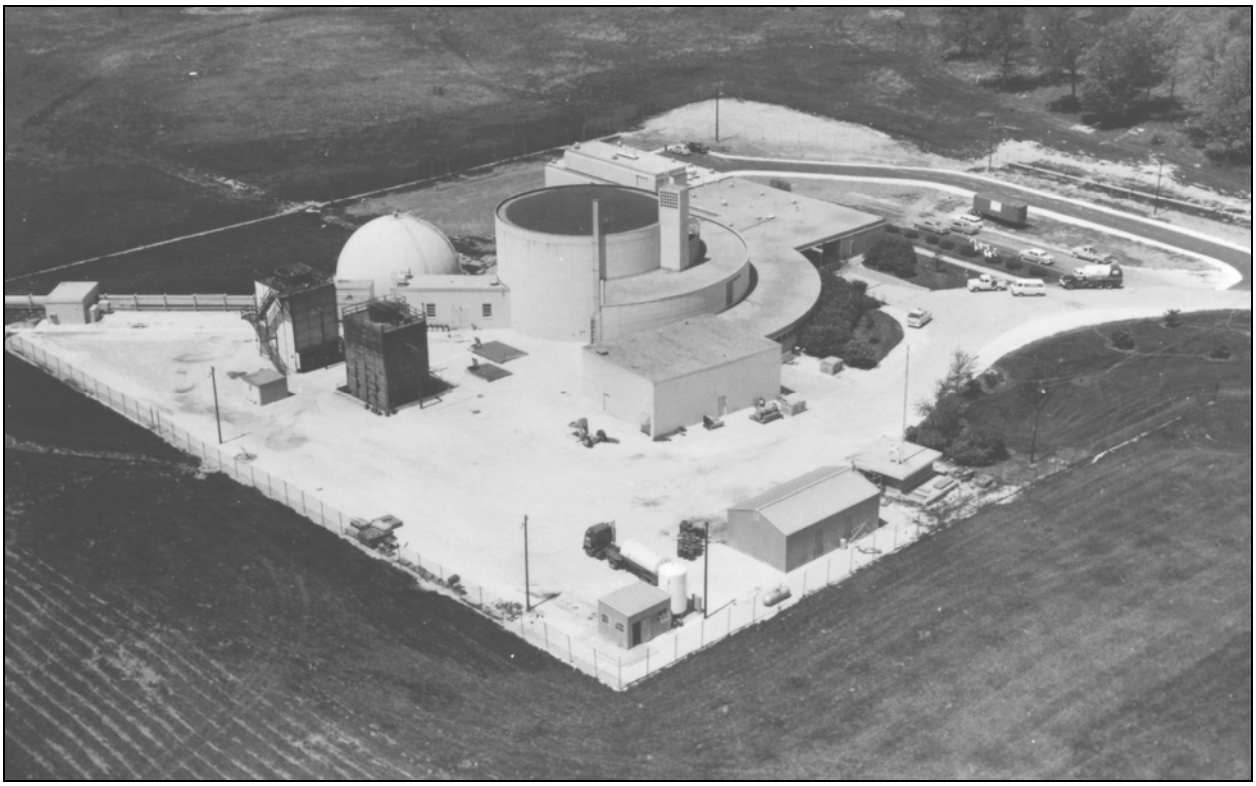
DOE/EA-1659

ENVIRONMENTAL ASSESSMENT

for the

PROPOSED DEMOLITION OF BUILDING 330 AT
ARGONNE NATIONAL LABORATORY



U.S. Department of Energy
Argonne Site Office
Argonne, Illinois

August 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	asbestos-containing material
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
APS	Advanced Photon Source
Argonne	Argonne National Laboratory
ASA	Auditable Safety Analysis
CFR	Code of Federal Regulations
Ci	curie(s)
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	environmental assessment
EBR	Experimental Breeder Reactor
EBWR	Experimental Boiling Water Reactor
EPA	U.S. Environmental Protection Agency
FONSI	Finding of No Significant Impact
ft	foot (feet)
FTE	full-time equivalent
FY	fiscal year
g	gram(s)
HAER	Historic American Engineering Record
HEPA	high efficiency particulate air (filter)
IEPA	Illinois Environmental Protection Agency
IHPA	Illinois Historic Preservation Agency
L	liter(s)
LLW	low-level radioactive waste
LWTP	Laboratory Wastewater Treatment Plant
m	meter(s)
µm	micrometer(s)
mCi	millicurie(s)
MLLW	mixed low-level waste
MOA	Memorandum of Agreement
mR	milliroentgen(s)
mrem	millirem(s)
MW	megawatt(s)
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRHP	*National Register of Historic Places*
NTS	Nevada Test Site
PCB	polychlorinated biphenyl
pCi	picocurie(s)
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances and Control Act
U.S.C.	United States Code

LIST OF ACRONYMS AND ABBREVIATIONS, cont.

Chemical Elements

H	hydrogen
Cs	cesium
Co	cobalt
Eu	europium
Pu	plutonium
Sr	strontium

1.0 BACKGROUND

The U.S. Department of Energy (DOE) is proposing to demolish Building 330[1] at Argonne National Laboratory (Argonne) in Argonne, Illinois. Under this proposed action, DOE would demolish the building and cover the project site with an impermeable barrier cap such as asphalt or other waterproof membrane. This work would begin in fiscal year 2009 (FY09), with expected completion by August 2011. DOE has prepared this environmental assessment (EA) in accordance with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321 *et seq*., and applicable regulations (Title 40, Code of Federal Regulations [CFR] Parts 1500–1508 and 10 CFR Part 1021).

1.1 Facility Description and History

Building 330, the former Chicago Pile 5 (CP-5) research reactor facility, was constructed from 1951 to 1954 and is located in the south-central area of the Argonne site (see Figures 1 and 2). The 48,900-cubic foot building is constructed of concrete and structural steel, originally consisting of the reactor containment room, C-Wing (where the reactor control rooms were located), and a full service level for scientific experiments (see Figures 3 through 7). Several additions were added after original construction (Argonne 2001):

- E-wing (1958), housing a shielded hot cave and fuel rod storage pool
- Support column (1959)
- A-Wing (1962), housing two-story office space and a fan loft
- J-Wing (1962)
- K-Wing

Building dimensions are as follows:

- The circular reactor containment room has an exterior diameter of 72 ft (22 m)
- B-Wing has an arc length of 135 ft (41 m)
- E-Wing measures 42 ft × 57 ft (13 m × 17 m)
- A-Wing measures 56 ft × 177 ft (17 m × 54 m)
- J-Wing is a polygon measuring 40 ft × 17 ft ×9 ft × 45 ft (12 m × 5 m × 3 m × 14 m)
- K-Wing is a polygon measuring 13 ft × 36 ft × 30 ft ×36 ft (4 m × 11 m × 9 m × 11 m)

With the additions noted above, the facility possesses a total of four loading docks (east end of A-Wing, east end of B-Wing, west end of K-Wing, and east side of E-Wing).

The CP-5 reactor was the principal nuclear reactor used to produce neutrons for scientific research from 1954 until shutdown in 1979. Originally designed to operate at a capacity of 1 megawatt (MW), the capacity was upgraded to 5 MW in 1959. The reactor employed a heavy-

[1] Decontamination and demolition of the interior of Building 330 has been largely completed. The environmental impacts of this action were described in *Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor*, DOE/EA-0173 (DOE 1982) and the project was summarized in *Decontamination and Decommissioning of the Chicago Pile-Five Reactor at Argonne National Laboratory-East Project Final Report*, ANL/D&D/00-1 (Argonne 2000a).

water moderator to slow neutrons and was surrounded on the bottom and sides with a neutron-reflecting layer of graphite, layers of lead gamma shield, and a biological shield of special, high-density concrete. In 1980, all nuclear fuel and heavy water that could be drained from the process system were shipped to the DOE Savannah River Plant.

The adjacent dome-shaped vapor-sphere (Building 330J) served as a support building for Building 330 and CP-5, measuring 21 ft (6 m) in diameter and 25 ft (8 m) tall. This building functioned to temporarily maintain negative air pressure in the reactor facility in the event of an accident or loss of power. The structure was released for unrestricted use in 1994 and has been used for road salt storage since that time. It will not be demolished as a part of the proposed project.

Following an assessment of potential environmental impacts (DOE 1982) and the issuance of a Finding of No Significant Impact (FONSI) in 1991, decontamination and decommissioning of the CP-5 reactor began in 1992 and was completed in 2000. The reactor, biological shield, and associated components (e.g., piping) were completely dismantled, with only the concrete reactor pedestal remaining. In addition to reactor-related components and systems, portions of the concrete pedestal were removed to comply with DOE and Argonne release objectives. Surfaces were wiped down and vacuumed prior to final status survey. Areas with contamination exceeding releasable levels were rendered inaccessible through the use of bolted metal covers.

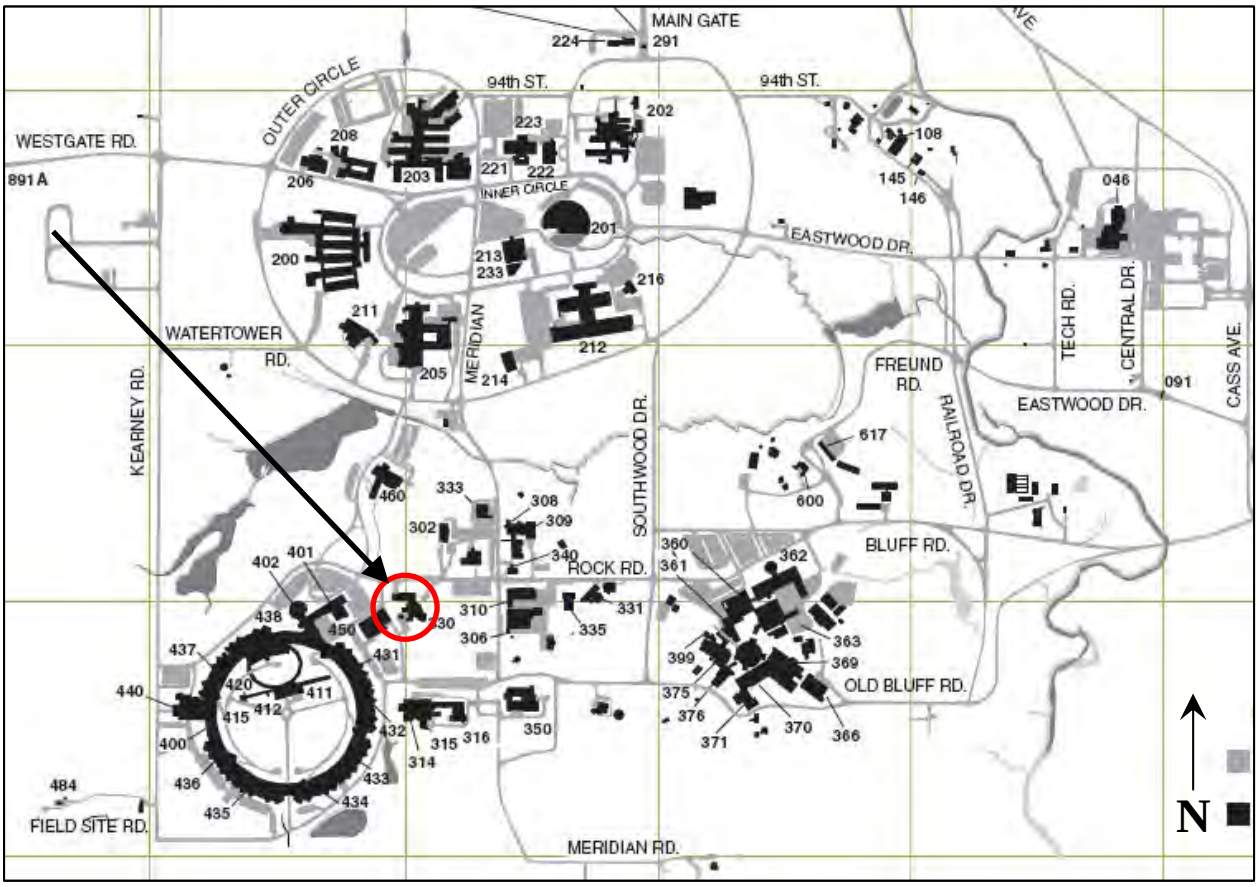

Figure 1. Location of Building 330 at the Argonne Site (2009)

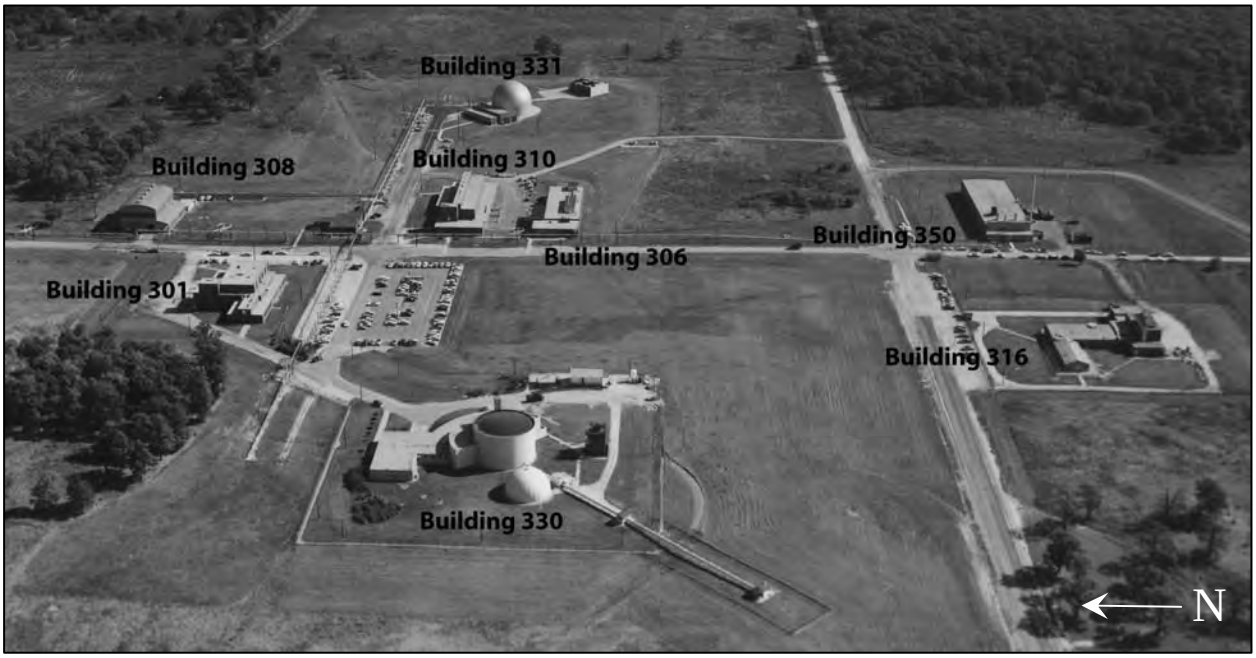

Figure 2. Argonne Site 300 Area (1957)

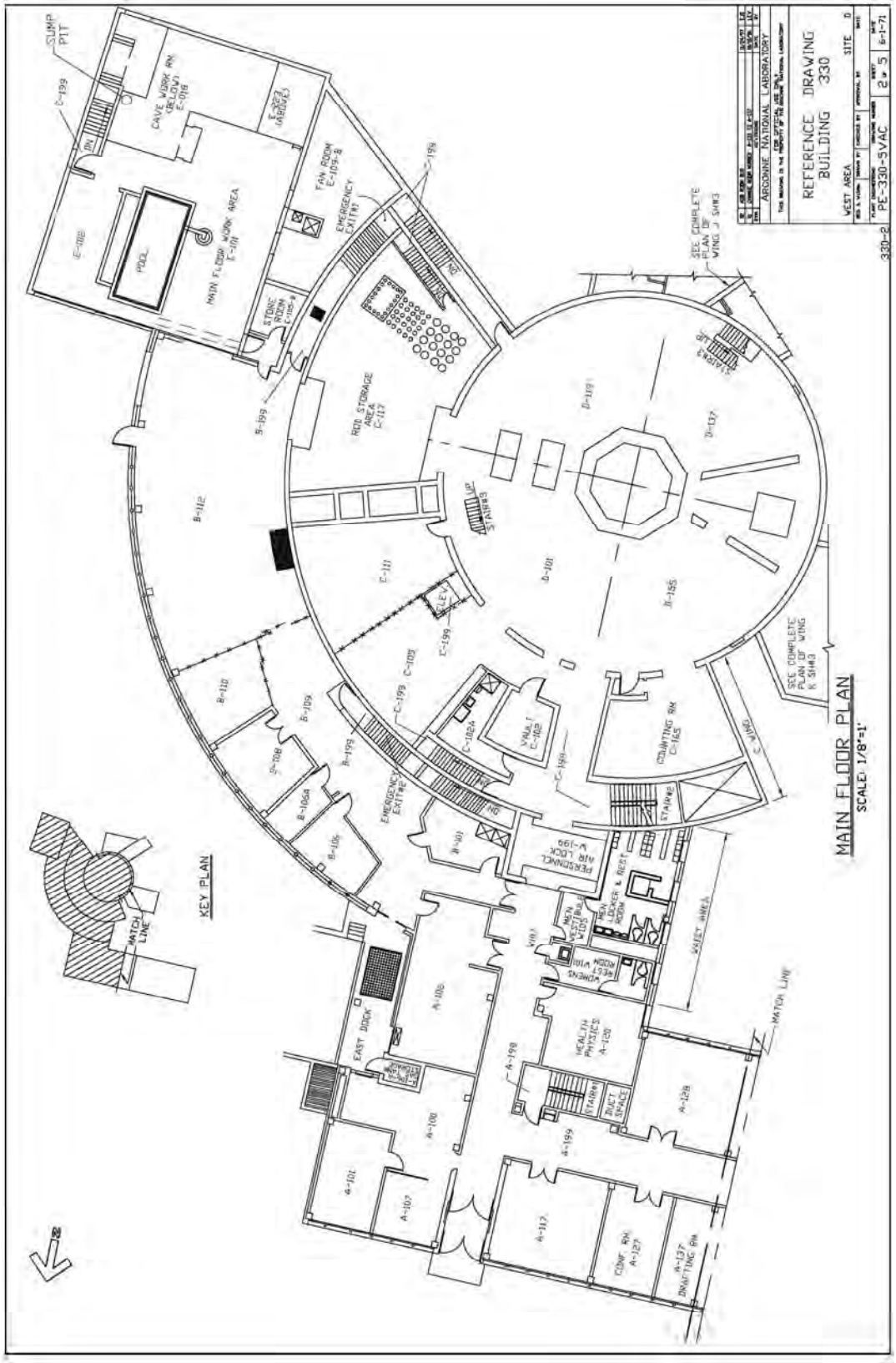

Figure 3. Building 330 Main Floor Plan

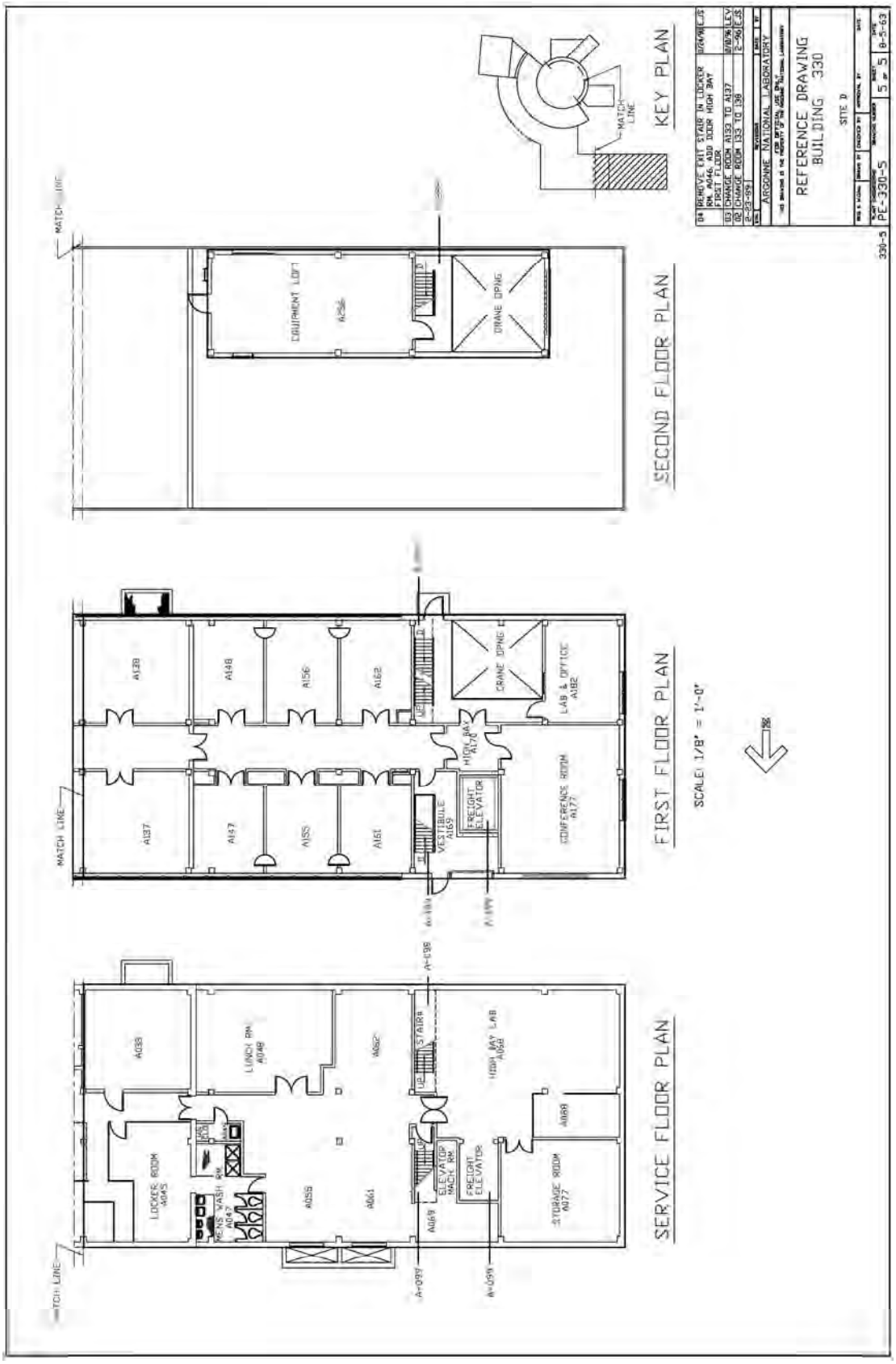

Figure 4. Building 330 Office Wing Plan

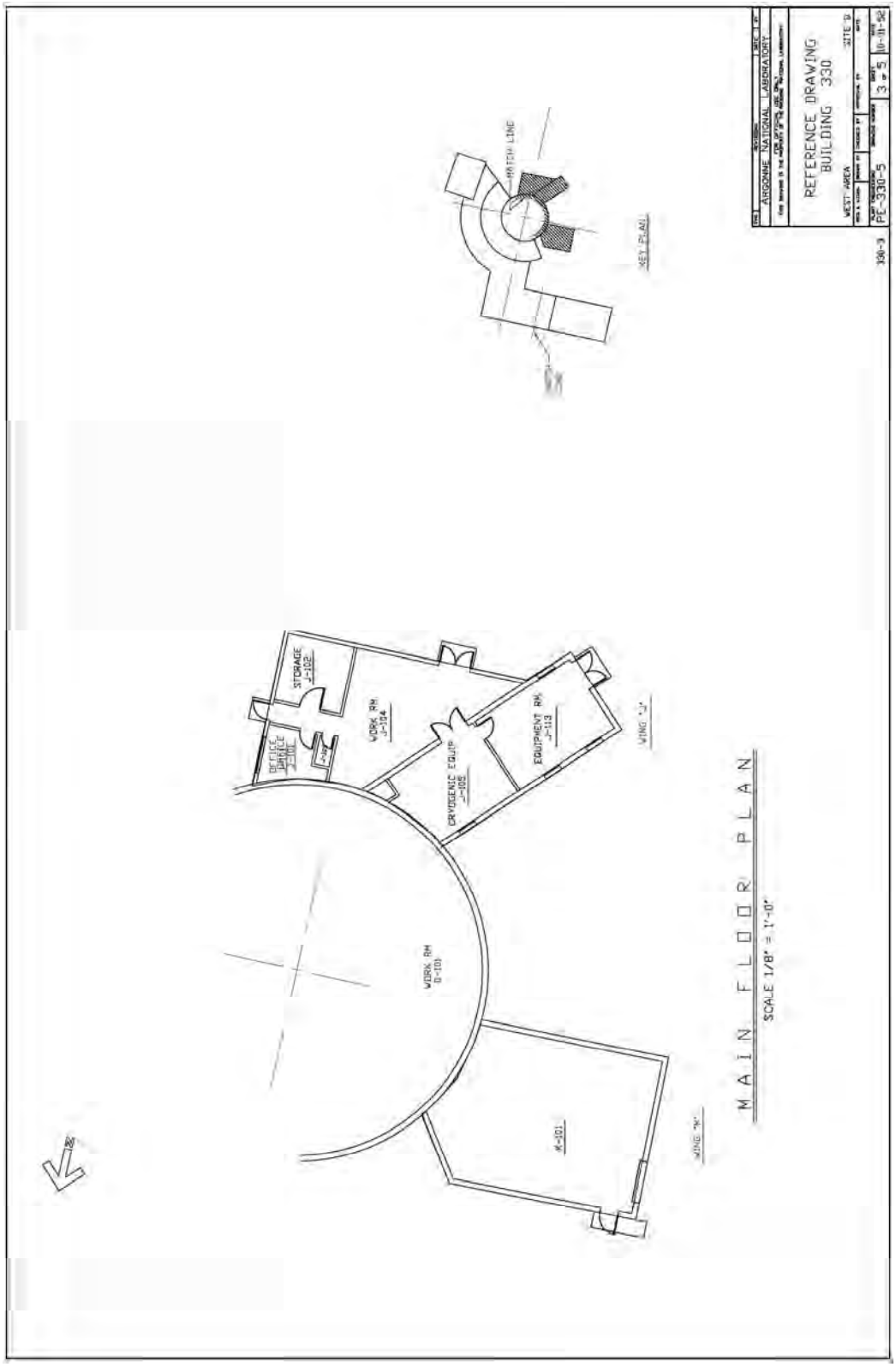

Figure 5. Building 330 Main Floor Plan — Work Rooms

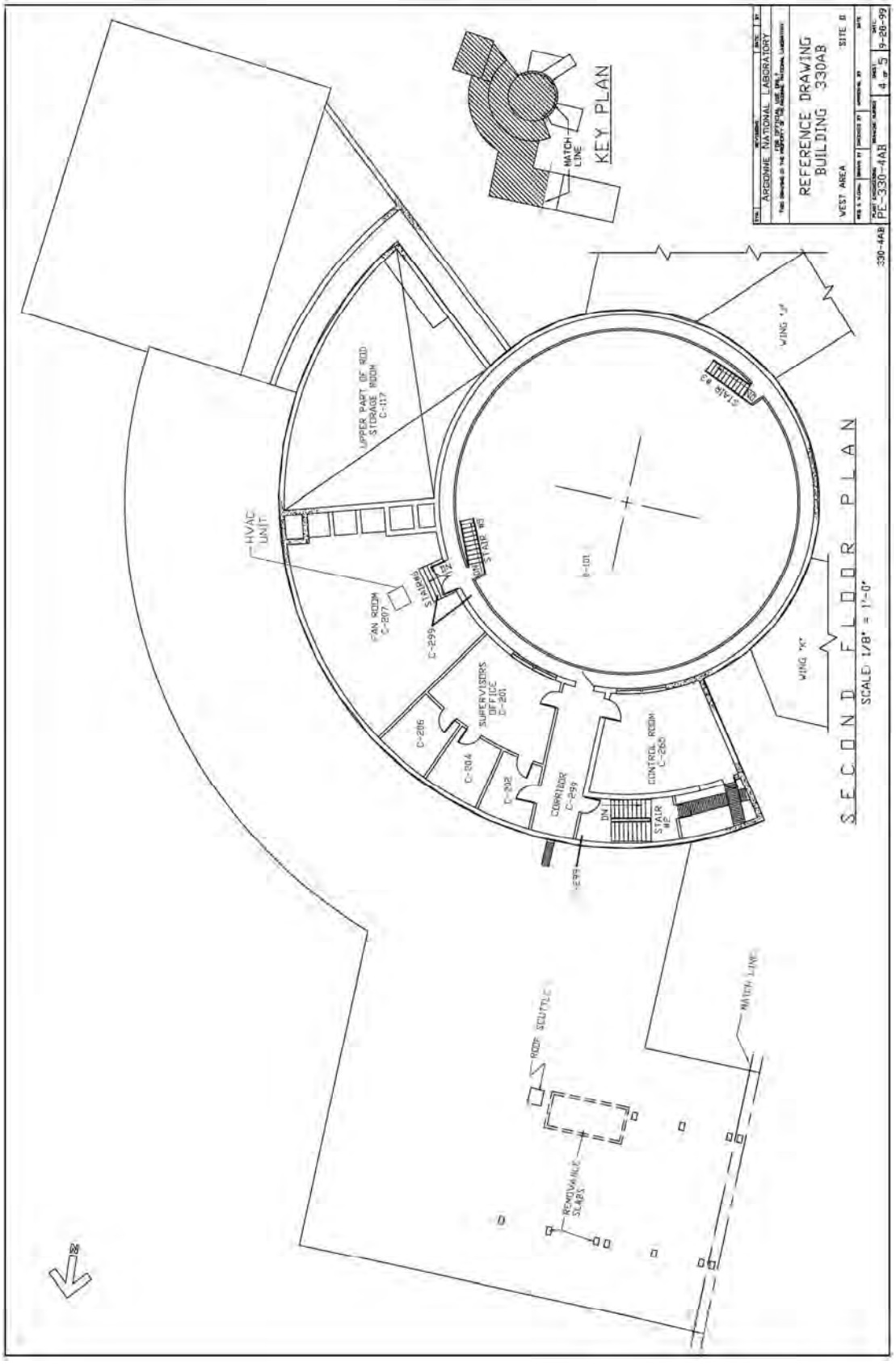

Figure 6. Building 330 Second Floor Plan — Main

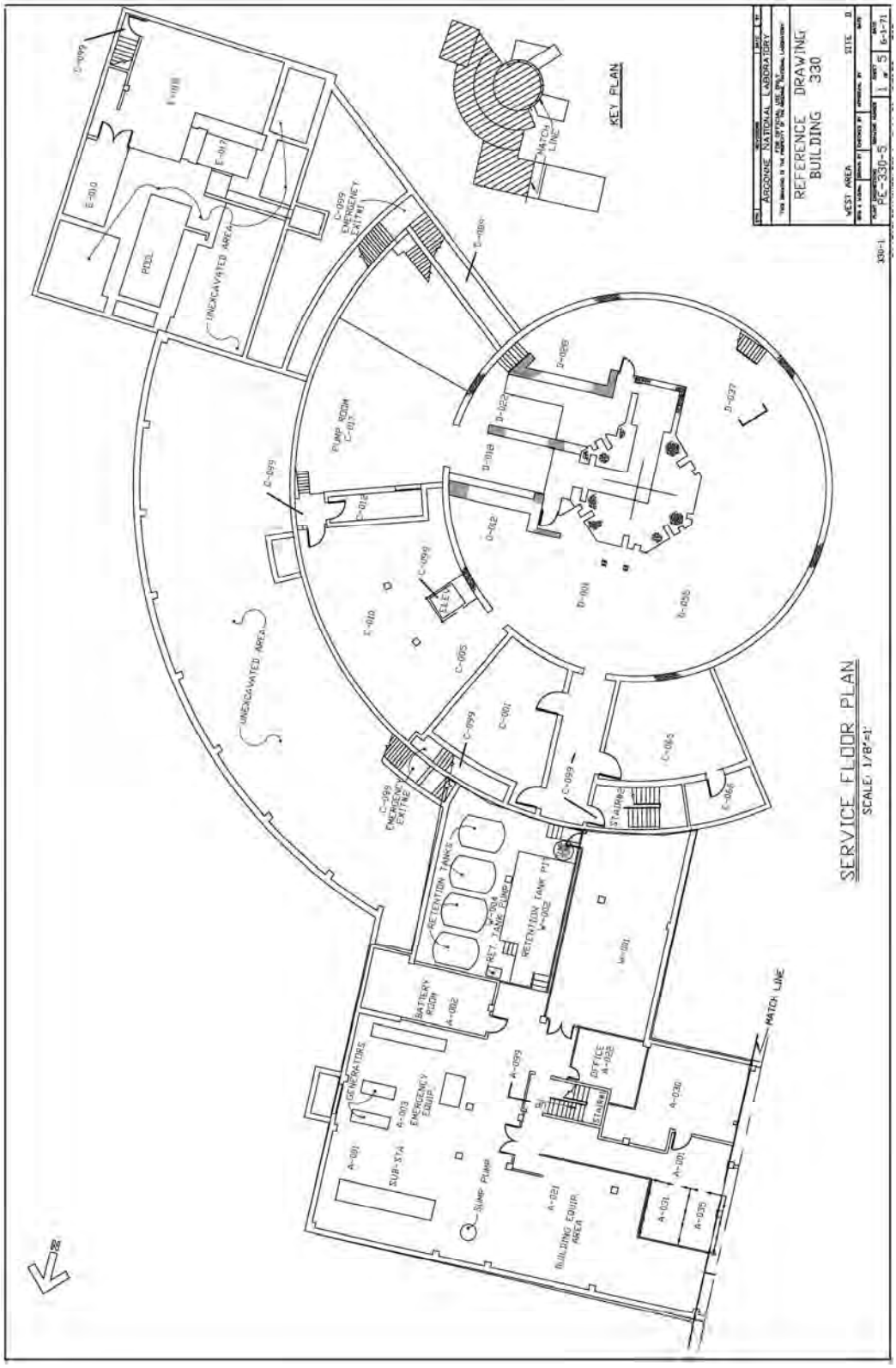

Figure 7. Building 330 Service Floor Plan — Main

1.2 Current Status

Building 330 is currently unoccupied/unused but maintained in a safe condition. All structures, systems, and components associated with reactor operations were removed during CP-5 decontamination and decommissioning, including primary and secondary coolant systems, reactor helium systems, reactor water purification and storage systems, ventilation systems, reactor control systems, biological shield, reactor, and radioactively contaminated auxiliary systems and components.

Although all accessible surface areas were decontaminated and/or configured to permit restricted reuse of the building, there remain a number of inaccessible areas of elevated contamination as noted in the final status survey report (DES 2000) and other documents (Argonne 2000b). They include contaminated systems that are embedded in structural components that would be removed during demolition, such as the containment ventilation system located in the containment shell wall and test piping located in the reactor pedestal. In addition, significant quantities of tritium (hydrogen-3) are present in the building foundations and soils beneath the concrete slabs, due primarily to the porous nature of concrete coupled with the pervasive presence of heavy water during facility operation. Tritiated water vapor (as much as 3 Ci per day) was routinely released from the building ventilation system during operation, and a number of incidents resulted in the release of heavy water to building systems, the sewer, and the subsurface (primarily in 1964 and 1971).

1.3 State Notification

Per DOE regulation (10 CFR 1021.301(d)), the preapproval draft EA was provided to the Illinois Environmental Protection Agency (IEPA) for review on July 17, 2009. The IEPA responded on July 22, 2009, with no objection to the proposed action and no comments that affect the EA (see Appendix A).

2.0 PURPOSE AND NEED

The purpose and need for agency action is to protect human health and the environment from risks associated with unneeded and deteriorating structures which contain radioactively contaminated areas and material.

3.0 DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVE

3.1 The Proposed Action

The proposed action is the demolition of Building 330, without any additional radiological decontamination. The scope of the proposed action would involve the demolition of all interior mechanical, electrical, and architectural systems and components; the open-air demolition and removal of the physical structures, including the concrete foundations, sidewalk and asphalt surfaces adjacent to the facility; and transportation of waste materials to approved disposal facilities.

All demolition activities would be performed in accordance with an approved work plan and program that meets the requirements of 10 CFR Part 835, Occupational Radiation Protection, including requirements to implement measures to keep radiological exposure as low as reasonably achievable (ALARA). The 10 CFR 835 dose limit for radiation workers is 5 rem per year, although Argonne imposes an administrative annual limit of 1 rem per year.

Applicable federal limits for public exposure are set at 10 mrem per year by the U.S. Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants regulations (40 CFR Part 61) for the airborne pathway and 100 mrem per year by DOE Order 5400.5 (DOE 1993) for the sum of all exposure pathways. The following steps would be taken to ensure compliance with the limits and ALARA principles in the implementation of the proposed action:

- Air monitoring would be performed at the building location and site boundaries as appropriate to verify that no threat to the public was present and that cumulative emissions of radionuclides during the proposed demolition activities would not result in members of the public receiving more than the applicable regulatory limits.

- Airborne contamination controls would be provided to ensure that no worker would receive a radiation dose in excess of the federally allowable limit. These controls may include, but would not be limited to, barriers, filters, containment structures, dust suppression techniques, and differential pressures between adjacent areas/rooms, as appropriate.

- If necessary, personal protective equipment such as respirators and anti-contamination clothing would be worn by workers in contaminated areas to minimize contamination and radiation exposures.

- Area radiation monitors, personal contamination monitors, friskers, and other radiation detection equipment would be used as appropriate to ensure that workers are made aware of any abnormal radiological conditions in a timely manner.

- ALARA reviews and other activities would be performed as appropriate during work planning and implementation.

- Post-demolition radiation surveys would be conducted and samples would be collected for radiological and hazardous waste characterization and other analyses as required.

Interior Demolition

No additional radiological decontamination activities are planned for the proposed action. Interior demolition tasks would include activities such as equipment and systems disassembly, size reduction by mechanical means, and all packaging and disposal of resultant waste. Depending on the amount, type, and level of non-radiological contamination, interior demolition could also include removing building components, tanks, piping, ventilation, fixtures, equipment, and debris to reduce hazards and simplify disposal. Additional surveys and inspections may be

required as part of detailed planning and before applying sealants and fixatives. This work would be performed indoors in Building 330.

Polychlorinated biphenyls (PCBs) are present in Building 330, primarily in the ballasts of aging fluorescent light fixtures. PCB-containing light fixtures would be removed and disposed of by trained workers during decontamination activities.

Asbestos-containing material (ACM) is also present in Building 330, primarily as fire-retardant insulation and floor tile. ACM would be removed and disposed of by certified asbestos abatement workers prior to any demolition activities. Due to the health-related implications of removing ACM, DOE intends to conduct ACM abatement under Categorical Exclusion B1.16 of 10 CFR 1021, Appendix A to Subpart D, and may initiate ACM abatement prior to the completion of this EA process. However, the transportation impacts of ACM waste removal are included in this EA.

Special chemicals may be used to remove hazardous materials such as ACM. Adhesives may be used to fix radionuclides or hazardous materials. However, no additional hazardous materials would be introduced into the project area. Cleaning supplies and other nonhazardous materials would be stored in cabinets designed for that purpose. Inventories would be kept to the minimum expected to be used and would be inventoried periodically. Disposal of any hazardous or mixed wastes generated by these activities would be the responsibility of the removal contractor.

Structural Demolition

Demolition of the building structure would include disconnecting all building utilities, removing salvageable equipment or materials, demolishing the building and foundations, removing and disposing of resultant waste, and restoring the area. During demolition, dust dispersion would be controlled to reduce releases into the atmosphere and exposure to both involved and noninvolved workers at and around the work site.

Small amounts of liquid waste may result from the demolition, as supply and discharge water systems may contain residual volumes of liquid. After testing for contamination, this wastewater would be treated in the Laboratory Wastewater Treatment Plant (LWTP) and compliantly discharged or, if levels of allowable contamination are exceeded, it would be collected, treated, and properly disposed in accordance with the Argonne Waste Management Plan or comparable waste disposal contractor document. Any contaminated liquids encountered while draining pipes or tanks would be processed in accordance with Argonne Waste Management Procedures (e.g., evaporated or solidified for off-site disposal).

Demolition would be conducted in open air. During rubble reduction, water would be misted over all surfaces for dust control, generating a secondary waste stream of potentially contaminated water. Up to an estimated 13,600 liters (3,600 gallons) of water per day would be used to suppress dust,[2] requiring collection and pumping to the LWTP after filtering for debris,

[2] For comparison, a large-scale, open-air demolition project conducted at the DOE Hanford Site used two 14-gallon-per-minute fog cannons for dust suppression during demolition of the 233-S Plutonium Concentration Facility, generating 51,000 liters (13,400 gallons) of contaminated wastewater per day (DOE 2004).

sand, etc. Standard industry practices such as diversion, retention, and testing would be used to minimize the potential for generating waste and spreading contamination, and the water would be tested and disposed of in accordance with Argonne Waste Management Procedures. If the wastewater met the Argonne release criteria, it could be released to the LWTP for treatment and disposal. If the wastewater required treatment, Argonne would use a commercial waste disposal contractor to store, treat, and transport the contaminated water for disposal.

Soil beneath Building 330 is expected to be contaminated with tritium due to activities conducted within the building, based on soil and groundwater monitoring in the vicinity of the building. Groundwater monitoring in late 2008 indicated tritium levels ranging from 188 to 36,000 pCi/L in the vicinity of the building, and soil sampling in 1998 indicated concentrations ranging from 0.79 to 8.8 pCi/g (Argonne 2002). However, there are no plans to remove or remediate tritium-contaminated soil as a part of the proposed action due to the low health risk presented by the contaminant, its relatively short half-life (12.3 years), evidence of little migration away from the building, and plans for continued groundwater monitoring in the area. Approximately 57 cubic meters (2,000 cubic feet) of soil are expected to be removed incidental to excavation of the building foundation.

After demolition, a final status survey would be performed to identify any non-tritium soil contamination and determine if additional actions or remediation are necessary. In the absence of such contamination, the site would be backfilled and graded. The graded site would then be covered with an impermeable barrier cap (such as asphalt or other waterproof membrane) to help prevent surface water infiltration into the backfilled soil.

Transportation and Waste Disposal

The waste generated by demolition activities would be transported by truck for off-site disposition.[3] Table 1 lists the types and estimated volumes of waste that would be generated as a result of the proposed demolition activities (Argonne 2009a, 2009b), and the locations where the wastes would likely be shipped for disposal. Although some wastes may not be radiologically contaminated, DOE assumed for purposes of analysis that all waste would have some level of radioactive contamination and would need to be disposed accordingly. There are no plans to recycle any waste from Building 330.

Low-Level Radioactive Waste (LLW) and Contaminated Debris Waste. The proposed action would generate an estimated 8,480 bulked cubic meters (299,400 cubic feet) of solid debris waste and LLW, consisting mainly of concrete, metal, wood, plastic, soils, paper, and cloth. Based on building characterization results, DOE assumed for the purposes of this analysis that all debris waste would be slightly radioactive and disposed of as LLW. This assumption conservatively bounds the potential impacts of transporting this waste. The major radioactive

[3] Argonne has no on-site rail access. It is possible that waste could be loaded into containers and transported by truck to a local railway node and transported by rail to appropriate disposal sites. For the purposes of this analysis, however, DOE assumed that all waste would be transported by truck to its final destination. Potential impacts are generally greater for transportation by truck than by rail because more trips are required for truck transportation and impacts are primarily a factor of the number of trips. For this reason, DOE believes that the truck transportation analysis bounds the potential impacts of transporting waste by rail.

isotopes anticipated to be present in Building 330 waste are hydrogen-3 (tritium), cobalt-60, and cesium-137.

LLW and debris waste would be loaded into ¼-height U.S. Department of Transportation (DOT) IP-1 cargo containers having a capacity of 8.5 cubic meters (300 cubic feet). Although disposal sites are subject to change, this waste would likely be shipped to the LLW disposal site at the Nevada Test Site (NTS) near Mercury, Nevada, or to Energy*Solutions* (a commercial disposal facility formerly known as Envirocare) near Clive, Utah, in accordance with DOE policies and procedures (or comparable waste disposal contractor document). LLW, soils, and debris rubble would be used as "filler" in shipping containers to reduce void space. Due to weight restrictions, a single container would likely constitute one truck shipment. A total of 1,037 round-trip truck shipments would be required to transport this volume of waste to the selected disposal location.[4]

Mixed Low Level Radioactive Waste (MLLW). MLLW is defined by the U.S. Environmental Protection Agency as containing both LLW and Resource Conservation and Recovery Act (RCRA)-defined hazardous waste. The proposed action is not expected to generate any MLLW, but contaminated lead bricks or other mixed waste constituents could be found. Therefore, one shipment of MLLW is included in this analysis for bounding purposes. If MLLW is encountered, the material would be surveyed and handled in accordance with Argonne Waste Management Procedures (or comparable waste disposal contractor document) and disposed of at a licensed facility. Waste that cannot be decontaminated and/or reused would be treated and disposed of in accordance with the draft Federal Facilities Compliance Act Site Treatment Plan for Argonne. MLLW destined for off-site disposal would be loaded into 90-ft^3 B-25 boxes and likely included with LLW/debris waste or hazardous/chemical waste in a single shipment. The likely off-site disposal locations for MLLW are Energy*Solutions* or PermaFix (but NTS is assumed for the purposes of conservatively bounding transportation impacts).

Asbestos-Containing Material (ACM). The proposed action would generate approximately 170 cubic meters (6,000 cubic feet) of ACM. The ACM would be removed prior to the start of general demolition activities by an Illinois-licensed contractor and disposed of in accordance with DOE policies and procedures (or comparable waste disposal contractor document). ACM sampling in the building has suggested that ACM is not radiologically contaminated, so it could be disposed of at a licensed commercial landfill within 160 kilometers (100 miles) of Argonne using intermodal containers with a capacity of 28 cubic meters (37 cubic yards). However, to conservatively bound transportation impacts in this analysis, DOE assumed that all ACM is radiologically contaminated and would be disposed of in the same manner as LLW.

Hazardous, Chemical, and Toxic Substances Control Act (TSCA) Waste. The proposed action would generate less than three cubic meters (90 cubic feet) of hazardous, chemical, or TSCA waste in forms such as lead-based paint or PCBs. Such wastes retrieved during demolition activities would be transferred to the Argonne waste management facility for disposition by a commercial waste disposal contractor in accordance with applicable Argonne Waste

[4] Total estimated weight of this waste stream is projected to be 15,746 tons (31,492,000 pounds). Although the IP-1 containers have a payload of 48,150 pounds, the shipping weight restriction is 40,000 pounds. Therefore, the maximum net payload per container is projected to be 33,750 pounds. Assuming a void fraction of 10% per container, 1,037 shipments of 30,375 pounds will be required.

Management Procedures (or comparable waste disposal contractor document) and state and RCRA requirements. This volume waste would be loaded into approximately thirteen 55-gallon drums. Although the waste drums could be shipped with the MLLW boxes, it was conservatively assumed that this waste stream would be shipped separately in one shipment.

Table 1. Types and Estimated Volumes of Waste to be Generated by the Proposed Action

Type	Volume (ft^3)	Container	Shipments	Disposal[a]
LLW[b]	299,400	¼-height DOT IP-1	1,037	Nevada Test Site Energy*Solutions*
MLLW[c]	90	B-25 boxes	1	Energy*Solutions* PermaFix
ACM[d]	6,000	¼-height DOT IP-1	20	Nevada Test Site Energy*Solutions*
Hazardous, chemical, and TSCA waste[e]	90	55-gallon drums	1	PermaFix or other licensed facility

[a] Disposal options are subject to change. To conservatively bound transportation impacts, the most distant disposal site is generally assumed.
[b] To conservatively bound transportation impacts, DOE assumed all debris waste will be slightly radioactive and disposed of with LLW and contaminated soil in DOT IP-1 containers (one container per shipment).
[c] One MLLW (or standard LLW) shipment can accommodate fourteen B-25 boxes; this MLLW shipment would contain a partial load of one B-25 box. This was conservatively rounded to one shipment.
[d] For purposes of this analysis, DOE assumed that all ACM would be contaminated and disposed of at NTS. If ACM is confirmed to be uncontaminated, it could be disposed of at a licensed commercial disposal site within 160 kilometers (100 miles) of Argonne, reducing transportation impacts.
[e] The projected waste shipment would contain a partial load of 13 drums. This was conservatively rounded to one shipment, although the drums could be transported together with the partial load of MLLW.

3.2 No Action Alternative

Under the no action alternative, Building 330 would not be decontaminated or demolished and would be maintained in a condition to potentially support restricted reuse. Surveillance and monitoring activities would continue to (1) ensure adequate containment of radioactive contamination, (2) provide physical safety and security controls, and (3) preserve the facilities to allow for personnel access. Continued maintenance, surveillance, and monitoring would cost approximately $141,000 annually to maintain the building in its present state (DOE 2008). At an escalation of 3% per year, these recurring maintenance and surveillance costs would total $1.6 million over the next 10 years.

3.3 Other Alternatives Considered

DOE considered alternatives to the demolition of Building 330 (DOE 2008). These alternatives are briefly described in Table 2, but not analyzed in this assessment.

Table 2. Alternatives to Building Demolition

	Demolition Alternative	Description
1	Conversion to museum	Decontaminate non-tritium contamination, demonstrate that building meets free-release condition, convert to museum.
2	Partial demolition	Demolish as LLW down to a few feet below grade.

Partial demolition (Alternative 2) would not meet DOE's purpose and need for agency action (i.e., to protect human health and the environment from risks associated with unneeded and deteriorating structures that contain radioactively contaminated areas and material), as demolition to a few feet below grade would not eliminate all building contamination. In addition, any future use of the site requiring subgrade construction would result in increased costs, as the below-grade structure would ultimately need to be removed. No future use has been identified for this excess facility, which is deteriorating, outdated, and no longer meets the Laboratory's mission need. Therefore, no alternatives to demolition were considered reasonable.

4.0 AFFECTED ENVIRONMENT

4.1 Project Site Description

Argonne occupies 600 hectares (1,500 acres) in southern DuPage County, Illinois. The Argonne site is completely surrounded by the 830-hectare (2,040-acre) DuPage County Waterfall Glen Forest Preserve, which is used as a public recreational area, nature preserve, and demonstration forest. The Argonne site is approximately 43 kilometers (27 miles) southwest of downtown Chicago and 39 kilometers (24 miles) west of Lake Michigan.

Building 330 is located in the south-central area of the Laboratory (see Figures 1 and 2), near the intersection of Meridian and Rock Roads. The building is located close to the center of the site and over 400 meters (1,320 feet) from the closest site boundary. The area near the building is developed, and there are several other buildings located in close proximity to Building 330.

Land use in the area surrounding Argonne is varied, including residential, commercial, and industrial properties. No residential populations live within 1.6 kilometers (1 mile) of the center of the project site.

4.2 Cultural Resources

Cultural resources include archaeological sites and historic structures and features that are protected under the National Historic Preservation Act (NHPA) of 1966, as amended. Cultural resources also include traditional cultural properties that are important to a community's practices and beliefs and are necessary to maintain the community's cultural identity. Cultural resources that meet the eligibility criteria for listing on the *National Register of Historic Places* (NRHP) are considered "significant" resources and must be taken into consideration during the planning of federal projects. Federal agencies are also required to consider the effects of their actions on sites, areas, and other resources (e.g., plants) that are of religious significance to Native Americans as established under the American Indian Religious Freedom Act. Native American graves and burial grounds are protected by the Native American Graves Protection and Repatriation Act.

Extensive research on cultural resources has been undertaken at Argonne. Research has focused on both archaeological sites and historic buildings. Numerous archaeological and historic building surveys have been performed at Argonne, and a Cultural Resource Management Plan (Argonne 2005) was developed to aid in the management of these resources. No Native

American concerns have been expressed concerning laboratory buildings. The following sections provide an overview of the types of cultural resources found at Argonne.

4.2.1 Archaeological Sites

Argonne is located in DuPage County on bluffs overlooking the Des Plaines River. Prehistoric occupation of DuPage County covers every known archaeological phase for eastern North America (Curtis and Berlin 1980). Evidence from the Paleoindian Period (10,000 to 8,000 B.C.) is minimal in the vicinity of Argonne and widely scattered. Sites with Paleoindian components are primarily found in upland areas or on the edges of large river valleys. The Archaic Period (8,000 to 1,500 B.C.) is noted for an increase in technology and adaptation to a new environment as the last of the glaciers from the Wisconsin glaciation retreated. The Woodland Period (1,500 B.C. to A.D. 1000) is generally marked by the discovery of ceramic technologies, and habitation during the Middle Woodland Period focused on broad river valleys and burial mounds. The Mississippian Period (A.D. 1000 to A.D. 1600) marks the highest level of social complexity in prehistoric America. These highly complex settlements appear along rivers with wide fertile floodplains and show a heavy reliance on agriculture.

As described in the 2007 Argonne *Site Environmental Report* (Argonne 2008), 46 archaeological sites have been recorded at Argonne. These include prehistoric chertscatters, special-purpose camps, base camps, and historical farmsteads. Of the 46 recorded sites, three sites have been determined to be eligible for the National Register of Historic Places, 22 have been determined to be ineligible, and 21 have not been evaluated for eligibility. None of the archaeological sites are in or near the area that would be disturbed or otherwise affected by the demolition of Building 330.

4.2.2 Historic Structures

The first recorded Europeans in the region, Louis Joliet and Father Jacques Marquette, traveled down the Des Plaines River in 1673 (Blanchard 1882). However, significant settlement of the area did not begin until after 1822, when the U.S. Government approved the construction of the nearby Illinois and Michigan Canal (located just south of the Des Plaines River). Settlers in the Argonne area included many Irish who had previously worked on the canal, as well as farmers from New England, New York, Pennsylvania, and Ohio (Pease 1919). In 1834, the community of Cass (consisting of Upper and Lower areas) was founded as a stage coach stop along the Chicago-Joliet Road, on what would become the Argonne site. The area surrounding Cass was quickly subsumed by large farms. The canal, and later the railroads, provided the farmers access to markets. This situation persisted into the 1940s.

4.2.2.1 Argonne National Laboratory

Argonne is located southwest of Chicago. The first permanent buildings constructed at Argonne housed the key divisions responsible for conducting nuclear research. The layout simulated a university setting, with a central green space surrounded by the Applied Chemistry, Cyclotron, Chemistry, Reactor Engineering, and Physics Buildings; the Biology Building was somewhat removed from the main core of the campus. Parts of the main campus have been deemed eligible for listing on the National Register of Historic Places (Wunderlich 2002). Specialized facilities

including test reactors and waste processing facilities were located south of the main campus in what is known as the 300 Area. Building 330 is located in this area.

In 1947, Argonne was selected as the primary nuclear reactor center for the U.S. Atomic Energy Commission (AEC), and activities within the main campus focused on reactor development. During the 1950s and 1960s, Argonne developed numerous reactor designs such as the Experimental Breeder Reactor-I (EBR-I) and the Experimental Boiling Water Reactor (EBWR). EBR-I was the first reactor to generate electricity, and EBWR's design is the basis for many operating commercial power reactors. Argonne was also involved in development of the pressurized water reactor design for the *U.S.S. Nautilus*, the world's first nuclear submarine.

4.2.2.2 Building 330

One of Argonne's premier nuclear facilities was CP-5, the fifth reactor in the Chicago Pile series of reactors. Over the course of its 25 years of service, CP-5 was used for hundreds of neutron beam, neutron flux, gamma ray, and biological experiments, irradiating more than 25,000 samples. CP-5 also served as a training facility for operators of the first commercial nuclear power reactors in the state of Illinois and throughout the United States. Several research reactors modeled after CP-5 have been constructed in the United States and abroad. CP-5 is an American Nuclear Society Historic Landmark (Argonne 2001).

In 1996, CP-5 and Building 330 were deemed eligible for listing on the *National Register of Historic Places* (Porubcan 1996). In anticipation of the removal of the reactor, DOE entered into a Memorandum of Agreement (MOA) with the Illinois Historic Preservation Agency and agreed to document the reactor to Illinois Historic American Engineering Record (IL HAER) standards. The documentation (IL HAER No. 1998-2) was completed in 1998, accepted by the Illinois Historic Preservation Agency (IHPA) in 2000 (see Appendix A), and is currently on file with the Illinois State Archives in Springfield, Illinois (Argonne 1999).

4.3 Biological Resources

The area immediately surrounding Building 330 includes three viable wildlife habitats, including oak woods (0.04 mi N, 0.12 mi NW, 0.19 mi S), wetlands (0.13 mi NW, 0.14 mi N, 0.20 mi S), and a floodplain (0.25 mi NW). These habitats are characterized predominantly by native species. The adjacent habitat to the E and SE is old-field and characterized by non-native grasses. No state or federally listed threatened or endangered species are known to reside in these habitats or around the Building 330 site (see Appendix A).

4.4 Air Quality

Routine continuous monitoring has demonstrated that the amount of radioactive material released to the atmosphere by emissions sources at Argonne is extremely small, resulting in a very small incremental radiation dosage to the neighboring population. The calculated potential maximum individual perimeter dose to a member of the general public for 2007 from radionuclide air emissions was 0.22 mrem, which is 2.2 percent of the 10-mrem per year National Emissions Standard for Hazardous Air Pollutants for radionuclide emissions (40 CFR

61 Subpart H). The largest estimated individual dose from all radionuclide air emissions to an off-site full-time resident in 2007 was 0.045 mrem (Argonne 2008).

Air monitoring was also conducted at Argonne perimeter and off-site sampling stations for total alpha and beta activities (Argonne 2008). A statistically significant difference was identified between samples collected at the Argonne site perimeter and samples collected off-site at surrounding communities. Perhaps counter-intuitively, samples collected at the site perimeter in 2007 show consistently lower concentrations of alpha and beta contaminants than at off-site locations. The difference has been attributed to the mass, type, and radionuclide content of airborne particulate matter on the filters at these sampling locations. For example, off-site samplers tend to be located in municipal complexes and are exposed to higher levels of airborne particulates (such as resuspended oil, which contains naturally occurring radionuclides).

National Ambient Air Quality Standards (NAAQS) are set by EPA, and the IEPA is responsible for ensuring compliance through its state implementation plan. Argonne is in a moderate non-attainment area for ozone and fine particulate matter (2.5 microns or less). The NAAQS of concern for the proposed demolition of Building 330 is fugitive particulate matter (dust), as the Argonne Title V air permit (condition 5.3.2) requires that dust not be visible by an observer looking generally overhead at the Argonne site boundary (IEPA 2006).

4.5 Waste/Wastewater Disposal Capacity

Water usage at the Argonne site was approximately 350 million gallons in FY2007 (Argonne 2008), and the Argonne LWTP has a treatment capacity of 0.46 million gallons per day (DOE 2007). Waste disposal at NTS or Energy*Solutions* would be in accordance with their waste acceptance criteria and their available disposal capacities. Neither NTS nor Energy*Solutions* are nearing their capacities for LLW disposal.

4.6 Transportation Infrastructure/Capacity

Road infrastructure and traffic volume capacity within Argonne are sufficient to accommodate the additional truck traffic required to transport the waste generated from the Building 330 site through Argonne (DOE 2007). No road upgrades, new roads, or new access gates would be required. Off-site, trucks would use interstate highways that are immediately adjacent to the site. These interstate highways are currently major truck routes.

4.7 Environmental Justice

Executive Order No. 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, directs federal agencies to identify any disproportionately high and adverse human health or environmental effects of their actions on minority or low-income populations. To identify such impacts, it is first necessary to identify the minority or low-income populations that could be affected by the proposed action or no action alternative. Approximately 8.9 million people live within an 80-kilometer (50-mile) radius of Argonne, and approximately 145,000 people live within 8 kilometers (5 miles) of Argonne (Argonne 2008). On the basis of 2000 census data, 51 percent of the population within 80 kilometers (50 miles) and 24.5 percent of the population within 8 kilometers (5 miles) of the site consists of minorities, as compared

with the state averages of 32.2 percent for Illinois, 14.2 percent for Indiana, and a national average of 30.9 percent (U.S. Census Bureau 2004a, DOE 2007).

With respect to low-income populations, based on 2000 census tract data, 10.6 percent of the population within 80 kilometers (50 miles) and 3.4 percent of the population within 8 kilometers (5 miles) of the site are comprised of low-income populations, as compared with the state averages of 12.7 percent for Illinois, 9.5 percent for Indiana, and a national average of 12.3 percent (U.S. Census Bureau 2004b, DOE 2007).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Environmental Impacts of the Proposed Action

The following sections describe the potential environmental impacts of the proposed action.

5.1.1 Impacts on Sensitive Resources

Demolition activities would be conducted outdoors, and all of the nearby wildlife habitats (described in Section 4.3) are potentially susceptible to air (dust and radiological), noise, and human disturbance from the proposed action. However, no state or federally listed threatened or endangered species are known to reside in these habitats (DOE 2007). All proposed demolition activities would be conducted in a manner that controls the airborne spread of dust and residual radioactive contamination. There would be no environmental impact on woods, wetlands, and floodplain as a result of the proposed action.

5.1.2 Impacts on Cultural Resources

Impacts to cultural resources occur when a historically significant structure or archaeological site is altered in a way that changes its historic character. Significance is based on four criteria (36 CFR 60.4) and the resource's potential to provide information on its period of historical use. Significant resources are eligible for listing in the *National Register of Historic Places*. Building 330 has been evaluated and was determined to be historically significant for its association with CP-5 (Haaker 1998). Much of the architecture of the building displays direct evidence of how the reactor operated and how the radiation generated by the reactor was controlled. The facility design and history were documented to Illinois Historic American Engineering Record (IL HAER) standards in 1998 (Argonne 1999).

In anticipation of the demolition of Building 330, an additional historical review was conducted in 2009 (O'Rourke 2009), focusing on the activities that occurred in the building after 1989 (the review conducted in 1996 focused on the Cold War period of 1946 to 1989). Based on the 2009 review, no activities occurred in the building between 1989 and 2009 that were of historical significance. A report was sent to the IHPA in April 2009; IHPA concurrence with DOE's finding of no adverse effect for the project was received on April 22, 2009 (see Appendix A).

5.1.3 Impacts on Waste Disposal Capacity

Table 1 contains the types and estimated volumes of waste that would be generated as a result of the proposed demolition activities and the number of shipments required to transport the waste off-site for disposal. These wastes would be disposed of off-site at the DOE disposal facility at NTS or at commercial disposal sites in accordance with their waste acceptance criteria. Neither NTS nor Energy*Solutions* is nearing its capacity for LLW disposal.

5.1.4 Wastewater Disposal Impacts

Under the proposed action, approximately 18 current Argonne personnel or outside contractors would conduct the proposed demolition activities for a period of about 15 months (see Table 4). The resulting increase in sanitary water handling requirements would be negligible and within the excess handling capacity of the existing Laboratory system.

The LWTP is expected to have adequate wastewater treatment capacity to accommodate liquid wastes generated as a result of the proposed action. All wastewater would be collected within the project site and sampled to determine if it meets LWTP release requirements. If radiologically contaminated wastewater met Argonne release criteria, it could be released into the LWTP in accordance with Argonne Waste Management Procedures. If the wastewater requires additional treatment beyond LWTP capability, DOE would use a commercial waste treatment contractor to store, treat, and transport the contaminated wastewater for disposal. In either case, Argonne has adequate waste handling capacity to manage the wastewater. The 13,600 liters (3,600 gallons) per day of wastewater from dust control would be a very small fraction of the 1.7 million liters (0.46 million gallons) per day average daily volume processed by the LWTP (DOE 2007). In practice, less than 5% of the water volume used for dust control is collectible after infiltration into the ground.

Argonne would develop a stormwater pollution prevention plan to contain runoff from the demolition site, as required by the National Pollutant Discharge Elimination System (NPDES) Permit. This plan would include the identification of stormwater discharge points, nearby permit outfalls that receive stormwater from the project site, and conveyances that serve these outfalls, and specific measures to mitigate stormwater contamination. Implementation of this plan would prevent runoff from the leaving the site, thereby mitigating any potential impacts to a nearby creek and NPDES Permit outfall(s).

5.1.5 Air Quality Impacts

Demolition activities would be essentially the reverse of construction activities, but typically on a more limited scale and duration. Operations typically involved in demolishing and removing structures include mechanical or explosive dismemberment (wrecking ball or blasting operations), drilling and breakup of foundations, debris loading, pushing (dozing) operations, and truck traffic. Explosives would not be used for the proposed action. For the above activities, fugitive dust particulate emissions are a primary concern and minor emissions of criteria pollutants and hazardous air pollutants from engine exhaust would be generated. Particulate air emissions (dust) from demolition activities would involve standard construction practices for demolition, including dust suppression. Dust could include lead and small amounts of radioactive

material (see Table 3). Dust emissions from the proposed action would be subject to the terms of the Argonne Title V air permit (condition 5.3.2). However, by employing dust suppression techniques, the demolition activities would be unlikely to violate these permit conditions. Work areas would be monitored for airborne dust, and respiratory protection may be used, if necessary. Protective clothing and personnel monitoring devices may also be used. Portable HEPA filters would be used during internal demolition activities. If necessary, a small, temporary shelter or tent with portable high efficiency particulate air (HEPA) filtration would be used to contain potential emissions from size reduction of certain materials, such as structural steel.

A construction permit would be required under the terms of the Argonne Title V air permit (condition 7.1.11) due to the potential release of radionuclides as a result of demolition activities (see Table 3). CAP88-PC air modeling would be used to prepare the permit application for open-air demolition; radiological air modeling results are addressed in Section 5.1.8. Air monitoring may be performed during the project to verify emissions levels in order not to exceed the permit limits in condition 7.1.3 (i.e., that emissions would not exceed amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/year).

Table 3. Estimated Building 330 Radiological Source Term

Radionuclide	Estimated Inventory (mCi)[a]	Location(s)
H-3	902	Pedestal, tunnel floor
Cs-137	5.12	Rod storage tubes, embedded pipe, E-Wing floor and underdrains, E-Wing fuel pool, service floor tunnel, E-Wing truck bay and doorway, C065 service floor
Co-60	0.02	Embedded pipe, C207 ventilation shafts, E-Wing fuel pool, service floor tunnel, main floor containment shell
Sr-90	0.33	Rod storage tubes, embedded pipe
Pu-238	0.0006	Embedded pipe
Pu-239/240	0.002	Embedded pipe
Eu-152	6.3E-5	Embedded pipe
Eu-154	0.005	Embedded pipe
Eu-155	0.0003	Embedded pipe

[a] Current (2009) inventory derived from previous estimates (Argonne 2000b, Wunderlich 2001).

Demolition activities would generate criteria and toxic air pollutants from heavy equipment engine exhaust, soil disturbances, and unpaved road traffic. Considering the small numbers of heavy equipment and crew required for the proposed action, and the fact that low emissions would be spread over a 15-month demolition period, the potential impacts of engine exhaust emissions from heavy equipment on ambient air quality are anticipated to be minimal. However, fugitive dust emissions are of concern for most construction activities because they are released near the ground without any plume rise induced by buoyancy and/or vertical momentum. Preliminary screening calculations indicate that, even under the worst meteorological conditions, the PM_{10} concentration[5] at the nearest site boundaries (about 0.4 mi from the demolition site and not in the direction of prevailing wind) would be low. Currently, the highest background PM_{10} levels observed at nearby monitoring stations are well below the ambient air quality standard (less than 60%). Accordingly, the contribution of fugitive dust emissions from demolition

[5] Particulate matter with an aerodynamic diameter of less than or equal to 10 μm.

activities would not likely result in exceedance of the ambient air quality standard at Argonne site boundaries.

Diesel particulate matter (DPM) from engine exhaust, which is toxic and accounts for most of the inhalation risk in urban air, is also considered. As explained above, levels at Argonne site boundaries would likely be very low. DPM is a known occupational hazard, so its effects would be generally limited to heavy equipment operators and other nearby workers.

Regulators generally use work practice standards rather than emission standards to control emissions such as those described above. Dust suppression by misting and erecting enclosures may be specified as conditions in permits that are required demolition or construction. In addition, most emissions from demolition activities will be temporary and intermittent in nature, and unlikely to result in the exceedance of the ambient air quality standard at site boundaries. Dust suppression techniques, which reflect the current state of knowledge and may be specified by permit, would be employed during demolition (see Section 3.1).

5.1.6 Noise Impacts

Noise would be associated with the operation of machinery and equipment such as coring machines, scabblers, jackhammers, saws, forklifts, and portable HEPA filter units. Receptors of such noise would be limited to persons who work in or near Building 330. Workers in areas where noise levels would exceed permissible noise exposures defined in 29 CFR 1910.95 would be required to wear hearing protection. Noise levels would be monitored weekly. Persons beyond the Argonne site boundary and its buffer zone (Waterfall Glen Forest Preserve) would not notice noise impacts due to the distances from the source. Major demolition equipment such as bulldozers, graders, compactors, and wrecking balls could cause vibrations that could affect ongoing experimental activities at nearby facilities such as the Advanced Photon Source (APS), requiring that activities be coordinated or that vibrations be dampened to acceptable levels.

Unless high-explosive detonation, impact pile driving, or a rock drill is used, heavy equipment used during demolition activities (e.g., jackhammers and bulldozers) could generate maximum combined noise level of around 95 dBA at a distance of 15 m (50 ft) from noise sources. The noise levels at 1,600 meters (1 mile) west-southwest of Building 330 (the nearest residence) would be approximately 50 dBA, considering geometric spreading and ground effects only. In addition, the APS structures and densely wooded forest in the direction of the nearest residence could significantly attenuate the noise levels. Due to the proximity to the major arterial Lemont Road and Interstates 55 and 355, the background noise level at the nearest residence is relatively high and could mask noise from the proposed activity. Considering these factors, the noise levels from the proposed activity would be barely discernable or completely inaudible at the nearest residence.

Demolition activities can result in various degrees of ground vibration, depending on the equipment, methods employed, and soil compactness. Activities that typically generate the most severe vibrations are high-explosive detonation and impact pile driving. All demolition equipment causes ground vibration to some degree, but the vibrations diminish in strength with distance. The vibration velocity level at a receptor beyond 70 meters (230 feet) from any demolition activities (except high-explosive detonation or impact pile driving) would diminish

below the 65-VdB threshold of perception by humans and interference with vibration-sensitive activities (Hanson 2006). No major heavy equipment capable of causing great ground vibration would be used and APS structures are located beyond about 140 meters (450 feet) from Building 330. Therefore, there would be no adverse vibration impacts from the proposed activity on the main APS structure. However, considering the importance of ongoing APS activities and the nearby location of the APS utility building, all necessary precautions should be taken to reduce the potential for vibration impacts.

5.1.7 Socioeconomic Impacts/Environmental Justice

The total cost of the proposed action (i.e., demolition and capping the project site with an impermeable barrier) would be approximately $34.35 million. The expenditure would take place over approximately 24 months and represents a small fraction of Argonne's annual operational budget. Thus, the economic impact of the proposed action would be minor in the context of Argonne and extremely small in the context of the regional economy. There would be no social impacts such as those related to relocation of residents or impacts on lifestyle and living conditions.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, requires federal agencies to analyze disproportionately high and adverse environmental effects of proposed actions on minority and low-income populations. As indicated in prior sections, off-site impacts of the proposed action would be minimal. Since the "adverse" condition is not met, there is no reason to determine and quantify the "disproportionately high" condition. Therefore, there would not be any environmental justice concerns associated with the proposed action.

5.1.8 Radiological Impacts on Occupational Workers and the Public

Workers demolishing Building 330 would be exposed to beta/gamma radiation from residual contamination and activated building components, as well as airborne tritium. Occupational exposures from direct radiation are expected to average less than 200 mrem per full-time equivalent (FTE)[6] laborer or equipment operator (the anticipated dose to management personnel is not expected to exceed the public dose limit of 100 mrem). Given the need for approximately 15 FTEs (see Table 4), the upper bound collective worker dose would be approximately 3 person-rem.[7] Based on an occupational risk factor of 6.0×10^{-4} fatal cancers per person-rem (DOE 2002a), workers engaged in the proposed demolition activity (see Table 4) would incur a 1.8×10^{-3} collective risk for a fatal cancer, or about 1 chance in 550. Worker exposure to

[6] Approximately 2,000 worker-hours per year.

[7] In the absence of a specific work plan and dose rates in currently inaccessible areas, the bounding scenario for the maximum dose assumes laborer/operator exposure to a point source of the highest reported, localized residual activity (Argonne 2000b) at a distance of 4 meters. This estimate is conservative, as the residual contamination is volumetrically distributed in different areas of the building and no single worker would spend the entire project in proximity to a single, penetrating source. By comparison, the CP-5 decontamination and decommissioning final status survey report and independent verification survey both confirmed that exposure rates in all occupiable locations were less than 0.01 mR/h (DES 2000, ORISE 2000), and the collective dose over the course of the project (1993–1999) was 11.5 person-rem (Argonne 2000a).

radiation would be controlled under established Argonne procedures that require doses to be kept ALARA and administratively limit any individual's dose to less than 1 rem per year.

Table 4. Anticipated Demolition Workforce

Type	Number	Occupancy (%)	Total Time (person-hour)[a]
Argonne Project Manager	1	25	625
Argonne Project Specialist	1	25	625
Contractor Project Manager	1	25	625
Argonne Project Specialist	2	25	1,250
Argonne Health & Safety Manager	1	25	625
Foreman	1	100	2,500
Health Physics Technician	2	50	2,500
Laborer	4	100	10,000
Equipment Operator	4	100	10,000
Waste Specialist	1	50	1,250
Total	18	-	30,000 (15 FTE)

[a] Assumes 15-month duration of demolition activities, 2,000 hours per worker-year.

The only potential radiological impact on non-project related workers at the Argonne site or members of the public would be from radiological air emissions (see Section 5.1.5). Assuming no additional decontamination prior to demolition and no dust suppression (for bounding purposes), the estimated radiation dose from the proposed action (calculated using CAP88-PC) for a nearby, maximally exposed resident would be 4.37×10^{-4} mrem per year, which is much less than the 10 mrem/year National Emission Standard for Hazardous Air Pollutants contained in 40 CFR 61, Subpart H. This radiation dose is equivalent to a latent cancer fatality risk of less than 2.6×10^{-10}, or about 1 chance in 3.8 billion. Although doses to nearby non-project-related workers could be higher due to their closer proximity to Building 330 (and the uncertainties involved in calculating doses at short distances),[8] the expected doses would still be significantly less than 1 mrem. As with worker exposures, public and non-project-related worker exposure to radiation would be controlled under established Argonne procedures that require doses to be kept ALARA.

5.1.9 Impacts Resulting from Transportation

As indicated in Table 1, 1,037 truckloads of potentially radioactive debris waste and LLW and 20 truckloads of potentially contaminated ACM (a total of 1,057 shipments) would leave Argonne for transport to either NTS or Energy*Solutions*. This is a bounding estimate, based on the conservative assumption that all waste would be radiologically contaminated. It is likely that some of the debris waste or ACM, if found to be uncontaminated, could be disposed of as nonradioactive at a licensed landfill. In addition, one shipment each of MLLW and hazardous/chemical/TSCA waste could be required. Because the preferred disposal locations for

[8] While CAP88-PC is reliable for calculating radiation doses to off-site residents, the calculated radiation dose to nearby noninvolved workers is less reliable due to the limitations of the model (DOE 2007). Uncertainties of 20% and 35% have been estimated at short distances (<10 km) for ground-level and elevated releases, respectively. However, the projected doses from demolition-related air emissions (see Section 5.1.8) are low enough that these uncertainties are insignificant.

MLLW, hazardous, chemical, and TSCA wastes are subject to change, NTS was assumed in order to bound the transportation impacts of these shipments.

The transport of radiological and hazardous/chemical/TSCA wastes would occur at random intervals over a 15-month period; ACM abatement and the resulting waste shipments would occur prior to the start of building demolition. The projected number of LLW shipments from Argonne in FY2009 is 73. Therefore, the 1,037 LLW/debris shipments from the proposed action would represent an 1,100-percent increase in LLW-type shipments over the span of one year. The total of 1,059 shipments of LLW/debris, MLLW, ACM, and hazardous/chemical/TSCA waste for the proposed action compares to the FY2009 projection of approximately 154 shipments of similar waste from Argonne, representing a 450-percent increase in the number of annual shipments.[9] On-site roads and gates would be adequate to accommodate this volume, as would the nearby interstate highways. The additional truck traffic associated with the off-site transportation of waste for disposal would be temporary and would contribute to a very small increase in the volume of truck traffic on the interstate highways in the vicinity of the site and nationwide.

A total of 6,110,638 vehicle-kilometers (3,797,786 vehicle-miles) would be traveled by 1,059 round-trip shipments to NTS in Nevada[10] (the farthest of the anticipated disposal site options). The round-trip shipments to NTS were assumed in this analysis to bound the transportation risk; actual distance traveled is expected to be less. Based on state-specific accident and fatality rates (Saricks and Tompkins 1999) for all proposed waste shipments, the probability of a traffic accident is estimated to be 1.78 (approximately two occurrences) and the probability of a fatality is estimated to be 0.067 (1 chance in 15).

Using the RADTRAN code[11,12] and conservative assumptions to evaluate transportation risk, the collective latent cancer risk to the general public from incident-free radiological exposure is estimated to be 0.012 (19.6 person-rem), or about 1 chance in 85. The collective latent cancer risk to occupational workers (truck drivers only) is estimated to be 0.017 (28.1 person-rem), or about 1 chance in 60. The collective latent cancer risk from the accidental release of radioactive materials following accidents severe enough to damage a shipping container is estimated to be 4.6×10^{-6} (7.7×10^{-3} person-rem),[13] or about 1 chance in 216,000. The collective risk of

[9] Data on the number of non-contaminated debris shipments to commercial landfill was not readily available. The FY2009 estimate also does not include sanitary waste and non-regulated debris from the demolition of Building 301 (approximately 194 shipments) or other waste types that would not be generated from the proposed action (e.g., lab packs, infectious waste, or remote-handled transuranic waste). Inclusion of these waste types would reduce the percent increase in the number of shipments due to the proposed action.

[10] Calculated using the DOE Transportation Routing Analysis Geographic Information System (WebTRAGIS), version 4.6.2.

[11] Version 5.6 (Weiner 2008).

[12] Specific measurements of dose rates for the shipping containers are not available. Rather than conducting detailed shielding analyses for specific containers, DOE assumed that the dose rate for the containers was 1 mrem per hour at 1 meter from the containers/truck, which is a typical dose rate used for LLW/MLLW shipping analyses (DOE 2002c). This is an overestimate and results in a conservative collective dose estimate for transportation workers.

[13] This is an extreme bounding estimate, which assumes the entire inventory of residual building radioactivity (Table 3) is available in each waste shipment. Given the distribution of contaminants throughout the building, it is highly unlikely that any single shipment will contain this level of activity and impossible that every shipment would.

pollution health effects from Class VIIIB vehicle emissions (Biwer and Butler 1999) is estimated to be 0.005, or about 1 chance in 200.

5.1.10 Physical Hazards and Accidents

Auditable Safety Analyses (ASAs) were prepared for the decontamination and decommissioning of the CP-5 reactor (Argonne 1998) and the decontamination and demolition of Building 301 (DOE 2007). Both projects were similar in scope to the proposed action, and both ASAs indicated the potential for only localized consequences.

Occupational accidents could occur in all proposed action operations, including demolition, maintenance, on-site transportation, characterization, disassembly, and packaging for off-site disposal. Potential causes of accidents could include vehicular crashes, forceful contact with objects and equipment, and falls. Based on a projected 30,000 person-hours of effort required to implement the proposed action (see Table 4) and an occurrence rate of 1.04×10^{-7} fatalities per hour (BLS 2007),[14] no fatal accidents would be expected to occur during the proposed action (risk of 0.003, or about 1 chance in 300). Based on a nonfatal occupational injury and illness incidence rate of 2.6×10^{-5} cases per hour for the construction industry (BLS 2008),[15] approximately one nonfatal occupational injury/illness is anticipated (risk of 0.78).

The estimated incidences of fatalities and injuries for the proposed action are based on national average construction industry rates. Accident rates for the proposed action would be expected to be lower because of the safety programs that would be implemented for decommissioning workers at Argonne. Three large decontamination and demolition projects — the EBWR, the Janus Reactor, and the CP-5 Reactor — involved 325,000 person-hours of work with no lost-time accidents, and only minor injuries occurred during the performance of these projects. Lessons learned from these projects would be incorporated into the plans and procedures for the demolition of Building 330 to further reduce the probability of an injury.

5.1.10.1 Accident Analysis

In addition to the industrial types of accidents discussed above, accidents could also occur due to natural phenomena (e.g., earthquakes, tornadoes, floods, etc.), equipment failure, or human error. These types of accidents are generally categorized according to their expected frequency of occurrence and the severity (i.e., the level of consequence). The types of accidents analyzed range from those that are high probability/low consequence to those that are low probability/high consequence. A sliding scale approach is generally employed with greater depth in analysis provided for higher-consequence accidents (DOE 2002b).

The maximum, reasonably foreseeable accident is the dispersal of contaminated dust and debris initiated by a tornado, although other events capable of causing similar dispersion (e.g., fires) are

[14] Hourly risk estimate was derived from Bureau of Labor Statistics (BLS) hours-based estimates of fatal occupational injuries per 100,000 full-time equivalent workers. Although a general rate of 12.6 is reported for construction and extraction occupations (5.4 for construction managers), the more conservative rate of 20.8 for construction laborers was used for this analysis. Derivation assumes 2,000 hours worked per year, which is consistent with BLS calculations.

[15] Derived from BLS-reported incidence rate of 5.2 nonfatal injuries/illnesses per 100 full-time equivalent workers.

also possible. The likelihood of a tornado hitting anywhere in DuPage County is 35 percent in a given year, and the odds of a tornado hitting any particular square mile in the County in a given year are 1 in 960 (DuPage 2007).

As indicated above, the ASAs prepared for decommissioning of CP-5 and the demolition of Building 301 indicated that the consequences of accidents would be localized and within the limits established by DOE for emergency actions, regardless of the frequency. Consequently, the risks associated with such accidents were determined to be negligible. These conclusions would continue to hold for the proposed action because of the limited amount of residual radioactive material in Building 330 (which is less than was estimated for Building 301) and the fact that the radioactivity is volumetrically fixed in the building materials (primarily concrete and metals). Once the concrete is rubblized during demolition, it would be more dispersible in air. Therefore, if an accident occurred involving a container of debris, some of that debris could aerosolize and disperse in the environment. However, the impacts from exposure to dispersed radioactive or hazardous material in an accident scenario would be comparable to the impacts from normal demolition activities. Exposure could potentially increase due to a time-intensive cleanup effort. However, the potential impacts from a hypothetical ten-fold increase in exposure would still be very low, with the collective risk of latent cancer fatality increasing from 1.8×10^{-3} (see Section 5.1.8) to 1.8×10^{-2}. The more significant potential impacts would be largely physical, such as the risk of injury from wind-blown debris (large and small).

The potential for dispersal of contaminated dust would be mitigated by minimizing the duration that demolition rubble is present at the project site.

5.1.10.2 Terrorism or Sabotage

Accident analysis is also required to address the results of an intentional destructive or terrorist act (DOE 2006). Because of their nature, a probability of occurrence for intentional acts cannot be estimated. Although Argonne is a secure, access-controlled site with security gates and 24-hour security, DOE considered the potential for a terrorist attack or sabotage during the decontamination and demolition of Building 301 and the subsequent transportation of waste (DOE 2007). The impacts of such an unlikely event would be similar to those associated with natural hazards such as tornadoes or the impacts of an accident involving a truck carrying waste from the site. These impacts for the proposed action are addressed in Sections 5.1.10.1 and 5.1.9, respectively. The Building 330 project would be conducted in such a manner that would not create a "highly visible" target for malicious acts or acts of terrorism.

5.1.11 Other Potential Direct, Indirect, Cumulative, or Long-Term Impacts

Cumulative impacts are defined as "the impact which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions" (40 CFR §1508.7). Based on the impact analysis of past decontamination and decommissioning projects such as those conducted for the CP-5 Reactor, EBWR, and Building 301, the incremental impact of the proposed action would be minimal and not significant when added to the impacts from other projects at Argonne (including ongoing operations). The decontamination and demolition of Building 310 is currently in the planning phase and the commencement of Building 310 activities may overlap with Building 330 demolition activities.

5.1.12 Compliance with Environmental Laws, Regulations, Permits, and Orders

The proposed action would comply with applicable federal, state, and local laws and regulations as well as current permits. The applicable and potentially applicable environmental laws, regulations, DOE Orders, and relevant permits are summarized below:

- IEPA Title V air permit for Argonne and construction permit for radionuclide emissions to the environment
- IEPA regulations for air pollution control
- IEPA NPDES permit for Argonne
- IEPA regulations for water pollution control
- IEPA RCRA Part B permit for the treatment and storage of hazardous and mixed waste
- DOE Order 435.1 governing radioactive waste management and DOE Order 5400.5 governing decontamination/decommissioning of certain structures
- DOE Order 450.1A, "Environmental Protection Program"
- Occupational Safety and Health Administration standards and/or 10 CFR Part 851
- Department of Transportation regulations governing shipment of hazardous and radioactive materials

5.1.13 Pollution Prevention

The proposed action would be performed in accordance with Argonne's waste minimization and pollution prevention (P2) practices.

5.2 Environmental Impacts of the No Action Alternative

Under the no action alternative, Building 330 would not be demolished on the proposed schedule. Surveillance and maintenance activities would continue to ensure adequate containment of radioactive materials and would provide physical safety and security controls to allow for personnel access. This alternative could result in low-level radiation exposure to surveillance and maintenance personnel and the continued risk of radioactive/hazardous material release due to accidents, natural hazards, or terrorism. Releases to the air would not likely increase, but resource requirements could escalate over time in order to maintain the integrity of the building and contain the residual contamination embedded in the pedestal/foundation. Transportation risks would be avoided, and cultural resources would not be affected. The excess facility would eventually be demolished, as no future use has been identified. Therefore, some of the impacts quantified in this environmental assessment would simply occur at a later time.

6.0 RELATIONSHIP OF THE PROPOSED ACTION TO OTHER NEPA REVIEWS

There are no known actions undergoing NEPA reviews, but there are three NEPA-related actions that relate to the proposed demolition of Building 330.

- Building 301 is currently undergoing demolition, following the issuance of an Environmental Assessment (DOE 2007) and Finding of No Significant Impact in 2007. The Building 301 demolition project is expected to be completed prior to the start of the proposed action and would therefore have no cumulative impact.

- Building 310 is currently undergoing characterization in anticipation of environmental assessment and eventual decontamination or demolition. The impacts of the Building 310 project will likely overlap with the 15-month duration of the proposed action.

- The Theory and Computing Sciences building is scheduled for completion prior to the start of the proposed action and would therefore have no cumulative impact.

7.0 INDIVIDUALS AND AGENCIES CONSULTED

Illinois Historic Preservation Agency, Anne E. Haaker, April 22, 2009

U.S. Fish and Wildlife Service, John D. Rogner, March 18, 2005

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9.0 APPENDIX A: INTERAGENCY CORRESPONDENCE

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 • (217) 782-2829
James R. Thompson Center, 100 West Randolph, Suite 11-300, Chicago, IL 60601 • (312) 814-6026

PAT QUINN, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

217-782-0547

July 22, 2009

Mr. Peter R. Siebach
Acting NEPA Compliance Officer
Department of Energy
Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Siebach:

Thank you for the opportunity to review the environmental assessment for the proposed demolition projects for Buildings 310 and 330 at Argonne National Laboratory.

The Agency has no objections to the projects; however, asbestos notification will be required to the Bureau of Air, Division of Air Pollution Control at least ten (10) working days prior to each demolition project initiation. Please contact Alan Grimmett, 217-782-2113, if you have questions concerning notification requirements.

Solid and hazardous waste must be properly disposed of or recycled.

Sincerely,

Lisa Bonnett
Acting Deputy Director

Rockford • 4302 N. Main St., Rockford, IL 61103 • (815) 987-7760
Elgin • 595 S. State, Elgin, IL 60123 • (847) 608-3131
Bureau of Land – Peoria • 7620 N. University St., Peoria, IL 61614 • (309) 693-5462
Collinsville • 2009 Mall Street, Collinsville, IL 62234 • (618) 346-5120
Des Plaines • 9511 W. Harrison St., Des Plaines, IL 60016 • (847) 294-4000
Peoria • 5415 N. University St., Peoria, IL 61614 • (309) 693-5463
Champaign • 2125 S. First St., Champaign, IL 61820 • (217) 278-5800
Marion • 2309 W. Main St., Suite 116, Marion, IL 62959 • (618) 993-7200

Illinois Historic Preservation Agency

FAX (217) 782-8161

1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • www.illinois-history.gov

DuPage County
Argonne
Demolition
Buildings 310, 330, Argonne National Lab.
IHPA Log #001040609

April 22, 2009

Ronald J. Lutha
Department of Energy
Argonne Site Office
9800 South Cass Avenue
Argonne, IL 60439

Dear Mr. Lutha:

We have reviewed the documentation submitted for the referenced project(s) in accordance with 36 CFR Part 800.4. Based upon the information provided, no historic properties are affected. We, therefore, have no objection to the undertaking proceeding as planned.

Please retain this letter in your files as evidence of compliance with section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

If you have any further questions, please contact me at 217/785-5027.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

A teletypewriter for the speech/hearing impaired is available at 217-524-7128. It is not a voice or fax line.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chicago Ecological Services Field Office
1250 South Grove Avenue, Suite 103
Barrington, Illinois 60010
Phone: (847) 381-2253 Fax: (847) 381-2285

IN REPLY REFER TO:
FWS/AES-CIFO/(4-2026) / 5-1087

March 18, 2005

Mr. Robert C. Wunderlich
Department of Energy
Argonne Area Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Wunderlich:

Thank you for your response dated February 28, 2005 in regards to a letter from us dated August 24, 2004 requesting searches for the habitat of the federally listed Hine's Emerald dragonfly *(Somatochlora hineana)* for the proposed construction of a regional biocontainment laboratory at Argonne National Laboratory-East. The proposed project site is located at T37N, R11E, Section 9 at Argonne National Laboratory, DuPage County, Illinois.

After reviewing additional detailed information submitted regarding the proposed project area, we concur with your conclusion for reasons given that suitable habitat does not exist at the site for the federally listed Hine's emerald dragonfly, and that the quantity and quality of groundwater responsible for the wetland seeps south of Argonne National Lab that support the Hine's emerald dragonfly would not be impacted by this project.

Based on the information provided in your submittal and a review of our records, we do not believe that any federally endangered or threatened species occur in the vicinity of the site. Based on the information provided, it does not appear that the project is likely to adversely affect any federally threatened or endangered species or adversely modify critical habitat of such species. This precludes the need for consultation on this project in accordance with section 7 of the Endangered Species Act of 1973, as amended. Should project modifications or new information indicate that endangered or threatened species may be affected, and the project is funded, authorized or carried out by a federal agency, then consultation with the Service should be initiated by the Army Corps of Engineers.

This letter only addresses federally listed species; the Illinois Department of Natural Resources should be contacted for information on State-listed species. Any impacts to wetlands or waters of the United States may require a permit from the U. S. Army Corps. of Engineers. This letter

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Mr. Robert C. Wunderlich 2

does not preclude separate evaluation and comment by the U.S. Fish and Wildlife Service on wetland impacts proposed for section 404, Clean Water Act authorization.

If you have any questions, please contact Ms. Cathy Pollack at 847/381-2253, ext. 239 or Ms. Karla Kramer at 847/381-2253, ext. 230.

Sincerely,

John D. Rogner

John D. Rogner
Field Supervisor

cc: Valerie Nottingham, National Institutes of Health

U.S. Department of Energy
Finding of No Significant Impact
Proposed Demolition of Building 330
at Argonne National Laboratory,
Argonne, Illinois

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: DOE has prepared an Environmental Assessment (EA), DOE/EA-1659, to evaluate impacts from the demolition of Building 330 at Argonne National Laboratory (Argonne) in Argonne, Illinois. Under this proposed action, DOE would demolish the building and cover the project site with an impermeable barrier cap. DOE intends to demolish this building as part of its mission to protect human health and the environment from risks associated with unneeded and deteriorating structures that contain radioactively contaminated areas and material.

Based on the analysis in the EA, DOE has determined that the proposed action would not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). Therefore, the preparation of an environmental impact statement is not required.

DESCRIPTION OF THE PROPOSED ACTION: The proposed action is the demolition of Building 330, the Chicago Pile-5 (CP-5) reactor facility, without additional radiological decontamination.[1] The scope of the proposed action involves the removal of all interior mechanical, electrical, and architectural systems and components; the open-air demolition and removal of physical structures, including the concrete foundations, sidewalk and asphalt surfaces adjacent to the facility; the transportation of waste materials to approved disposal facilities, and capping of the project site. All activities would be performed in accordance with an approved work plan that meets the requirements of 10 CFR Part 835, Occupational Radiation Protection.

The areas of elevated contamination that would be encountered during demolition include systems embedded in structural components, such as the containment ventilation system located in the containment shell wall and test piping located in the reactor pedestal. Predominant radionuclides include cesium-137, cobalt-60, and strontium-90. In addition, significant quantities of tritium (hydrogen-3) are present in the building foundations and soils beneath the concrete slabs, due primarily to the porous nature of concrete coupled with the presence of tritium that was pervasive during facility operation.

[1] Decontamination and demolition of the interior of Building 330 has been largely completed. The environmental impacts of this action were described in *Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor* (DOE/EA-0173) and the project is summarized in *Decontamination and Decommissioning of the Chicago Pile-Five Reactor at Argonne National Laboratory-East Project Final Report* (ANL/D&D/00-1).

Background

Building 330 was constructed from 1951 to 1954 and is located in the south-central area of the Argonne site. The CP-5 reactor was the principal nuclear reactor used to produce neutrons for scientific research from 1954 until shutdown in 1979. The reactor employed a heavy-water moderator and was surrounded on the bottom and sides with a graphite reflector, lead gamma shield, and a biological shield of high-density concrete. In 1980, all nuclear fuel and heavy water that could be drained from the process system were shipped to the DOE Savannah River Plant. Following an assessment of potential environmental impacts and the issuance of a Finding of No Significant Impact (FONSI) in 1991, decontamination and decommissioning of the CP-5 reactor began in 1992 and was completed in 2000. The reactor, biological shield, and associated components were completely dismantled, and portions of the concrete pedestal were removed to comply with DOE and Argonne objectives for the release of structures (i.e., release from radiological control after confirming that residual contamination did not exceed established limits). Areas with residual contamination exceeding release levels were rendered inaccessible through the use of bolted metal covers.

Demolition

Interior demolition tasks would include activities such as equipment and systems disassembly, size reduction, disconnection of utilities, removal of salvageable equipment or materials, and removal of building components, tanks, piping, ventilation, fixtures, equipment, and debris. Polychlorinated biphenyl (PCB)-containing light fixtures would be removed and disposed of by trained workers. Asbestos-containing material (ACM), present primarily as fire-retardant insulation and floor tile, would be removed and disposed of by certified asbestos abatement workers prior to any demolition activities. DOE intends to conduct ACM abatement under Categorical Exclusion B1.16 of 10 CFR 1021, Appendix A to Subpart D, and may initiate this activity prior to the completion of the EA process. However, the transportation impacts of ACM waste removal were considered in the EA.

Any water encountered during demolition activities would be collected and tested for contamination. In addition, water would be misted over all surfaces to control dust emissions during demolition of the exterior structure and subsequent rubble reduction, generating a secondary waste stream of potentially contaminated water. Up to an estimated 13,600 liters (3,600 gallons) of water per day would be used to suppress dust, requiring collection and pumping to the Laboratory Wastewater Treatment Plant (LWTP). Standard industry practices would be used to minimize the potential for generating waste and spreading contamination, and the wastewater would be tested and disposed of in accordance with Argonne Waste Management Procedures. If the wastewater requires treatment, Argonne would use a commercial waste disposal contractor to store, treat, and transport the contaminated water for disposal.

Soil beneath Building 330 is expected to be contaminated with tritium, based on soil and groundwater monitoring. However, there are no plans to remove or remediate tritium-

contaminated soil as a part of the proposed action due to the low risk presented by the contaminant and its lack of migration away from the building. Approximately 57 cubic meters (2,000 cubic feet) of soil are expected to be removed incidental to excavation of the building foundation.

Waste generated by the proposed action would be transported by truck for off-site disposition. Although some wastes may not be radiologically contaminated, DOE assumed for purposes of analysis that all waste would have some level of radioactive contamination and would need to be disposed accordingly. There are no plans to recycle any waste from Building 330.

DOE estimated that the proposed action would generate approximately 8,480 cubic meters (299,400 cubic feet) of solid debris waste and low-level radioactive waste (LLW), consisting mainly of concrete, metal, wood, plastic, soils, paper, and cloth. Based on building characterization results, DOE assumed that all debris waste would be slightly radioactive and disposed of as LLW. DOE also estimated that the proposed action would generate less than 2.5 cubic meters (90 cubic feet) of mixed LLW. LLW or mixed LLW would likely be disposed of at Nevada Test Site (NTS) in Mercury, Nevada, or Energy Solutions in Clive, Utah.

The proposed action would also generate approximately 170 cubic meters (6,000 cubic feet) of ACM and less than 2.5 cubic meters (90 cubic feet) of hazardous, chemical, or Toxic Substances Control Act (TSCA) waste in forms such as lead-based paint or PCBs. ACM sampling has suggested that ACM is not radiologically contaminated and can be disposed of at a licensed commercial landfill within 160 kilometers (100 miles) of Argonne. However, to conservatively bound transportation impacts, DOE assumed that all ACM is radiologically contaminated and would be disposed of in the same manner as LLW. Hazardous, chemical, and TSCA wastes would be disposed of at a licensed facility.

After demolition, a final status survey would be performed to identify any non-tritium soil contamination and determine if additional actions or remediation are necessary. Once it has been determined that no further remediation is necessary, the site would be backfilled, graded, and covered with an impermeable barrier cap (such as asphalt or other waterproof membrane) to help prevent surface water infiltration.

The proposed action is expected to take 15 months to complete (excluding ACM abatement) and require a workforce of approximately 18 full-time equivalent employees or contractors.

ALTERNATIVES: Under the no action alternative, Building 330 would not be demolished. Surveillance and monitoring activities would continue to (1) ensure adequate containment of radioactive contamination, (2) provide physical safety and security controls, and (3) preserve the facilities to allow for personnel access. Continued maintenance, surveillance, and monitoring would cost approximately $141,000 annually ($1.6 million over the next 10 years).

DOE considered alternatives to demolition, but these alternatives did not meet DOE's purpose and need for agency action and were not analyzed in the EA. Partial demolition would not protect individuals and the environment from risks associated with unneeded and deteriorating structures that contain radioactively contaminated areas and material, as demolition to a few feet below grade would not eliminate all building contamination. No future use has been identified for this excess facility, so no alternatives to demolition were considered reasonable.

ENVIRONMENTAL IMPACTS: Impacts of activities associated with the proposed demolition of Building 330 were analyzed in the EA. This FONSI for the proposed action is based on the following factors, which are supported by information and analysis in the EA.

Sensitive Resource Impacts: Demolition activities would be conducted outdoors, and all of the nearby wildlife habitats are potentially susceptible to air (dust and radiological), noise, and human disturbance. However, no state or federally listed threatened or endangered species are known to reside in these habitats. All proposed demolition activities would be conducted in a manner that controls the airborne spread of dust and residual radioactive contamination. There would be no environmental impact on woods, wetlands, and floodplain as a result of the proposed action.

Cultural Resource Impacts: Building 330 has been evaluated and was determined to be historically significant for its association with CP-5. The facility design and history were documented to Illinois Historic American Engineering Record standards in 1998.

In anticipation of the demolition of Building 330, an additional historical review was conducted in 2009, focusing on activities that occurred in the building after 1989. No activities occurred in the building between 1989 and 2009 that were of historical significance. In April 2009, the Illinois Historic Preservation Agency concurred with DOE's finding of no adverse effect.

Solid Waste Impacts: Waste generated as a result of the proposed action would be transported off-site for disposal at the DOE disposal facility at NTS or at commercial disposal sites (e.g., Energy*Solutions*) in accordance with their waste acceptance criteria. Neither NTS nor Energy*Solutions* are nearing their capacities for LLW disposal.

Wastewater Impacts: Approximately 18 current Argonne personnel and/or outside contractors would conduct the proposed demolition activities for a period of about 15 months. The increase in sanitary wastewater handling requirements would be negligible and within the excess handling capacity of the existing Laboratory system.

The LWTP is expected to have adequate wastewater treatment capacity to accommodate liquid wastes generated as a result of the proposed action. All wastewater would be collected within the project site and sampled to determine if it meets LWTP release requirements. If radiologically contaminated wastewater meets Argonne release criteria,

it would be released to the LWTP in accordance with Argonne Waste Management Procedures. If the wastewater requires additional treatment beyond LWTP capability, DOE would use a commercial waste treatment contractor to store, treat, and transport the contaminated wastewater for disposal.

Argonne would develop a stormwater pollution prevention plan to contain runoff from the demolition site, as required by the National Pollutant Discharge Elimination System (NPDES) Permit. Implementation of this plan would prevent runoff from the leaving the demolition site, thereby mitigating any potential impacts.

Air Quality Impacts: Fugitive dust particulate emissions from the proposed action (which could include lead and small amounts of radioactive material) would be subject to the terms of the Argonne Title V air permit. However, by employing dust suppression techniques, dust emissions from the proposed action are unlikely to violate permit conditions. Work areas would be monitored for airborne dust, and respiratory protection may be used, if necessary. Protective clothing and personnel monitoring devices may also be used. Portable high efficiency particulate air (HEPA) filters would be used during internal demolition activities. If necessary, a small, temporary shelter or tent with portable HEPA filtration would be used to contain potential emissions from size reduction of certain materials.

A construction permit would be required under the terms of the Argonne Title V air permit due to the potential release of radionuclides. Air modeling was used to prepare the permit application for open-air demolition (see ***Human Health Impacts*** for air modeling results). Air monitoring may be performed during the project to verify emissions levels and demonstrate compliance with permitted limits (10 mrem/year to any member of the public).

Demolition activities would also generate criteria and toxic air pollutants from heavy equipment engine exhaust, soil disturbances, and unpaved road traffic. Considering the small numbers of heavy equipment and crew, and the fact that emissions would take place over a 15-month period, the potential impacts of engine exhaust emissions from heavy equipment on ambient air quality are anticipated to be minimal. Preliminary screening calculations indicate that, even under the most unfavorable meteorological conditions, the particulate matter concentration at the nearest site boundaries would be low. Currently, the highest background particulate concentrations observed at nearby monitoring stations are well below the ambient air quality standard. Accordingly, fugitive dust emissions from the proposed action would not likely result in exceedance of the ambient air quality standard at site boundaries.

Levels of diesel particulate matter (DPM) from engine exhaust, which is toxic and accounts for most of the inhalation risk in urban air, are expected to be low at site boundaries. DPM is a known occupational hazard, so effects would be generally limited to heavy equipment operators and nearby workers.

Regulators generally rely on work practice standards rather than emission standards to control emissions. Dust suppression techniques, which reflect the current state of knowledge and may be specified by permit, would be employed during demolition. In addition, most emissions from demolition activities would be temporary and intermittent in nature, and unlikely to result in the exceedance of the ambient air quality standard at site boundaries.

Noise Impacts: Noise receptors are limited to persons who work in or near Building 330, and noise levels would be monitored weekly. Workers in areas where noise levels exceed permissible noise exposures would be required to wear hearing protection. Persons beyond the Argonne site boundary and buffer zone (Waterfall Glen Forest Preserve) would not notice noise impacts due to the distances from the source.

The heavy equipment used during demolition activities (e.g., jackhammers and bulldozers) could generate maximum combined noise level of around 95 dBA at a distance of 15 m (50 ft) from noise sources. The noise levels at 1,600 meters (1 mile) west-southwest of Building 330 (the nearest residence) would be approximately 50 dBA. In addition, the Advance Photon Source (APS) structures and densely wooded forest in the direction of the nearest residence would significantly attenuate noise levels. Due to the proximity to Lemont Road and Interstates 55 and 355, the background noise level at the nearest residence is relatively high and noise levels from the proposed activity would be barely discernable or completely inaudible.

Demolition activities result in various degrees of ground vibration, depending on the equipment, methods employed, and soil compactness. However, vibrations diminish in strength with distance. Major demolition equipment could cause vibrations that are capable of affecting ongoing experimental activities at nearby facilities, requiring that activities be coordinated or that vibrations be dampened to acceptable levels. The vibration velocity level at a receptor beyond 70 meters (230 feet) from any demolition activities (except high-explosive detonation or impact pile driving) would diminish below the threshold of human perception and interference with vibration-sensitive activities. No high-explosive detonation or major heavy equipment capable of causing great ground vibration would be used and APS structures are located beyond about 140 meters (450 feet) from Building 330. Therefore, there would be no adverse vibration impacts from the proposed activity on the main APS structure. However, necessary precautions should be taken to reduce the potential for vibration impacts on the nearby APS utility building.

Socioeconomic and Environmental Justice Impacts: The total cost of the proposed action would be approximately $34.35 million. The expenditure would take place over approximately 24 months and represents a small fraction of Argonne's annual operational budget. Thus, the economic impact of the proposed action would be minor in the context of Argonne and extremely small in the context of the regional economy. There would be no social impacts such as those related to relocation of residents or impacts on lifestyle and living conditions.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, requires federal agencies to analyze disproportionately high and adverse environmental effects of proposed actions on minority and low-income populations. Since off-site impacts of the proposed action would be minimal and the "adverse" condition is not met, there is no reason to determine and quantify the "disproportionately high" condition. Therefore, there would not be any environmental justice concerns associated with the proposed action.

Human Health Impacts: The proposed action would result in the exposure of workers to ionizing radiation and exposure of the public to very small quantities of radioactive materials, which could result in an increased risk of a latent cancer fatality. The discussion below describes the potential for these human health impacts.

Radiological Impacts to Workers. Workers demolishing Building 330 would be exposed to beta/gamma radiation from residual contamination and activated building components, as well as airborne tritium. Occupational exposures from direct radiation are expected to average less than 200 mrem per full-time equivalent laborer or equipment operator, and the upper bound collective worker dose would be approximately 3 person-rem. Based on an occupational risk factor of 6.0×10^{-4} fatal cancers per person-rem, workers engaged in the proposed action would incur a 1.8×10^{-3} collective risk for a fatal cancer, or about 1 chance in 550. Worker exposure to radiation would be controlled under established Argonne procedures that require doses to be kept As Low As Reasonably Achievable (ALARA) and administratively limit any individual's dose to less than 1 rem per year.

Radiological Impacts to Noninvolved Workers and the Public. The only potential radiological impact on non-project-related workers at the Argonne site or to members of the public would be from radiological air emissions. Assuming no dust suppression (for bounding purposes), the estimated radiation dose from the proposed action for a nearby, maximally exposed resident is 4.37×10^{-4} mrem per year, which is much less than the 10 mrem/year regulatory limit contained in the National Emission Standard for Hazardous Air Pollutants, Subpart H to 40 CFR 61. This radiation dose is equivalent to a latent cancer fatality risk of less than 2.6×10^{-10}, or about 1 chance in 3.8 billion. Although doses to nearby non-project-related workers would likely be higher due to their closer proximity to Building 330, the anticipated doses are significantly less than 1 mrem. As with worker exposures, public and non-project-related worker exposure to radiation would be controlled under established Argonne procedures that require doses to be kept ALARA.

Transportation Impacts: All waste transportation for the proposed action would be conducted by truck. Approximately 1,037 truckloads of potentially radioactive debris waste and LLW and 20 truckloads of potentially contaminated ACM would leave Argonne for transport to either NTS or Energy*Solutions*. This is a bounding estimate, based on the conservative assumption that all waste would be radiologically contaminated. It is likely that some of the debris waste or ACM, if found to be uncontaminated, could be disposed of as nonradioactive at a licensed landfill. In addition, one shipment each of MLLW and hazardous/chemical/TSCA waste are anticipated.

Because preferred disposal locations for these shipments are subject to change, NTS was assumed to bound the transportation impacts.

The 1,037 projected LLW/debris shipments for the proposed action represent an 1,100-percent increase in LLW-type shipments from Argonne over the span of one year. The total of 1,059 waste shipments for the proposed action compares to the FY2009 projection of approximately 154 shipments of similar waste from Argonne, representing a 450-percent increase in the number of annual shipments. On-site roads and gates would be adequate to accommodate this volume, as would the nearby interstate highways. The additional truck traffic associated with the off-site transportation of waste for disposal would be temporary and would contribute to a very small increase in the volume of truck traffic on the interstate highways in the vicinity of the site and nationwide.

A total of 6,110,638 vehicle-kilometers (3,797,786 vehicle-miles) would be traveled by the 1,059 round-trip shipments to NTS in Nevada (the farthest of the anticipated disposal site options). The round-trip shipments to NTS were assumed to bound the transportation risk; actual distance traveled is expected to be less. Based on state-specific accident and fatality rates for all proposed waste shipments, the estimated probability of a traffic accident is 1.78 (approximately two occurrences) and the estimated probability of a crash-related fatality is 0.067 (1 chance in 15).

Using conservative assumptions, the estimated collective latent cancer risk to the general public from incident-free radiological exposure to cargo in transit is 0.012 (19.6 person-rem), or about 1 chance in 85. The estimated collective latent cancer risk to occupational workers (truck drivers only) is 0.017 (28.1 person-rem), or about 1 chance in 60. The estimated collective latent cancer risk from the accidental release of radioactive materials following accidents severe enough to damage a shipping container is 4.6×10^{-6} (7.7×10^{-3} person-rem), or about 1 chance in 216,000. The estimated collective risk of pollution health effects from vehicle emissions is 0.005, or about 1 chance in 200.

Physical Hazards and Accidents: Auditable Safety Analyses (ASAs) were prepared for the decontamination and decommissioning of the CP-5 reactor and the decontamination and demolition of Building 301. Both projects were similar in scope to the proposed action, and both ASAs indicated the potential for only localized consequences.

Occupational accidents could occur during all operations of the proposed action, including demolition, maintenance, characterization, disassembly, and packaging, and transportation. Potential causes of accidents could include vehicular crashes, forceful contact with objects and equipment, and falls. Based on a projected 30,000 person-hours of effort and a national average occurrence rate of 1.04×10^{-7} fatalities per hour for construction laborers, no fatal accidents are expected to occur during the proposed action (risk of 0.003, or about 1 chance in 300). Based on a national average nonfatal occupational injury and illness incidence rate of 2.6×10^{-5} cases per hour for the construction industry, approximately one nonfatal occupational injury/illness is anticipated (risk of 0.78). Accident rates for the proposed action would be expected to be

lower because of the safety programs that would be implemented for decommissioning workers at Argonne.

Accidents could also occur due to natural phenomena (e.g., earthquakes, tornadoes, floods, etc.), equipment failure, or human error. These types of accidents are generally categorized according to expected frequency of occurrence and severity, from high probability/low consequence to low probability/high consequence. The maximum, reasonably foreseeable accident is the dispersal of contaminated dust and debris initiated by a tornado, although other events capable of causing similar dispersion are possible. The likelihood of a tornado hitting anywhere in DuPage County is 35 percent in a given year, and the odds of a tornado hitting any particular square mile in the County in a given year are 1 in 960.

Analyses performed for previous Argonne decommissioning projects of similar size and scope have indicated that the consequences of accidents would be localized and within the limits established by DOE for emergency actions, regardless of the frequency. Consequently, the risks were determined to be negligible. These conclusions continue to hold for the proposed action because the limited amount of residual radioactive material in the building is volumetrically fixed not readily dispersible. If an accident occurs involving a container of rubblized debris, some of that debris could aerosolize and disperse into the environment. However, the impacts from exposure to dispersed radioactive or hazardous material in an accident scenario would be comparable to the impacts from normal demolition activities. The potential impacts from a hypothetical ten-fold increase in exposure from a time-intensive cleanup effort would still be very low, with the collective risk of latent cancer fatality increasing from 1.8×10^{-3} to 1.8×10^{-2}. The more significant potential impacts would be largely physical, such as the risk of injury from wind-blown debris. The potential for dispersal of contaminated dust would be mitigated by minimizing the duration that demolition rubble is present at the project site.

Because of their nature, a probability of occurrence for intentional destructive or terrorist acts cannot be estimated. Although Argonne is a secure, access-controlled site with security gates and 24-hour security, DOE considered the potential for a terrorist attack or sabotage during the decontamination and demolition of Building 301 and the subsequent transportation of waste. The impacts of such an unlikely event would be similar to those associated with natural hazards such as tornadoes or the impacts of an accident involving a truck carrying waste from the site. The Building 330 project would also be conducted in such a manner that would not create a "highly visible" target for malicious acts or acts of terrorism.

Other Potential Direct, Indirect, Cumulative, or Long-Term Impacts: Based on the impact analysis of past decontamination and decommissioning projects, the incremental impact of the proposed action would be minimal and not significant when added to the impacts from other projects at Argonne (including ongoing operations). The decontamination and demolition of Building 310 is currently in the planning phase and the commencement of Building 310 activities may overlap with the proposed action.

Compliance with Regulations: The proposed action would comply with applicable federal, state, and local laws and regulations, as well as current permits.

Pollution Prevention: The proposed action would be performed in accordance with Argonne's waste minimization and pollution prevention (P2) practices.

DETERMINATION: Based on the analysis in the EA, DOE has determined that the proposed demolition of Building 330 at Argonne does not constitute a major federal action that would significantly affect the quality of the human environment within the meaning of NEPA, and DOE will not prepare an environmental impact statement. The proposed action alternative would result in only minor environmental, health, and safety impacts and is the most efficient and cost-effective alternative.

PUBLIC AVAILABILITY: Copies of the EA (DOE/EA-1659) are available from:

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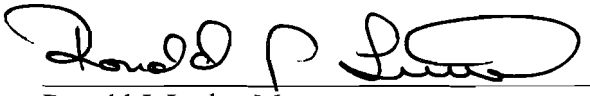
Issued in Argonne, Illinois, this 11 day of August, 2009.



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