

## NATIONAL AMBIENT RADIATION DATABASE

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### **Abstract**

The U.S. Environmental Protection Agency (EPA) recently developed a searchable database and website for the Environmental Radiation Ambient Monitoring System (ERAMS) data. This site contains nationwide radiation monitoring data for air particulates, precipitation, drinking water, surface water and pasteurized milk.

This site provides location-specific as well as national information on environmental radioactivity across several media. It provides high quality data for assessing public exposure and environmental impacts resulting from nuclear emergencies and provides baseline data during routine conditions. The database and website are accessible at [www.epa.gov/enviro/](http://www.epa.gov/enviro/).

This site contains 1) a query for the general public which is easy to use - limits the amount of information provided, but includes the ability to graph the data with risk benchmarks and 2) a query for a more technical user which allows access to all of the data in the database, 3) background information on ERAMS.

### **Introduction**

Since the mid-1900's, domestic and foreign weapons tests, accidents, and other events have released radioactive material into the ambient environment. The U.S., initially through the U.S. Department of Health Education and Welfare, Public Health Service (PHS), and later by EPA, has closely monitored the movement of this material ever since using a complex network of air, water, and milk sampling stations and a sophisticated analytical radiochemistry laboratory.

The more recent data available on this website were collected under EPA's ERAMS. ERAMS was formed in 1973 by consolidating a number of existing radiation monitoring networks, managed by the PHS. ERAMS has more than 200 stations distributed across all fifty states and the American Territories which regularly sample the nation's air particulates, precipitation, drinking water and pasteurized milk.

This site provides a plethora of information and links on radiation in the environment. The environmental radiation database has been used to characterize two prominent examples of historical nuclear events resulting in significant ambient radiological contamination, (1) the hundreds of above-ground nuclear weapons tests and other detonations that took place around the globe from 1945 to 1980; and (2) the Chernobyl nuclear reactor accident in 1986. These

events are described along with selected analyses of EPA monitoring data. A third section provides additional analysis of EPA long-term ambient radiation monitoring to illustrate how the data can (and cannot) be used to characterize nuclear events and long-term radiological trends.

Once queried, the results can be displayed in both table form or as a graph. The graph will provide additional benchmarks for each media/radionuclide, including EPA's 10E-4 to 10E-6 risk range, the average minimum detectable concentration for the measurement device, and the EPA environmental standard, if there is one.

This is a valuable database and web page, useful to both a general and technical audience. EPA would like to continue to work with other Federal and State Agencies to develop an even more comprehensive web site for radiation releases to the environment.

## **Historical Background**

In August 1959, President Eisenhower gave the Department of Health Education, and Welfare (HEW) the primary authority within the Executive Branch for collection, analysis, and interpretation of data on environmental radiation levels. The purpose of establishing this program was to determine trends in the levels of radioactivity in air particulates, precipitation, drinking water, surface water and pasteurized milk.

In response to this direction, HEW's Public Health Service (PHS) established several national radiation monitoring networks, including the Radiation Alert Network, the Tritium Surveillance System, the Interstate Carrier Drinking Water Network, and the Pasteurized Milk Network. PHS collected, analyzed, interpreted and published environmental monitoring data from these monitoring networks through 1970.

In 1970, the responsibility to conduct environmental radiation monitoring was transferred to EPA under Reorganization Plan Number 3. EPA continued with data collection and publication while they reevaluated the monitoring system. On July 1, 1973, EPA instituted an updated environmental radiation monitoring system, called ERAMS. This system was designed to consolidate and complement the monitoring networks previously instituted by PHS. The responsibility for operating ERAMS is assigned to the Director, National Air and Radiation Environmental Laboratory (NAREL), Montgomery, Alabama.

EPA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama conceived and helped establish ERAMS in 1973. NAREL is responsible for management and operation of ERAMS as well as analyzing all samples.

## **ERAMS Overview**

ERAMS is a comprehensive environmental radiation monitoring network of over 200 stations that regularly sample the nation's air particulates, precipitation, drinking water, and pasteurized milk. The ERAMS network also included a surface water sampling program from 1973 through 1999. In some cases the air particulate and precipitation monitoring stations are co-located. All station operators are volunteers provided mainly by state government agencies or, in

some cases, local government bodies. ERAMS provides broad geographical coverage and covers many major populations centers.

Since its inception in 1973, ERAMS has collected over a half million high quality radiation samples, nationwide. The resulting data is useful for assessing public exposure and environmental impacts from nuclear emergencies and historical nuclear testing and to provide reliable baseline data during routine conditions. The current database provides data that has been collected since 1978 as well as strontium-90 in pasteurized milk data collected since 1960. Data generated from ERAMS is used to provide the information base for making decisions necessary to ensure protection of public health and the environment.

Since the most likely scenarios of major nuclear incidents involve the release of substantial amounts of radioactivity into the atmosphere, air particulate and precipitation sampling are critical for determining the extent and degree of dispersion of radioactive material and subsequent human exposure. Data from air particulate monitoring during a nuclear emergency can be used for dose assessment. In addition, data from air particulate monitoring during routine operations can be used as a baseline data for comparisons by organizations performing facility and site monitoring.

Drinking water and pasteurized milk are monitored since they represent significant human pathways and provide valuable data for dose assessment. Milk is a particularly good indicator of the bioaccumulation of select radionuclides into the food chain following a nuclear incident involving the atmospheric dispersion of radioactivity. Milk is also an important indicator because of the sensitivity of infants and children to radiation coupled with their normally high consumption of milk. There is also significant public concern over the quality of the nations drinking water.

The objectives of the ERAMS monitoring network are to provide a means of estimating ambient levels of radioactive pollutants in our environment, to follow trends in environmental radioactivity levels, and to detect and assess the impact of fallout from atomic weapons testing, nuclear accidents, and other intrusions of radioactive materials. To accomplish this, ERAMS may operate in either a "routine" or "emergency" (or alert) mode. ERAMS normally operates in "routine" mode, sampling radiation in all media on a regularly defined schedule. In the event of a threat of a significant radiation release ERAMS operates in an "emergency" (or alert) mode, accelerating the frequency of sampling and generating many more data records for a given period of time compared to the ERAMS routine mode. This was done in 1976 and 1977 following the Chinese weapons tests, in 1979 following the Three Mile Island nuclear reactor accident in the U.S., in 1986 following the Chernobyl nuclear reactor accident in the Soviet Union, in 2000 following the Los Alamos and Hanford wildfires in the U.S., and in 2001 following the terrorist attacks in the U.S.

## **ERAMS Website and Searchable Database**

The Radiation Protection Division (RPD), Office of Radiation and Indoor Air (ORIA) is responsible for providing environmental radiation protection information for both the general public and advanced users. Environmental radiation monitoring data are an important component of that information. The ERAMS website provides both a searchable database and information on environmental levels of radiation. It is designed to provide both the general public and advanced users a clear understanding of the data, and the uses and limitations of the data.

The ERAMS website provides an easy to use query that allows the user to search for results at a specific location, in a specific media for a particular radionuclide, and to graph those results. The user will have access to information on trends at specific monitoring sites and make comparisons with environmental radiation levels at other ERAMS monitoring sites across the nation. In order to provide context for the results EPA has included appropriate risk benchmarks. The benchmarks represent the following parameters: EPA's risk range of  $10^{-4}$  to  $10^{-6}$ , the minimum detectable concentration (MDC's) for a given method, and EPA's drinking water standard, the maximum contaminant level (MCL) where available. The benchmarks differ depending on media (eg. precipitation, air particulates, drinking water, and pasteurized milk), and radionuclide. This website also provides a Customized Query approach which offers more detailed functionality for the advanced user.

The ERAMS website contains:

- Background information on ERAMS
- What ERAMS samples for and why
- Sample collection information
- Background information on specific radionuclides
- Basic radiation information
- Discussion of fallout from weapon testings
- Discussion of nuclear accidents picked up by ERAMS (e.g., Chernobyl)
- Sources of radiation
- QA/QC
- I      Information on the locations of ERAMS monitoring stations.

The ERAMS website is available to a wide range of users through EPA's Envirofacts Warehouse ([www.epa.gov/enviro](http://www.epa.gov/enviro)). Envirofacts provides a single point of access to several EPA databases to provide users with information about environmental activities that may affect air, water, and land anywhere in the United States. With Envirofacts, users can learn more about these environmental activities in a specific area and can generate maps of environmental information.