



Site A/Plot M, Illinois, Decommissioned Reactor Site



FACT SHEET

*This fact sheet provides information about the Site A/Plot M Decommissioned Reactor Site.
This site is managed by the U.S. Department of Energy Office of Legacy Management.*

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. The newly constructed laboratory used two locations in the Palos Forest Preserve: Site A, a 19-acre area that contained experimental laboratories and nuclear reactor research facilities, and Plot M, a 150-foot by 140-foot area that was used 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 ceased 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 (uranium in which the natural 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 corrosion of the aluminum cladding around some of the fuel rods. The natural uranium fuel in CP-3 was replaced with enriched uranium (uranium in which the amount of uranium-235 in the fuel has been increased from its naturally occurring abundance). The redesigned reactor, named CP-3' (CP-3 prime), became operational in May 1950.



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

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.

Because the Forest Preserve District of Cook County was not willing to sell or permanently convey 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 essentially 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. An excavation approximately 100 feet across and 40 feet deep was prepared between the two reactors. The 800-ton,



Marker at Plot M

concrete-filled shell of CP-3' was buried by excavating around it on three sides and detonating strategically placed explosives in the earthen "pedestal" supporting it. The reactor shell rolled and ended upside down in the excavation. The buildings that housed the reactors were demolished. The concrete shield of CP-2, the only remaining portion of that reactor, was demolished with a wrecking crane and pushed into the excavation, 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 generated 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 excavation of the site and to impede the flow of water through the buried radioactive materials. The concrete slab was covered with about 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 ground water wells located near Plot M. Additional investigation determined that the tritium had migrated from Plot M into the surrounding soil and ground water before the inverted concrete box

was emplaced in 1956. In response, AEC established a monitoring program.

During routine oversight 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 determined that surface soils in several areas of the site contained radionuclides at levels above background. A number of physical hazards, such as pipes protruding from the ground and concrete rubble, were also identified.

A risk assessment conducted in association 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 further reduce risks by conducting a voluntary cleanup action. For purposes of the cleanup, the 19-acre area around Site A and Plot M was expanded to 35 acres and was fenced in 1993. The U.S. Army Corps of Engineers removed the physical hazards in 1995. 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. Subsequent verification surveys confirmed that the removal actions had met cleanup criteria, and the Illinois Department of Nuclear Safety concurred that radiological cleanup criteria were met at Site A.

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 traverse the region, and a picnic area is located near Plot M. Site A is relatively 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 emplaced at Site A explains the historical significance of the site.

The primary contaminants of concern in ground water and surface water near Site A and Plot M are tritium and strontium-90. Tritium concentrations exceed the Illinois ground water quality standard in samples from several monitor wells at the sites and from an intermittent stream near Plot M. Low levels of strontium-90 have been detected in ground water samples collected near Site A and Plot M since 1984. As part of an ongoing monitoring program, Argonne National Laboratory conducts quarterly sampling at 27 ground water locations and 9 surface water locations in the Site A and Plot M areas and is responsible for sample analysis and reporting.

Current Risk

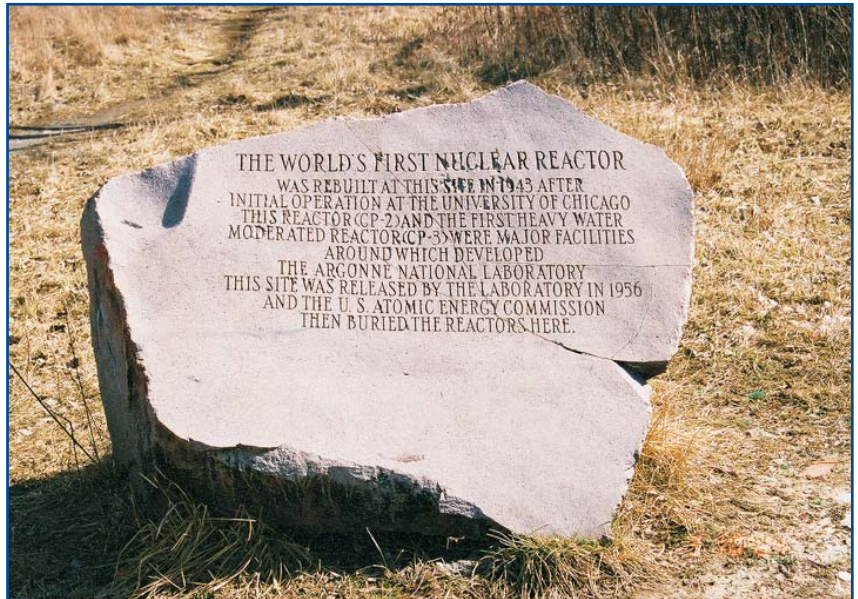
The Forest Preserve District prohibits digging in the Palos Forest Preserve. This regulation also prohibits drilling and excavating and serves as a land-use restriction to reduce the likelihood that buried waste would be exposed through intentional human intrusion.

Currently, the only complete exposure pathway to subsurface contaminants is where ground water surfaces at a local seep and an intermittent stream that flows several months each spring. Potential exposures to contaminated ground water and surface water are of low frequency and 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 the relevant standards.

Regulatory Setting

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

The primary guidance governing surveillance of Site A/Plot M is DOE Order 5400.5, *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 established in Title 40 *Code of Federal Regulations* Part 141 do not apply because the affected ground water and surface water do not meet the definition of a public water supply. However, the Illinois Class I Ground Water Quality Standards (Title 35 *Illinois Administrative Code* subpart 620) for tritium and strontium-90 are useful contamination benchmarks. 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 manages Site A/Plot M according to a site-specific Long-Term Surveillance and Maintenance Plan. Under provisions of this plan, the Office of Legacy Management conducts annual inspections of the site to evaluate the condition of surface features, such as site vegetation and any on-site and adjacent off-site erosion. The Office of Legacy Management will evaluate the ground water and surface water monitoring program every 3 to 5 years.

Contacts

Documents related to the Site A/Plot M Site are available on the DOE Office of Legacy Management website at <http://www.LM.doe.gov/land/sites/il/sitea/sitea.htm>.

For more information about DOE Office of Legacy Management activities at Site A/Plot M, contact

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