



# Piqua, Ohio, Decommissioned Reactor Site

## FACT SHEET

*This fact sheet provides information about the Piqua, Ohio, Decommissioned Reactor. This site is managed by the U.S. Department of Energy Office of Legacy Management.*

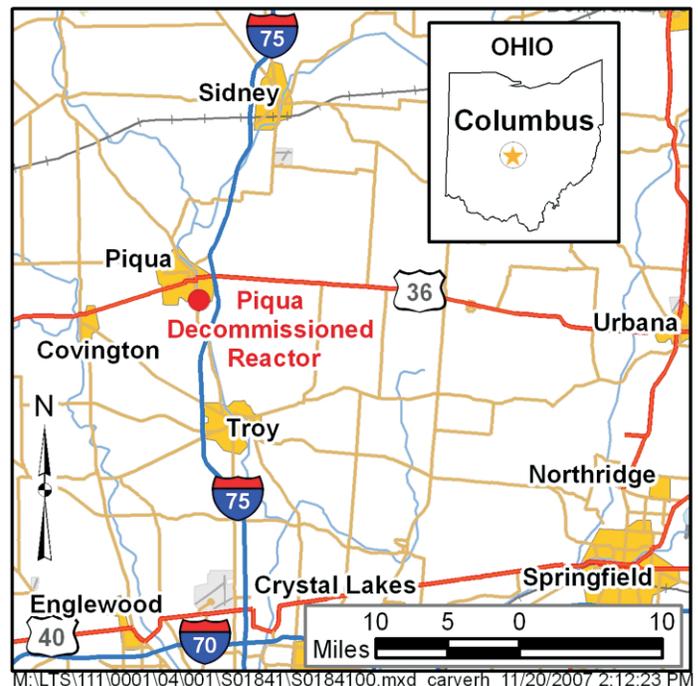
### Site Description and History

The Piqua Decommissioned Reactor is located in southwestern Ohio in the city of Piqua on the east bank of the Great Miami River, about 30 miles north of Dayton. The site is about 900 feet southeast of the Piqua municipal power station and 150 feet north of the city sewage treatment plant. A limestone quarry bounds the north and east sides of the reactor site. The decommissioned reactor is about 120 feet from the Great Miami River.

The U.S. Atomic Energy Commission (AEC), a predecessor agency to the U.S. Department of Energy (DOE), built the 45.5-megawatt thermal reactor as a demonstration project. AEC selected the city of Piqua as the site of the first organically cooled and moderated reactor. This prototype design used a commercially available mixture of aromatic hydrocarbons called terphenyls as the reactor coolant. The reactor vessel was made of low-carbon steel and had an average wall thickness of 2 inches, an inside diameter of 7.6 feet, and an overall height of 27 feet. The reactor was designed to produce 150,000 pounds per hour of superheated steam at a pressure of 450 pounds per square inch and a temperature of 550 °F. The superheated steam was pumped through pipes in a footbridge across the Great Miami River to turbo-generators in the Piqua municipal power plant to augment the city's power supply.

The City of Piqua operated the facility under contract to AEC. Operations began in June 1963 and continued until January 1966, when the reactor was shut down because of economic and technical considerations. AEC terminated its contract with the City of Piqua for facility operation and maintenance in 1967. Dismantling and decommissioning activities began that year and were completed in 1969. The reactor vessel was entombed in place.

Before 1921, considerable flooding occurred throughout the Great Miami River Basin. Construction of retarding dams and basins in 1921 has greatly reduced river



*Location of the Piqua Decommissioned Reactor*

flooding. One of the retarding dams was constructed 4 miles upstream of Piqua. This dam, together with levees and river channel improvements at Piqua, was designed to permit a maximum river flow at Piqua of 80,000 cubic feet per second. The highest river flow at Piqua since the construction of the dams was 22,000 cubic feet per second in 1929 and 1933, and the river elevation during that flow was about 9 feet below the main floor level of the reactor building.

### Regulatory Setting

DOE holds title to the land and the entombed radioactive materials and is responsible for long-term custody and care of the facility and those materials. In 1968, AEC entered into a lease agreement with the City of Piqua. Under terms of this agreement, AEC (now DOE) leases the land containing the facility to the City at no cost. The City is responsible for maintaining the portion of the land and structures that are not associated

with radioactive materials, including maintenance and testing of a high-water alarm in the sump pump and a cathodic protection system that protects the steel containment shell from corrosion. The agreement further stipulates that the City must permit DOE free and ready access to the premises and that use of the property carries an absolute prohibition against breaching the concrete and steel structure that encapsulates the radioactive materials. According to the agreement, title to the site will revert to the City of Piqua when radioactivity in the reactor complex has decayed to levels that allow the facility to be released for unrestricted use.

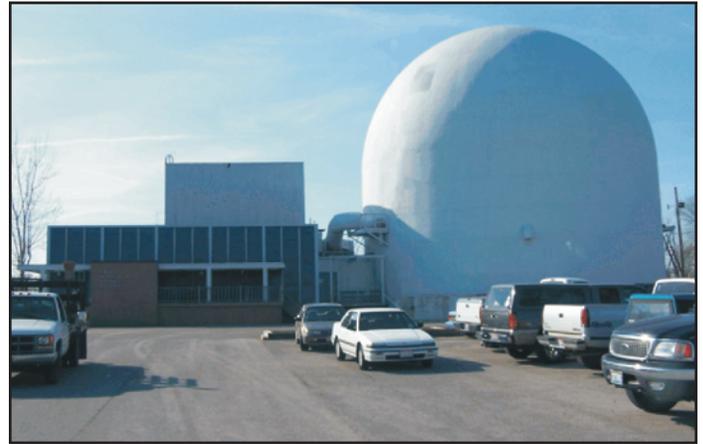
The U.S. Nuclear Regulatory Commission has established radiation exposure and dose standards in Title 10 *Code of Federal Regulations* Part 20, "Standards for Protection Against Radiation." DOE conducts annual radiological monitoring of the reactor complex.

## Facility Decommissioning

Between 1967 and 1969, AEC removed the reactor fuel and coolant and most of the radioactive materials from the site. Contaminated piping and equipment inside the reactor building were removed or decontaminated. The reactor vessel, concrete biological shield (the bioshield), and nonremovable components in the reactor vessel were left in place. Contamination remaining in the reactor consists mainly of activation products—materials that were formerly stable but became radioactive after being bombarded with high levels of radioactivity in the reactor core.

The facility currently consists of the reactor building and a connected auxiliary building. The belowground portion of the reactor building is a vertical cylindrical steel structure housing the reactor vessel, steam-generating equipment, and other components of the heat transfer system. The City of Piqua presently uses the facility for offices, meeting rooms, and storage areas.

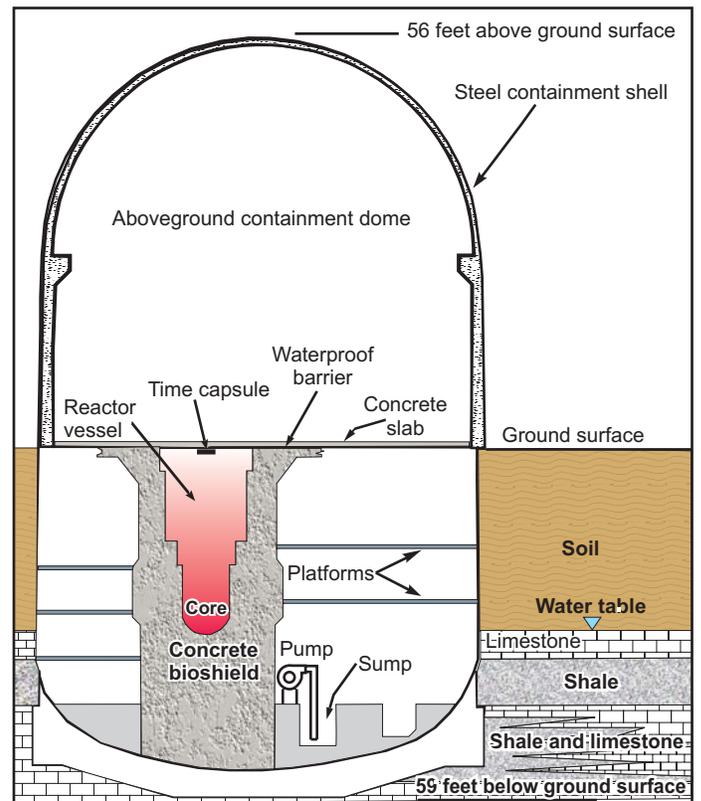
An 8-foot-thick concrete bioshield surrounds the reactor vessel, which is located entirely below ground. An estimated 2 feet of the innermost thickness of the bioshield is contaminated with activation products. However, the fuel (enriched uranium) has been removed from the reactor core area, and the facility was designed to contain radioactivity from an operating reactor. Consequently, the bioshield is considered to be more than sufficient to contain the activation products during the process of radioactive decay. The main floor of the reactor building was covered by a waterproof material to prevent downward leakage of surface water, and a layer of concrete was poured over the waterproofing to render the areas containing the radioactive material completely inaccessible to people. Two "time capsules" were installed, one beneath the concrete that



*Aboveground Portion of the Piqua Decommissioned Reactor Complex and Auxiliary Building*

covers the reactor vessel and the other on a wall inside the reactor building. These time capsules are sealed metal boxes that contain detailed information about the structure and contents of the reactor complex. When radioactivity in the reactor has decayed to safe levels, the information in the time capsules will provide adequate records for access to and complete disposal of the reactor vessel.

More than 99 percent of the approximately 260,000 curies of radioactive material entombed at the site in 1969 is located within the belowground portion of the reactor complex. Calculations performed by AEC in 1968 indicate that by 2088 the radioactivity will have decayed to levels low enough to allow the removal of



*Cross Section of the Piqua Decommissioned Reactor Building*

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all safety constraints. DOE will reevaluate the total radioactivity of the reactor prior to removing the safety constraints at which time the title to the facility will be transferred to the City.

## **Legacy Management Activities**

DOE manages the Piqua Decommissioned Reactor Site according to a site-specific Long-Term Surveillance Plan to ensure that the massive concrete and steel entombment structure continues to prevent release of contaminants to the environment. Under provisions of this plan, DOE conducts annual inspections of the site to evaluate the condition of surface features and measure radioactivity on the interior of the reactor containment building, auxiliary building, and exterior areas. DOE also ensures that the City maintains and tests the high-water alarm in the sump pump system and the cathodic protection system that protects the steel containment shell from corrosion.

## **Contacts**

Documents related to the Piqua Decommissioned Reactor Site are available on the DOE Office of Legacy Management website at

<http://www.LM.doe.gov/land/sites/oh/piqua/piqua.htm>.

For more information about DOE Office of Legacy Management activities at the Piqua Decommissioned Reactor Site, contact

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