

Public Health Assessment

Argonne National Laboratory, 318 Area

DuPage and Cook Counties, Illinois

Cass Avenue and Bluff Road

December 3, 2001

Prepared and Issued by the

Illinois Department of Public Health

SUMMARY

Argonne National Laboratory (ANL) used the 318 Area to bury old or damaged gas cylinders that could not be reused. When possible, cylinders were emptied before burial; however, ANL believes that some cylinders contained small amounts (typically less than one pound) of toxic or corrosive gases. Records show that ANL buried cylinders containing ammonia, carbon monoxide, hydrogen chloride, hydrogen cyanide, hydrogen fluoride, hydrogen sulfide, phosgene, and phosphine. No radioactive materials were placed in this unit.

Currently, the 318 Area poses no apparent public health hazard because human exposure to contaminants is not presently occurring. A concrete and soil cap covers all buried cylinders, and workers only occasionally visit the area. Placing the 318 Area and its concrete cover under the 319 Area soil cap has reduced the likelihood of toxic gases escaping to the atmosphere at levels that would be a problem except to, perhaps, people working at the 318 Area. To prevent disturbance in the future, this area is clearly marked to warn people not to excavate the area. A fence was also installed around this site.

Any future disturbance of buried cylinders in the 318 Area may cause the release of toxic gases. Persons present at the time could inhale those gases. If sufficient pressure remains inside a disturbed cylinder, it also may pose a physical hazard; however, the installed concrete and soil cap makes this scenario highly unlikely.

Exposure to groundwater contamination at the site is not occurring and is unlikely to occur in the future. ANL has not found elevated concentrations of radionuclides in air or soil around the ANL perimeter fence. The concentrations of chemicals in soil at the 318 Area are below levels of concern for on-site workers or an occasional trespasser.

Nearby residents are concerned about elevated cancer rates because of radioactive contamination at ANL. Epidemiological studies have not found elevated cancer rates in populations living near ANL.

PURPOSE AND HEALTH ISSUES

The Illinois Environmental Protection Agency (IEPA) is overseeing remedial efforts at the Argonne National Laboratory (ANL) 318 Area under the corrective action requirements of the Resource Conservation and Recovery Act (RCRA). The Illinois Department of Public Health (IDPH) has received calls from residents near ANL concerned about increased cancer risks because of radioactive contamination at several areas on the site. For that reason, IDPH is providing information on ANL for the community. Because of the complexity of the site and the number of contaminant source areas, IDPH believes the information is more understandable if specific contaminant source areas are discussed in separate documents. This document contains information about the 318 Area.

BACKGROUND AND STATEMENT OF ISSUES

Argonne National Laboratory (ANL)

ANL is near Lemont, Illinois (Figures 1 and 2). Many on-site locations have suspected or known releases of hazardous substances. The Illinois Environmental Protection Agency (IEPA) is addressing those areas as part of the RCRA Part B Permit corrective action program.

ANL occupies the central 1,500 acres of a 3,740 acre property owned by the U.S. Government and DuPage County. ANL has been at this location since 1949 (Golchert and Kolzow 1994). ANL is a research facility funded by the U.S. Department of Energy (DOE) and operated by the University of Chicago. Current topics of study at ANL include (Golchert and Kolzow 1998; Golchert and Kolzow 1994):

1. Nuclear energy.
 - a. Safety studies for light water and breeder reactors.
 - b. Component and material development for fission and fusion reactors.
 - c. Immobilization of radioactive wastes for disposal.
2. Medical radioisotope technology.
3. The biological effects of low-level radiation.
4. Superconductivity advances and applications.
5. The design of synchrotron radiation accelerators.
6. The development of electrochemical energy sources including fuel cells and batteries for vehicles and energy storage.
7. Improvements in the use of coal for power production, especially high-sulfur coal.
8. Evaluation of heat exchangers for recovery of waste heat from engines.
9. Environmental activities.
 - a. Biological activity of energy-related mutagens and carcinogens.
 - b. Characterization and monitoring of energy-related pollutants.
 - c. Effects of acid rain on soil, surface water, and vegetation.

ANL generated a Preliminary Assessment report in 1987 that identified 13 sites on the current ANL property with known or suspected hazardous substances: (1) 317 Area; (2) 319 Area; (3) 800 Area Landfill; (4) East Area Sewage Treatment Sand and Filter Beds; (5) Freund Ponds; (6) Wastewater Treatment Plants; (7) 570 Area Wastewater Sludge Drying Beds; (8) East Area Burn Pit; (9) Building 810; (10) Old Shooting Range at Building 832; (11) Building 34; (12) Building 330; and (13) 360 Area (Morris 1993).

Golchert and Kolzow (1998) listed three additional areas: (1) 318 Area Gas Cylinder Disposal Area; (2) Gasoline Spill, Gasoline Station; and (3) Reactive Waste Disposal, Underwriters Pond, which is part of the Forest Preserve.

This document addresses only the 318 Area. Emissions from other sources at ANL are not within the scope of this report, although they contribute to off-site monitoring data interpreted in this document. Consequently, interpretation of off-site data includes that from all emissions from the facility.

The 318 Area

The 318 Area is inside the northeastern corner of the 317 Area (Figure 3). ANL used the 318 Area to bury old or damaged gas cylinders that could not be reused. When possible, cylinders were emptied before burial. ANL believes that some cylinders contained small amounts (typically less than one pound) of toxic or corrosive gases. Records of gas cylinders buried at the site are incomplete, but ANL reported burying cylinders containing ammonia, carbon monoxide, hydrogen chloride, hydrogen cyanide, hydrogen fluoride, hydrogen sulfide, phosgene, and phosphine. They also may have buried cylinders of chlorine and bromine. Some cylinders may have contained custom-made gases that are not available commercially. There is no record of the burial of any radioactive material in this area.

A geophysical survey showed that ANL buried at least 15 gas cylinders in the 318 Area 4 to 5 feet below the ground surface. In 1997, ANL placed a 12-inch, reinforced concrete cap over the 318 Area to prevent disturbance of the cylinders. The concrete contains red dye to make it more visible and is posted with "do not dig" signs. The 318 Area was incorporated under the 319 Area Landfill cap in 1999 (Chiu 1999; Golchert 1999; Golchert and Kolzow 1998; Moos 1997).

The Waterfall Glen Forest Preserve surrounds ANL. The forest preserve is part of the DuPage County Forest Preserve District. It contains a campground and trails for cross-country skiing, hiking, horseback riding, mountain-biking, and running. The Waterfall Glen Forest Preserve receives about 140,000 visitors annually (DuPage County Forest Preserve District 1997).

No people live within 1 mile of the 318 Area. ANL estimated that 5,137 people lived within 2 miles and 31,238 people lived within 3 miles of the center of ANL (Golchert and Kolzow 1994).

No private or municipal wells are down gradient of the 318 Area. Until December 1996, drinking water for ANL came from four on-site wells, but these wells were not down gradient of the 318

Area. In December 1996, ANL began using water from Lake Michigan to provide better quality drinking water for its workers (Golchert and Kolzow 1998). All land between the 318 Area and the Des Plaines River is forest preserve property, which makes residential or industrial development unlikely. Consequently, no one is consuming or is likely to consume groundwater that might be contaminated by the 318 Area.

Site Visits

IDPH staff conducted site visits at ANL on March 6, 1997, August 29, 1997, and May 20, 1999. Only four of the ANL sites: the 317 Area, 318 Area, 319 Area and 800 Area are visible from the site perimeter. A chain-link fence surrounds ANL, and barbed wire tops the fence. The fence is posted with signs that identify the land as U.S. Government property or as operated by DOE. Guards staff all open gates to the facility.

The 318 Area is about a 40-minute walk from the nearest forest preserve parking lot. That includes a 10-minute walk down an unmarked side trail. On March 6, 1997, a chain-link fence surrounded the 317 and 318 Areas. The fence had yellow radiation signs and was not topped with barbed wire. A narrow unmarked trail on the Waterfall Glen Forest Preserve property follows the perimeter fence along the 317 and 319 Areas. On March 6, 1997, one set of boot prints was found in the mud on the trail. On August 29, 1997, vegetation 4 to 5 feet tall had overgrown the trail along the fence by the 317 and 319 Areas.

On May 20, 1999, a large fallen tree blocked the side trail that IDPH staff previously used to reach the 317 and 319 Areas. No paths led around the fallen tree. IDPH staff found another trail along a nearby power line right-of-way that also led to the perimeter fence. A trail led along the perimeter fence past the 317 Area. IDPH staff noted evidence of horseback riding along this trail. ANL had demolished several structures in the 317 Area, and only a small concrete block building, the in-ground concrete vaults, an electrical box (controls for the lift station), and electrical wires remained. ANL had also removed the separate fence that had surrounded the 317 Area. Construction equipment was present. IDPH noted no distinguishing features in the 318 Area.

DISCUSSION

Environmental Contamination

ANL has monitored the levels of airborne radionuclides around the perimeter fence and has not detected elevated levels (Golchert and Kolzow 1998; Golchert and Kolzow 1997; Golchert and Kolzow 1996; Golchert and Kolzow 1995; Golchert and Kolzow 1994; Golchert, Duffy, and Moss 1992; Golchert and Duffy 1990). No other chemicals were analyzed in those samples.

In surface and subsurface soil, ANL did not find concentrations of inorganic elements or radionuclides above regional or state background levels (Moos 1997). The only exception was

tritium in subsurface soil, which evidently is from groundwater. ANL (Moos 1997) found organic chemicals in surface soil; however, the concentrations were below levels of concern for an on-site worker or an occasional trespasser. ANL did not find elevated concentrations of radionuclides in soil along the perimeter fence (Golchert and Kolzow 1998). Consequently, no further discussion is needed regarding exposure to contaminated soil.

Exposure Pathways

A hazardous substance can affect people only if they contact it through an exposure pathway at a sufficient concentration over a sufficient period. A source of exposure, an environmental transport medium, a route of exposure, and an exposed population (point of exposure) are the components of an exposure pathway. An exposure pathway is complete if all components are present and if people were exposed in the past, are being exposed, or will be exposed in the future. An exposure pathway is potential if parts of a pathway are absent, data are insufficient to decide whether it is complete, or exposure might occur at some time (past, present, future). An exposure pathway is incomplete if part of it is not present and will never exist.

Completed Exposure Pathways

No completed human exposure pathways currently exist at this site.

Potential Exposure Pathways

Air

Disturbing the cylinders buried in the 318 Area could cause the release of toxic gases. If the area were to be excavated, on-site workers could inhale released gases. If sufficient pressure remains inside a disturbed cylinder, it could explode and pose a physical hazard. The public is less likely to be exposed to toxic gases from a disturbed cylinder; however, a park visitor could be exposed if the person is nearby when a release occurs. The ANL perimeter fence is about 600 feet south of the 318 Area. The main Waterfall Glen Forest Preserve hiking trail is about ¼ mile south of the perimeter fence. Airborne contaminant levels would decrease with distance from a ruptured cylinder.

The cylinders were buried in the 1950s and 1960s; therefore, their integrity is unknown. Consequently, safe removal may not be possible.

Leakage of a buried cylinder might result in release of gases, but human exposure is unlikely because people occupy the area only occasionally. Furthermore, the gas would have to move laterally through the soil beyond the concrete cap to become airborne. Migration through the ground also would slow the rate of release, resulting in lower airborne levels.

ANL included the 318 Area under an extension of the 319 Area Landfill cap in 1999. The multi-layered cap will further slow the upward migration of any gases from a leaking cylinder. That

would result in lower airborne levels of any toxic gas leaking from a cylinder. The burial area was permanently marked by six 6-inch diameter steel “witness posts” clearly marked with “Do Not Dig” warning signs. The entire 317 and 318 Areas are enclosed by a six foot high chain-linked fence.

COMMUNITY HEALTH CONCERNS

Community concerns about ANL voiced at a September 17, 1991, public meeting organized by the Kingery East Citizen's Advisory Committee included: (1) the contamination of plants, soil, rivers, and sewers; (2) the presence of americium, neptunium, plutonium, and uranium in groundwater; and (3) increased cancer rates (especially leukemia from strontium-90, ovarian cancer, and genetic defects from cesium-137), and learning disabilities from exposure to contaminants.

On February 21, 1997, the group expressed concern about the past airborne dispersal of radioactive chemicals downwind of ANL. The group was concerned that the radiation may have caused elevated cancer rates in Burr Ridge, Clarendon Hills, Darien, Willowbrook, and Willow Springs. One concern was that airborne emissions might have been higher in the past. The group also expressed concern that past airborne emissions from ANL have contaminated soils with radionuclides in downwind residential areas.

Response to Concerns for the 318 Area

The presence of contaminants does not mean they pose a threat to public health. For health effects to occur, chemical exposure must be at high enough levels over a sufficient period. At the 318 Area, because of the low levels of contaminants and the infrequent opportunity for exposure, people should not experience adverse health effects.

ANL has restricted access, which reduces the likelihood that the public would be exposed. No one is drinking contaminated groundwater from ANL, and no wells used for human consumption exist down gradient of any of the areas with known groundwater contamination (including the 318 Area). All land between the 318 Area and the Des Plaines River is forest preserve, so future residential, business, or industrial development is unlikely. Consequently, the known groundwater contamination at ANL is not a health hazard.

From at least 1989 to the present, the exposure of residents around ANL to airborne radionuclides has been negligible. Overexposure of on-site workers may have occurred, but because monitoring data are unavailable, IDPH cannot evaluate past health risks. Past ANL emissions have not caused elevated radionuclide levels in surface soil around the facility perimeter. Consequently, the soil of more distant downwind residents also should not be contaminated. The 318 Area did not contain radioactive materials and thus did not contribute to any radionuclide exposure.

Health professionals cannot distinguish chemically or radiologically induced cancers from cancers that occur spontaneously. Consequently, to evaluate whether chemicals may have caused cancer, researchers compare cancer rates in an exposed or possibly exposed population to the expected cancer rate in a similar unexposed population.

The IDPH Division of Epidemiologic Studies conducted five cancer incidence data reviews (by zip code) of people living in different areas near ANL. The areas where data were reviewed were (1) Bolingbrook and Lemont (IDPH 1991a), (2) Clarendon Hills (IDPH 1995), (3) Darien and Westmont (IDPH 1996), (4) Willow Springs (IDPH 1993), and (5) Woodridge (IDPH 1991b). No evidence of increased cancer rates was found in communities around ANL.

CONCLUSIONS

The ANL 318 Area poses **no apparent public health hazard** because human exposure to contaminants is not occurring. A concrete cap covers all contamination, and workers only occasionally visit the 318 Area.

Any future disturbance of the buried cylinders in the 318 Area may cause the release of toxic gases. Persons present at the time could inhale the gases. If sufficient pressure remains inside a disturbed cylinder, it also may pose a physical hazard. The public is less likely to be exposed to toxic gases than workers, but exposure is possible if a park visitor is near the perimeter fence by the 317 Area should a release occur.

Leakage from a buried cylinder could occur, but people infrequently visit the area, which makes exposure less likely. Migration through the ground also would slow the rate of release and result in lower airborne levels.

Exposure to groundwater contamination at the site is not occurring and is unlikely to occur in the future. ANL has not found elevated levels of radionuclides in air along the perimeter fence.

RECOMMENDATIONS AND PUBLIC HEALTH ACTION PLAN

IDPH recommends that ANL establish deed restrictions to prevent future development of the 318 Area. ANL concurs with this recommendation.

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FIGURES

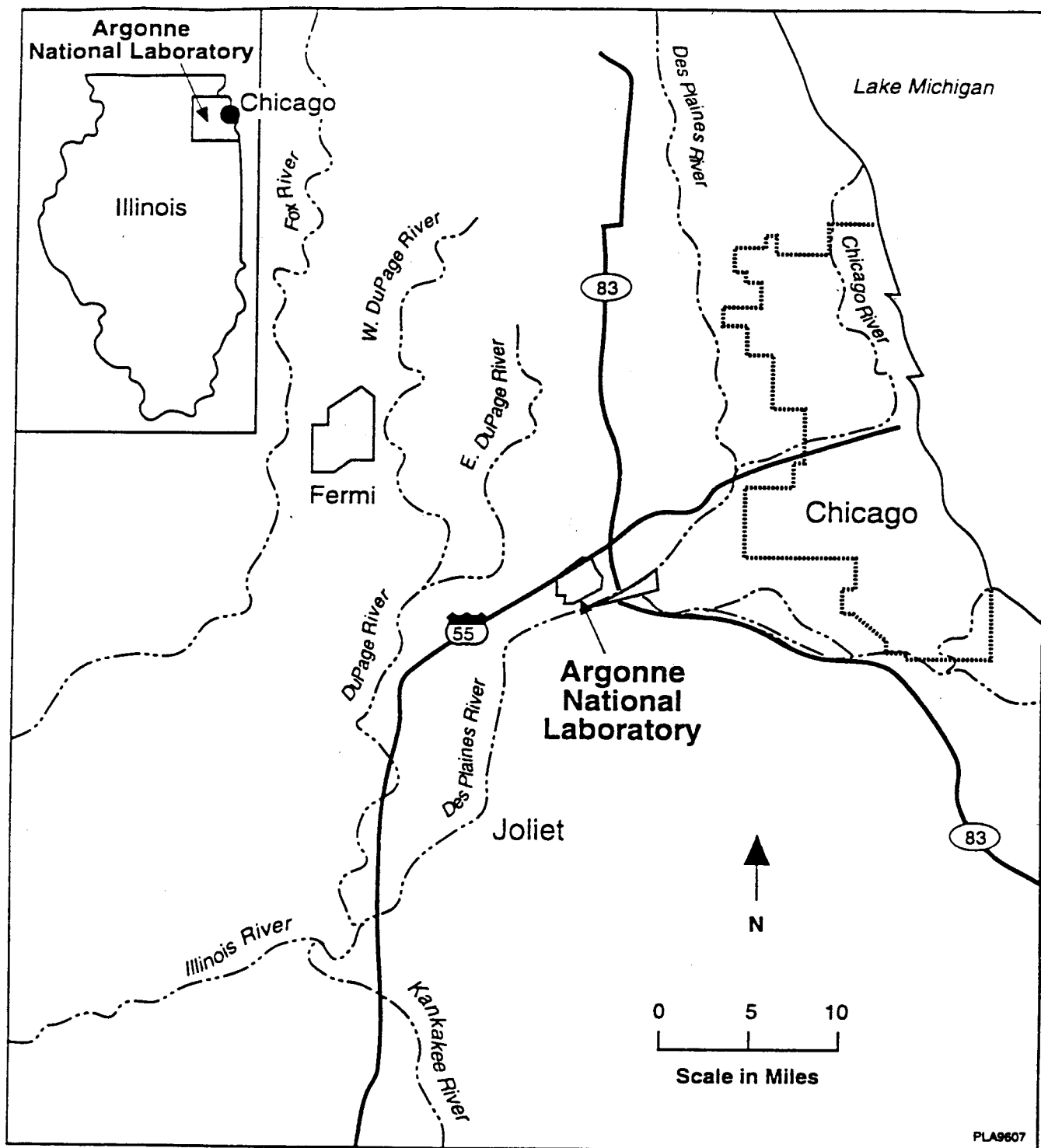
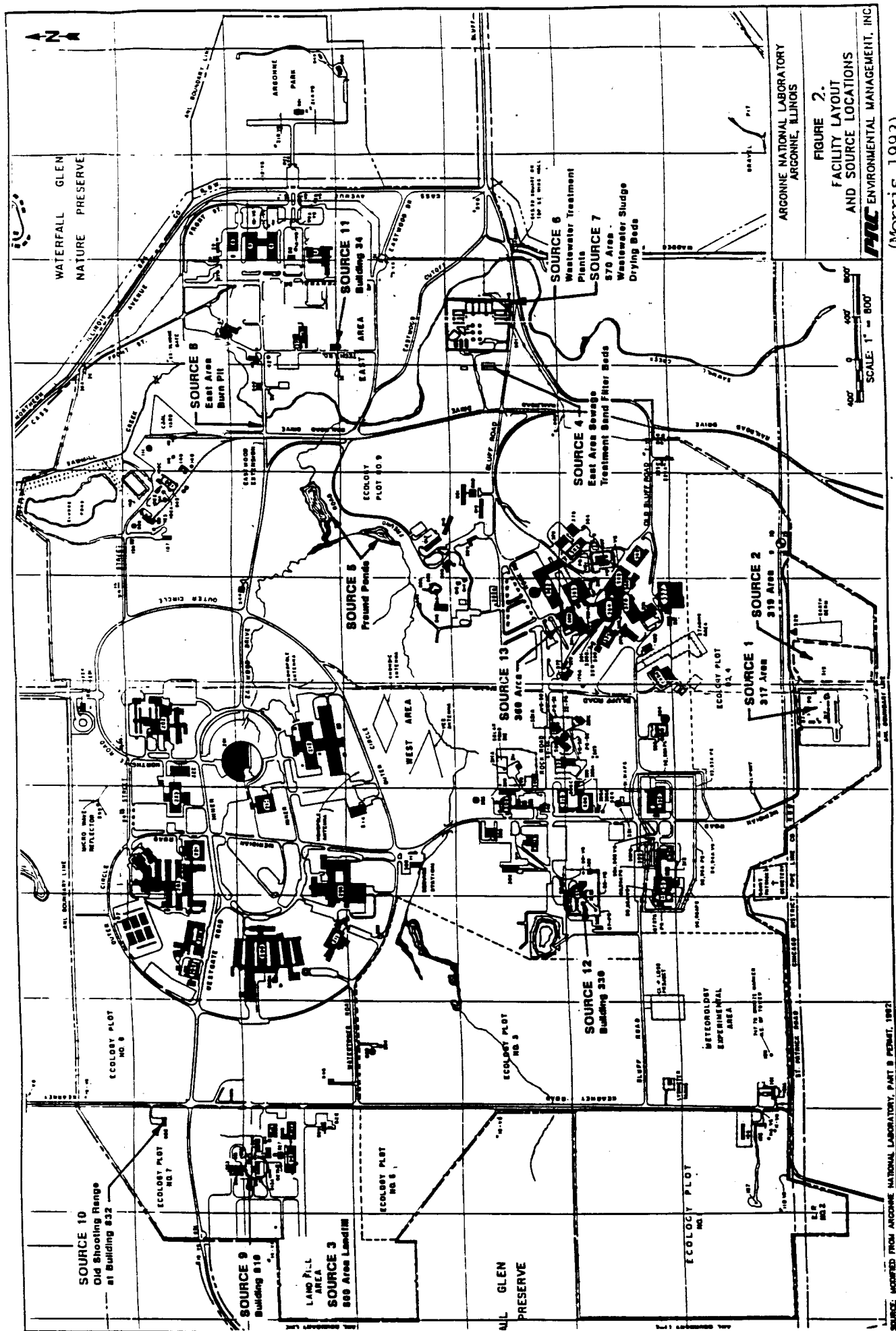
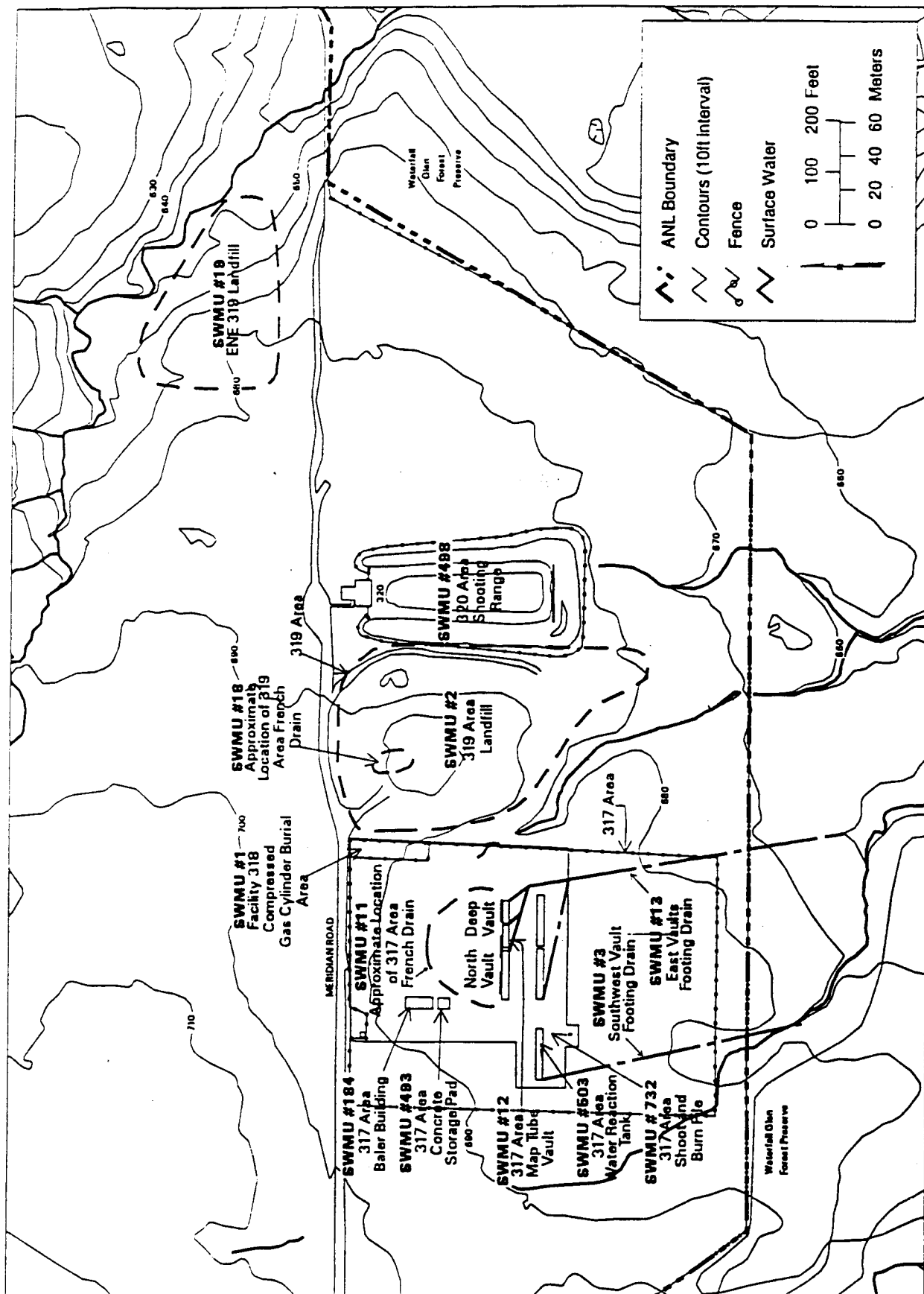


FIGURE 1. Location of Argonne National Laboratory

(Moos 1997)





**FIGURE 3 . Locations of the SWMUs in the 317/319/ENE Area
(MOOS 1997)**