



D&D

## Site A/Plot M, Illinois, Decommissioned Reactor Site

*This fact sheet provides information about the Site A/Plot M, Illinois, Decommissioned Reactor Site. This site is managed by the U.S. Department of Energy Office of Legacy Management under the DOE Defense Decontamination and Decommissioning (D&D) Program.*

### Site Description and History

The Site A/Plot M decommissioned reactor site is located in the Palos Forest Preserve in Cook County, Illinois, 20 miles southwest of Chicago. The site is underlain by 100 feet of glacial till overlying dolomite bedrock. About 8.9 million people live within 50 miles of the site; the population within a 5-mile radius is about 150,000.

The Site A/Plot M area is the former site of Argonne National Laboratory and its predecessor, the University of Chicago Metallurgical Laboratory, which was part of the World War II Manhattan Engineer District. In 1942, the U.S. Army Corps of Engineers leased 1,025 acres of land in the Palos Forest Preserve from the Forest Preserve District of Cook County (FPDCC). The newly constructed laboratory used two locations in the Palos preserve: Site A, a 19-acre area for experimental laboratories and nuclear reactor research facilities, and Plot M, a 150-foot by 140-foot area for burial of radioactive waste. Plot M is located about 1,500 feet north of Site A.

Site A was the operational facility for two of the nation's first nuclear reactors, referred to as Chicago Pile-2 and Chicago Pile-3 (CP-2 and CP-3). Besides the two reactors, an estimated 35 support buildings were constructed at the site, including laboratories, dormitories, a cafeteria, dog kennels, and a lead foundry.

Operations at Site A began in 1943 and ended in 1954. The first nuclear reactor to achieve a self-sustaining chain reaction, CP-1, was moved from the University of Chicago to Site A in 1943 and renamed CP-2. A second reactor, CP-3, was constructed on the site in 1943. The fuel for both reactors was natural uranium (abundance of the isotopes uranium-234, uranium-235, and uranium-238 has not been altered). CP-3 was dismantled in January 1950 because of suspected



Location of the Site A/Plot M, Illinois, Decommissioned Reactor Site

corrosion of the aluminum cladding around some of the fuel rods. The natural uranium fuel in CP-3 was replaced with enriched uranium (amount of uranium-235 in the fuel has been increased from its naturally occurring abundance). The redesigned reactor, named CP-3 prime (CP-3'), became operational in May 1950.

Research programs conducted at Site A included reactor physics studies, fission product separations, tritium recovery from irradiated lithium, and studies of radionuclide metabolism in laboratory animals.



*Marker at Plot M*

Because the FPDC was not willing to sell or permanently transfer title to Site A to the federal government, the U.S. Atomic Energy Commission (AEC, a successor agency to the Manhattan Engineer District) purchased land 6 miles northwest of Site A in 1947 to build a larger nuclear research complex, Argonne National Laboratory. By May 1954, both CP-2 and CP-3 were shut down, and all work was moved to the new complex.

When work at Site A ceased, the reactor fuel for both reactors and heavy water (water composed of mainly deuterium and oxygen instead of ordinary hydrogen and oxygen) in reactor CP-3 were removed and shipped to Oak Ridge National Laboratory, an AEC facility near Oak Ridge, Tennessee. A hole approximately 100-feet across and 40-feet deep was excavated between the two reactors. The 800-ton, concrete-filled shell of CP-3 was buried by digging around it on three sides and detonating strategically placed explosives in the earthen “pedestal” that supported it. The reactor shell landed upside down in the excavated hole. The reactor buildings were razed. The concrete shield of CP-2, the only remaining portion of that reactor, was broken down using a wrecking crane and pushed into the hole, which was then filled, leveled, and landscaped. By 1956, all buildings and equipment at Site A had been decontaminated and demolished.

Radioactive waste and radioactively contaminated laboratory articles from Site A were buried in Plot M from 1943 to 1949. Records of items placed in Plot M are incomplete, but known items include animal carcasses, building debris, clothing, contaminated equipment, air filters, paper, and other radioactive and hazardous materials. Decommissioning of Plot M was completed in 1956, when an inverted concrete box was constructed over the entire burial plot. The concrete walls of the box are 18 inches thick and extend 8 feet into the ground. A 1-foot-thick concrete slab was poured over the entire disposal area. The purpose of the concrete barrier is to prevent digging from taking place at the site and to block

the flow of water through the buried radioactive materials. The concrete slab was covered with approximately 2 feet of soil, grass was planted, and a granite marker inscribed with “Caution—Do Not Dig” and additional cautionary text, was placed in the center of Plot M.

In 1973, elevated levels of tritium were detected in samples from two groundwater wells near Plot M. Investigations showed that the tritium had traveled from Plot M into the surrounding soil and groundwater before the inverted concrete box was put into place in 1956. In response, AEC established a monitoring program.

While conducting routine monitoring in 1990, workers with the Illinois Department of Nuclear Safety discovered a piece of uranium metal beneath the leaves and underbrush at Site A. Further investigation revealed that surface soils in several areas of the site contained radionuclides at levels above background. Several physical

hazards, such as pipes protruding from the ground and concrete rubble, were also identified.

A risk assessment associated with the investigation concluded that risks from contamination at Site A were low. Although the U.S. Department of Energy (DOE, the successor agency to AEC) was not required by federal or state law to remove the contamination, DOE agreed that it was in the best interests of all parties to reduce risks by conducting voluntary cleanup. To support cleanup efforts, the 19-acre area around Site A and Plot M was expanded to 35 acres and was fenced in 1993. Physical hazards were removed in 1995 by the U.S. Army Corps of Engineers. During a limited removal action in 1997, approximately 500 cubic yards of low-level radioactive soil and debris was excavated, mixed with Portland cement, and shipped to the DOE Hanford facility near Richland, Washington, for disposal. Follow-up verification surveys confirmed that the removal actions had met radiological cleanup criteria; concurred by the Illinois Department of Nuclear Safety.

The surface at both Site A and Plot M is considered to be clean and suitable for unrestricted recreational use. Hiking trails and a bike path pass through the sites, and a picnic area is located near Plot M. Site A is secluded, and a hiking trail that once crossed the site was rerouted along the site boundary after the fence was installed in 1993. The fence has since been removed. A marker placed at Site A explains the historical significance of the site.

As part of an ongoing monitoring program, Argonne National Laboratory conducts sampling at 19 groundwater locations and 9 surface water locations in the Site A and Plot M areas and is responsible for sample analysis and reporting. Sampling is conducted in accordance with the Long-Term Surveillance Plan for Site A and Plot M. This document defines both the frequency for monitoring and the analysis to be performed for each monitored location.

The primary contaminants of concern in groundwater and surface water near Site A and Plot M are tritium and strontium-90.

## Current Risk

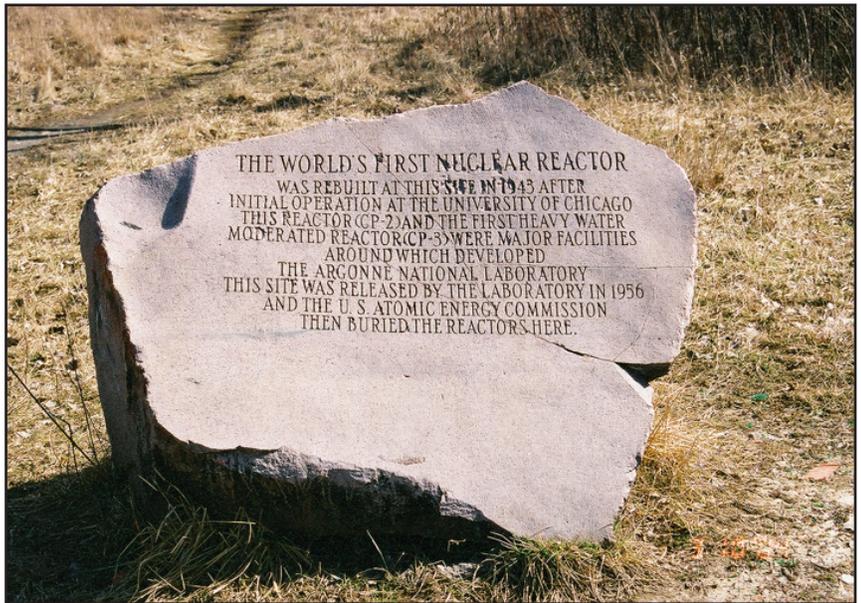
FPDCC prohibits digging in the Palos Forest Preserve. Regulation also bans drilling and serves as a land-use restriction to reduce the likelihood that buried waste would be exposed due to human involvement.

Currently, the only complete exposure pathways to subsurface contaminants is where groundwater surfaces at a local seep and an intermittent stream that flows for several months each spring. Exposure possibility to contaminated groundwater and surface water are low frequency and of short duration, and observed levels of contamination do not endanger the health or safety of the public visiting the site, using the picnic area, or living in the vicinity. Potential radiation doses are well below standards.

## Regulatory Setting

Site A/Plot M land is owned by the Forest Preserve District of Cook County, Illinois. DOE is responsible for subsurface radioactivity at the sites under the authority of the Atomic Energy Act of 1954 (Title 42 *United States Code* [USC], Section 2011, et seq.).

The primary guidance for surveillance of Site A/Plot M is DOE Order 458.1, *Radiation Protection of the Public and the Environment*, which establishes a radiological dose limit to members of the public. U.S. Environmental Protection Agency Drinking Water Standards in Title 40 USC Part 141 do not apply because the affected groundwater and surface water do not meet the definition of a public water supply. However, the Illinois Class I Groundwater Quality Standards (Title 35 *Illinois Administrative Code*, Subpart 620), for tritium and strontium-90 are useful contamination standards. The Illinois Emergency Management Agency Division of Nuclear Safety acts as an interested but unaffiliated third party.



Marker at Site A

## Legacy Management Activities

The DOE Office of Legacy Management (LM) manages Site A/Plot M according to a site-specific Long-Term Surveillance and Maintenance plan. Management activities include annual site inspections to evaluate the condition of surface features (site vegetation and onsite and adjacent offsite erosion). LM also evaluates the groundwater and surface water monitoring program every 3 to 5 years. Evaluations in 2011 and 2014 resulted in reduced monitoring frequency and recommendations to plug and abandon eight wells. Monitoring program changes effective in 2015 continue to align with the LM mission to protect human health and the environment.

## Contacts

Documents related to the Site A/Plot M site are available on the LM website at [http://www.lm.doe.gov/sitea\\_plotm/Sites.aspx](http://www.lm.doe.gov/sitea_plotm/Sites.aspx).

For more information about LM activities at Site A/Plot M site, contact:

U.S. Department of Energy  
Office of Legacy Management  
2597 Legacy Way, Grand Junction, CO 81503

(970) 248-6070 (monitored continuously), or  
(877) 695-5322 (toll-free)