001/930107	15.50+/-.20
45	TLD	920110/920402	12.60+/-.20
45	TLD	920402/920701	13.60+/-.40
45	TLD	920701/921001	13.30+/-.40
45	TLD	921001/930107	15.20+/-.30
53	TLD	920110/920402	13.40+/-1.00
53	TLD	920402/920701	13.70+/-.50
53	TLD	920701/921001	13.60+/-.70
53	TLD	921001/930107	14.90+/-.20
54	TLD	920402/920701	14.90+/-.30
54	TLD	920701/921001	15.10+/-.40
54	TLD	921001/930107	15.40+/-.30
55	TLD	920110/920402	13.10+/-.50
55	TLD	920402/920701	14.30+/-.60
55	TLD	920701/921001	13.50+/-.50
55	TLD	921001/930107	16.60+/-.30

DIRECT REPORT
SAMPLE FREQUENCY IS : QUARTERLY
RESULTS IN MR/QTR +/- 2 SIGMA

STATION LOCATION	SAMPLE TYPE	COLLECTION DATE	DIRECT
56	TLD	920110/920402	14.50+/-.40
56	TLD	920402/920701	14.70+/-.50
56	TLD	920701/921001	15.20+/-.50
56	TLD	921001/930107	15.30+/-.20
58	TLD	920110/920402	14.70+/-.50
58	TLD	920402/920701	14.00+/-.50
58	TLD	920701/921001	15.60+/-.50
58	TLD	921001/930107	15.90+/-2.30