ANL/D&D/98-5

Decontamination and Dismantlement of the Building 200/205 Pneumatic Transfer Tube at Argonne National Laboratory-East Project Final Report

Decontamination and Decommissioning Program

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Argonne, Illinois 60439

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1.0 EXECUTIVE SUMMARY

The decontamination and dismantlement (D&D) of the Building 200/205 Pneumatic Transfer Tube at Argonne National Laboratory-East (ANL-E) was completed in September 1998. Descriptions and evaluations of the activities performed and analyses of the results obtained during the D&D project are provided in this Final Report. The following information is included:

- Description of the ANL-E site and the Building 200/205 Pneumatic Transfer Tube
- History of the Building 200/205 Pneumatic Transfer Tube
- Description of the D&D activities performed
- Summary of the final status of the Building 200/205 Pneumatic Transfer Tube based upon the final survey results
- Summaries of the waste minimization techniques utilized and total waste generated by the project
- Description of the health and safety aspects of the project, including personnel exposure and OSHA reporting
- Summary of the final cost and schedule for the Building 200/205 Pneumatic Transfer Tube D&D project

This project was funded with operating funds provided by the Plant Facilities and Services (PFS) Division. This type of funding required the project to be completed by September 30, 1998. The Technology Development Division Decontamination and Decommissioning (TD/D&D) Group was chosen to be the lead organization for this project because of past experience in planning and scheduling of time-critical D&D projects.

This final report was written in accordance with requirements outlined in the ANL-E D&D Project Planning Guidance Manual and the ANL-E D&D Program Management Plan. It covers the entire Building 200/205 Pneumatic Transfer Tube D&D Project, from initiation of planning and characterization activities to final project closeout. The final survey was completed in September 1998.

The entire length of the Building 200/205 Pneumatic Transfer Tube excavation was surveyed to meet free-release requirements as specified in the ANL-E Environment, Safety and Health Manual.

Contaminated piping was removed and packaged for disposal; the radiologically clean control cable and wood planking were removed for recycle or reuse by ANL-E.

The total cost of the project was approximately $65,000, compared to an original estimated cost of $78,000. A total of 120 ft^3 (4 m^3) of low-level radioactive waste was packaged for off-site disposal at a DOE-approved low-level waste repository.

2.0 PROJECT OBJECTIVE

The Building 200/205 Pneumatic Transfer Tube D&D Project was directed toward the following goals:

- Remove any radioactive and hazardous materials associated with the transfer tube
- Survey the transfer tube to identify any external contamination
- Remove the transfer tube and package for disposal
- Survey the soil and sand surrounding the transfer tube for any contamination
- Backfill the trench in which the tube sat and restore the area to its original condition

These goals had been set in order to eliminate the radiological and hazardous safety concerns inherent in the buried transfer tube and to allow, upon completion of the project, the removal of this project from the ANL-E action item list. The physical condition of the transfer tube and possible nuclear fuel samples lost in the tube were the primary areas of concern, while the exact location of the transfer tube was of secondary concern. ANL-E health physics technicians collected characterization data from the ends of the Building 200/205 pneumatic transfer tube in January 1998. The characterization surveys identified contamination to a level of 67,000 dpm (1,117 Bq) β/γ and 20,000 dpm (333 Bq) α smearable at the opening.

3.0 FACILITY HISTORY AND DESCRIPTION

3.1 Building 200/205 Pneumatic Transfer Tube History

The pneumatic transfer tube was constructed in the late 1960s between Hot Cell M-4 in Building 200 and a glove box in Room F-131, Building 205. The tube was used to transfer irradiated fuel specimens and other samples between the two buildings. The system operated until the mid 1970s, when it was abandoned and partially disassembled within both buildings.

The below-grade portion of the transfer system consisted of a 2.125-in (5.4-cm) outside diameter copper tube and an accompanying conduit for interconnecting electrical controls. The system ran

approximately 1,850 linear ft (563.9 linear m) from the south end of the M-Wing of Building 200 to the south end of Building 205. The below-grade tubing was in a trench approximately 4-ft (1.22-m) deep which followed the elevation contours of the area through which it ran. It was routed through the woods south of Building 200 until it approached Outer Circle Road. It then turned southeast and followed the road for approximately 600 ft (182.9 m), where it then turned east toward Building 205.

3.2 Site Description

The Building 200/205 pneumatic transfer tube was located in the 200 Area on the ANL-E site, a 1,275 acre (5.16 km^2) reservation in DuPage County, Illinois, operated by the University of Chicago under contract with the Department of Energy. Approximately 4,000 people work at the ANL-E site. The majority of the reservation is forested and landscaped with only 200 acres (0.81 km^2) currently dedicated to operational facilities. The Laboratory is approximately 22 miles (35.4 km) southwest of Chicago and 25 miles (40.3 km) west of Lake Michigan at the closest point. Access is available from State Highway 83, county roads, Northgate Road, and Cass Avenue, all of which have access to Interstate 55. The reservation is surrounded by the 2,040-acre (8.26 km^2) Waterfall Glen Forest Preserve, a greenbelt forest preserve managed by the DuPage County Forest Preserve District. The areas south and west of the site are primarily rural, with more heavily populated areas to the north and east. The Des Plaines River, Illinois Waterway, and the Chicago Sanitary and Ship Canal are all located about 1 mile (1.6 km) from the southern boundary of the site.

3.3 Facility Description

The Building 200/205 Pneumatic Transfer Tube D&D Project did not involve either of the two buildings. The project scope of work addressed only the transfer tube between the buildings, not the facilities themselves.

4.0 OVERVIEW OF THE BUILDING 200/205 PNEUMATIC TRANSFER TUBE D&D PROJECT

4.1 General

The Building 200/205 Pneumatic Transfer Tube D&D Project began in January 1998. Characterization of the tube was performed by the ANL-E Environment, Safety and Health/Health Physics (ESH/HP) group. In January 1998, ANL-E Plant Facilities and Services (PFS) requested TD/D&D to prepare an estimate for the removal of the tube. In July 1998, funding was identified, TD/D&D was chosen to be the lead organization, and the project was authorized to proceed. The funding source required that all work be completed by the end of Fiscal Year 1998, i.e., September 30, 1998. Document preparation for the project consisted of developing a Health and Safety Plan, NEPA Assessment, and appropriate procurement documents for any required subcontracted work. The D&D work consisted of excavating the trench, performing the tube

removal, surveying the trench for any loose contamination and restoration of the work area. Northwest Contractors of Elgin IL performed the excavation and the restoration work per a Firm Fixed-Price Task Order. ANL-E Waste Management Operations (WMO) personnel performed the tube removal, PFS managed the Task Order and subcontractor supervision, and ESH/HP was responsible for surveys.

4.2 Major Tasks

The following major tasks were performed during the D&D of the Building 200/205 pneumatic transfer tube (see Figure 4.1):

- Excavate trench down to the wood plank. Survey trench for any loose contamination
- Remove plank and uncover the copper tube from the sand bedding
- Examine tube for any holes or punctures. Survey outside of tube for loose contamination and any high radiation spots within the tube
- Crimp an area of the tube with hydraulic crimper. Cut tube with hydraulic cutters at the crimp area (See Figure 4.2)
- Tape cut ends of the tube to eliminate possible spread of contamination. Remove tube from trench
- Backfill trench and seed area
- Package tubing for waste disposal
- Complete project closeout activities

5.0 BUILDING 200/205 PNEUMATIC TRANSFER TUBE D&D PROJECT TRAINING REQUIREMENTS

5.1 Project Training

All project personnel involved with the Building 200/205 Pneumatic Transfer Tube D&D project were required by ANL-E policy to meet minimum training requirements, as identified below:

For all personnel requiring unescorted access during D&D field work:

- ANL-E Radiological Worker II
- OSHA 40-hour Hazardous Waste Site Operations
- Building 200/205 Pneumatic Transfer Tube Facility Orientation

For personnel assigned as Health and Safety Manager:

- OSHA Hazard Recognition for Construction

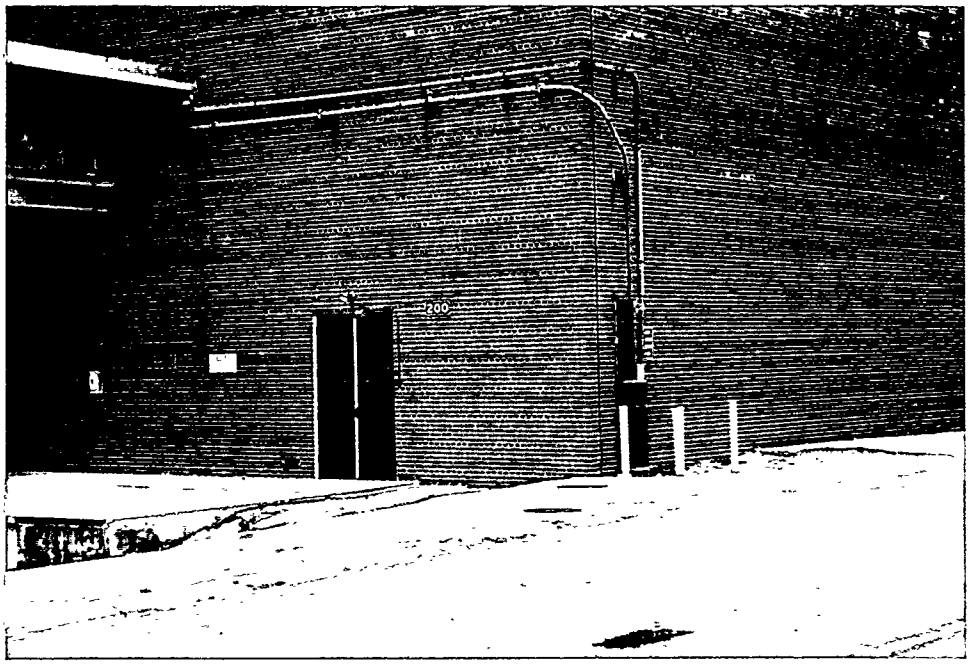

Figure 4.1 The Pneumatic Transfer Tube Ran Between Buildings 200 and 205
(ANL Neg. 23887K, Frame 6)

Figure 4.2 The Pneumatic Transfer Tube Was Crimped Before Being Cut
(ANL Neg. 24692K, Frame 24)

For personnel who perform health physics-related functions:

- Previously qualified as a Radiological Controls Technician at a DOE site

For personnel who performed radioactive waste packaging, inspection, or labeling functions:

- Complete ANL-E Radioactive Waste Generator Training

Additional job-specific training requirements for individuals involved in those operations:

- Confined space training
- Specialized training for various equipment and tools

5.2 Health and Safety

The project manager was responsible for implementing the ANL-E Health and Safety requirements for the project to ensure compliance with existing directives on environment, safety, and health issues. The actions implemented are discussed below.

5.2.1 ES&H Policy

All project activities were performed in a manner that ensured protection of the environment, and the health and safety of the general public and workers. All project personnel had the authority and responsibility to stop work if an unsafe condition or activity was observed. The project manager was the only individual at the project level with authority to restart work after an unsafe condition or activity had been identified and corrected. All work was performed in accordance with the ANL-E Environment, Safety and Health (ESH) Manual and the project-specific Health and Safety Plan.

5.2.2 Radiation Safety

Radiation safety at the Building 200/205 Pneumatic Transfer Tube D&D Project was the responsibility of ESH/HP personnel. The ANL-E ESH Manual served as a guide for implementing the project's radiation safety program. Health physics coverage of the project was provided by ESH/HP personnel. The coverage was 100% during excavation operations. Project plans and procedures were developed and implemented using the "As Low As Reasonably Achievable" (ALARA) principle.

5.2.3 Industrial Hygiene

Environment, Safety and Health Division Industrial Hygiene (IH) furnished technical guidance on materials handling and reviewed sample results.

5.2.4 Industrial Safety

All industrial safety aspects of the project were required to comply with rules and regulations as stated by OSHA, and in the ANL-E ESH Manual and the project-specific Health and Safety Plan. ANL-E ESH safety engineering personnel, and the project manager and staff continuously observed subcontractor operations. Daily project briefings and safety meetings were used to keep project personnel aware of potential or existing personnel hazards and accident prevention techniques.

5.2.5 Fire Protection and Security

Project fire protection services and safety guidance were provided by the ANL-E Fire Department. Physical security was provided by the ANL-E security force.

6.0 BUILDING 200/205 PNEUMATIC TRANSFER TUBE D&D OPERATIONS

6.1 General

The Building 200/205 Pneumatic Transfer Tube D&D Project was divided into four main areas of responsibility. These areas of responsibility were cost and schedule, health physics coverage, excavation and restoration, and tube removal and disposal. The project was completed with the efforts of various groups at Argonne and an outside subcontractor working together to accomplish the removal of the transfer tube.

6.2 Project Preparation and Planning

Technology Development Division Decontamination and Decommissioning Program (TD/D&D) was responsible for the planning of the project and the preparation of the project documents. The documents included a project-specific Health and Safety Plan, NEPA Document, and a Job Plan. The Job Plan contained an outline of the various tasks to be performed, who would perform them, and "Stop Work Points" to follow if there were any discoveries made during excavation. Cost and schedule of the project was also the responsibility of TD/D&D.

6.3 Decommissioning Activities

On-site D&D activities commenced on September 7, 1998. There was a pre-job meeting with all of the involved personnel. The meeting covered schedule, the Health and Safety Plan, the Job Plan, the Radiological Work Permit (RWP), and identified the responsible persons for the job.

6.3.1 Excavation and Restoration

Plant Facilities and Services Division was responsible for subcontracting the excavation equipment and operator. The PFS Construction Representative scheduled the subcontractor and performed

oversight duties during the project. The subcontractor handled the excavation duties and, once the tube was removed, backfilled the trench. The work area was machine-graded, and then grass seed was planted. There were four road/driveway crossings that were excavated during the removal of the tube. The trench was backfilled with compactable gravel to within three inches of the surface. Blacktop was then installed to complete the road restoration.

6.3.2 Removal of the Tube and Waste Packaging

Waste Management Operations was responsible for the removal of the tube, size reduction, waste packaging, and disposal of the low-level waste. They supplied supervision, trained employees, tools and equipment, waste containers, and disposal as required to complete the removal of the transfer tube. The tube was first uncovered from the sand bed, surveyed, and then, using a hydraulic crimper, the tube was flattened in an 8- to 10-in (20.3- to 25.4-cm) area at various intervals. The tube was then cut in the middle of the crimped area using a hydraulic cutter. The cut ends of the tube were taped over with duct tape and placed in a controlled area. The sections of tube were then further size reduced to fit into a proper waste container which will be sent off-site for disposal.

6.3.3 Radiation Safety

Environment, Safety and Health Division had responsibility for issuing the RWP and supplying trained personnel to provide health physics coverage during the excavation and tube removal. The RWP identified potential radiation hazards, and specified the level of Personal Protection Equipment (PPE) that was required. Environment, Safety and Health/Health Physics surveyed the trench during excavation; surveyed the tube before it was crimped and cut; and surveyed the workers, tools and equipment that were in the trench.

6.3.4 Demobilization

After all work was completed, all equipment and tools were surveyed for loose contamination by ESH/HP. None was found, and the equipment and tools were released. All tools and equipment were removed from the project area.

7.0 POST-DECOMMISSIONING RADIOLOGICAL SURVEY

7.1 Final Survey Objectives

The purpose of the final status survey was to demonstrate that radiological conditions at the site of the Building 200/205 Pneumatic Transfer Tube satisfied the unrestricted release guidelines of the ANL-E ESH Manual, and ANL-E Health Physics Procedure HPP-610 "Surface Contamination Surveys for Unrestricted Release of Equipment and Materials."

Based on the contaminants present at Building 200/205 Pneumatic Transfer Tube, the release criteria specified for the project were as follows:

Beta-Gamma Contamination

- 5,000 dpm (83 Bq)/100 cm^2, beta-gamma fixed and removable (total) contamination, averaged over 1 m^2;
- 15,000 dpm (250 Bq)/100 cm^2, maximum beta-gamma fixed and removable (total) contamination over 100 cm^2; and
- 1,000 dpm (17 Bq)/100 cm^2, removable beta-gamma contamination.

Alpha Contamination

- 100 dpm (1.67 Bq)/100 cm^2, alpha fixed and removable (total) contamination, averaged over 1 m^2;
- 300 dpm (5 Bq)/100 cm^2, maximum alpha fixed and removable (total) contamination over 100 cm^2, and
- 20 dpm (0.3 Bq)/100 cm^2, removable alpha contamination.

7.2 Survey Instrumentation

7.2.1 Instrument Selection

Instruments were chosen to assure that the Minimum Detectable Activity (MDA) for the selected instrument/technique was less than the release criteria.

7.2.2 Daily Instrument Function Test and Quality Assurance

Instruments that were used had records of calibration and were checked daily for proper operation.

7.3 Final Survey Results

The final survey of the trench found no contamination. The trench was free released for backfilling. During D&D, all sections of the underground tubing were removed and surveyed. No contamination was detected on the outside of the tubing; all contamination was contained within the tube. The tube was disposed of as low-level waste. There will be no further action required in the area of the transfer tube.

8.0 COST AND SCHEDULE

8.1 Building 200/205 Pneumatic Transfer Tube D&D Project Cost

The estimated cost of the project was $78,000, which included $13,000 in contingency. The actual cost of the completed project was $65,000.

8.2 Building 200/205 Pneumatic Transfer Tube D&D Project Schedule

The project began in July 1998 and was completed in September 1998, lasting a total of three months. Activities included sampling, planning and scheduling, document preparation, D&D activities, waste handling, and site restoration.

9.0 WASTE MANAGEMENT

9.1 Waste Types

There were two types of waste generated during the Building 200/205 Pneumatic Transfer Tube D&D Project: radiological waste and clean waste.

9.2 Waste Volume

9.2.1 Radiological Waste

The low-level radiological waste generated from this project consisted of the transfer tubing that was removed and PPE used during the D&D operations. The amount of waste generated was 120 ft^3 (4 m^3).

9.2.2 Clean Waste

There was approximately 1 ft^3 (0.028 m^3) of clean waste generated during the D&D of the Building 200/205 Pneumatic Transfer Tube. This waste was primarily plastic, gloves, and rags used in the removal of the tube. This material was sent to a land fill for disposal.

9.3 Waste Packaging

Waste packaging operations conformed with Department of Transportation (DOT) regulations and with the requirements of the designated disposal site. Standard waste containers were loaded with low-level radioactive waste and sealed by WMO for final disposition. These containers were used for packaging the low-level waste.

9.4 Recycled Material

Waste minimization is an important factor in all project planning at ANL-E. The control cable that was buried with the pneumatic tube was removed, surveyed for any loose contamination, free released, and then placed in a scrap metal bin for recycling. The wood planks that were used to mark the top of the pneumatic tube were also surveyed and free released. The planks were stacked in a storage area for reuse by ANL-E as needed.

10.0 HEALTH AND SAFETY

10.1 Industrial Health and Safety

It was (and continues to be) the policy of ANL-E and its subcontractors to execute all reasonable precautions in the performance of work during the Building 200/205 Pneumatic Transfer Tube D&D Project to protect the safety and health of employees, members of the general public, and the environment. Strict compliance with all applicable environmental, safety and health regulations, and requirements including reporting requirements of the DOE was essential. Safety took precedence over production goals for the duration of the project. It was ANL-E's objective to complete the project in a timely manner while maintaining the highest standards of safety and health for the project. The Building 200/205 Pneumatic Transfer Tube D&D Project Health and Safety Plan provided the guidance necessary to perform the work in a safe manner.

A pre-job hazard evaluation was performed to identify as many of the potential hazards expected to be present at the job site as possible. Some of the hazards identified included heavy equipment operation, lifting and rigging, noise, falling objects, eye hazards, radiation exposure, pinch points, confined space entry work, fire hazards, electrical shocks, and heat stress. A hazard communication program was implemented to keep employees informed and aware of the hazards present. Frequent inspections and job briefings by ANL-E Management were performed to ensure employee awareness and compliance with established safety regulations.

10.2 Radiation Protection

Personal Protection Equipment was utilized to limit worker exposures to potential loose and airborne contamination. Signs and barriers were used to keep unauthorized personnel from entering radiation and/or contamination areas as well as posting the entry requirements and radiological conditions inside the area. To prevent the spread of contamination all equipment, tools and personnel leaving the controlled area were monitored for radioactive contamination at the exit point.

Radiological Work Permits were utilized for the work. They specified the safety and protective equipment, radiological conditions in the area, type of personnel monitoring equipment and sampling requirements required for the work. Each individual working in the trench was required to read,

understand, and sign the specific RWP under which they were working. Radiation exposure was monitored with thermoluminescent dosimeters (TLDs).

Continuous air monitors (CAMs) were utilized near the work areas to sample and alarm if high airborne radioactivity existed. Respiratory protection was required to be worn when any individual was expected to be exposed to airborne levels of 10% derived airborne concentration (DAC) or higher.

11.0 FINAL FACILITY CONDITION

Building 200/205 Pneumatic Transfer Tube was removed in September 1998. The area was backfilled with dirt, graded, and seeded. No further work will be done as part of this project.

12.0 CONCLUSIONS, RECOMMENDATIONS, AND LESSONS LEARNED

12.1 General Problems Encountered

There was one minor problem involving ground water trapped in the sand bed of the trench that had to be addressed during the D&D project. After excavation, the water would drain out of the sand and partially fill the trench. At one point, water got into the cut end of the tube before it could be raised above the water. The water was discovered when it spilled out of the tube and onto the ground. A barricade was put around the area and the dirt removed. The area was sampled to verify that all of the contamination was removed. The affected area was approximately 1 yd^2 (0.836 m^2). The remaining water was drained from the tube and collected.

12.2 Management Issues

There was some concern prior to the start of the project about contaminates and contamination levels inside the tube. There was very little documented information available on the system, how long it had operated, or what types of materials may have been left in the system. During all phases of this project, the unexpected was planned for but, fortunately, never encountered.

12.3 Lessons Learned

12.3.1 Integrated Safety Management

The use of Integrated Safety Management practices saves time. The Pneumatic Transfer Tube D&D Project was planned and executed in a very short period of time. The amount of pre-job documentation was held to a minimum by using Integrated Safety Management practices. Key personnel from various divisions were involved in helping to plan the project. Safety concerns were incorporated into the work plan, and "Stop Work Points" were identified which could be used if any conditions changed from the original plan. This allowed the work to start quickly and finish ahead

of schedule. The field work had been scheduled to take three weeks; it was completed in two weeks with no reportable injuries.

12.3.2 Water in the Tube

Forward planning for water problems in the trench would have avoided soil clean-up. When water was first encountered in the trench, a plan should have been developed for collecting water that might get caught in the tube. If a plan had been in place, possibly a container would have been available to catch the contaminated water, thus avoiding a spill and the cleanup of contaminated soil. The spill could have been avoided with better preparation.

13. ACKNOWLEDGEMENTS

This project was the joint effort of many groups at ANL-E working side-by-side with a subcontractor to finish the work. There were many individuals within these groups who contributed to the successful completion of the Building 200/205 Pneumatic Transfer Tube D&D Project. All of these involved, whether listed or not, should congratulate themselves on a job well done.

- Building Managers from Buildings 200, 205, and 211: Handled the notices of road closures for their buildings and re-routed traffic to accommodate the project schedule.

- Chemical Technology Division Analytical Chemistry Laboratory (CMT/ACL): Processed samples quickly and provided quick turn-a-round on the results, helping the project to stay ahead of schedule.

- Waste Management Operations: Provided the trained employees and required equipment for the actual removal and packaging of the contaminated pneumatic transfer tube. Also developed the specific job plan for the segmentation and removal of the tube.

- Environment, Safety and Health Fire Safety/Construction Safety: Provided ESH compliance and OSHA-safety oversight for the project. Also contributed specific safety requirements for excavation activities.

- Environment, Safety and Health/Health Physics: Wrote the RWP and assigned trained employees to provide continuous HP coverage during excavation activities and tube removal.

- Northwest Contractors, Elgin, Illinois: Subcontractor to this project, provided the equipment and qualified personnel to perform the excavation and restoration activities.

- Plant Facilities and Services Facilities Engineering and Construction Group: Provided the subcontractor and managed the subcontractor personnel during the project. Also performed the field oversight function during the excavation and restoration activities.

- Plant Facilities and Services Site Services Group: Provided road signs and barricades at various places during the field activities Responsible for clearing the work area through the wooded area and for seeding the disturbed areas at the end of the project. Also removed the wood planks from the project and stored them for future use.

- Technology Development Division D&D Group: Lead organization for the project, responsible for the planning, scheduling, and budgeting of all project activities. Worked with various groups on-site to bring the project together and manage the project.

- All Others: There were many individuals who provided input to this project, from making phone calls to reviewing the various plans and documents. They provided answers to many questions and were instrumental in the successful completion of this project.

14.0 ACRONYM AND ABBREVIATION LISTING

α	alpha
ALARA	As Low As Reasonable Achievable
ANL-E	Argonne National Laboratory - East (located in Argonne, Illinois USA)
β	beta
Bq	Becquerels
cm	centimeters
D&D	Decontamination and Decommissioning; Decontamination and Dismantlement
dpm	disintegrations per minute
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ESH	ANL-E Environment, Safety, and Health Division
ft	foot (feet)
γ	gamma
HP	ESH Health Physics Group
hr	hour
IH	ESH Industrial Hygiene Group
in	inch
km	kilometer
m	meter or milli
MDA	Minimum Detectable Activity
min	minute
μ	micro
NEPA	National Environmental Policy Act
OSHA	Occupational Safety and Health Administration
PFS	ANL-E Plant Facilities and Services Division
PPE	Personal Protection Equipment

QA	Quality Assurance
RWP	Radiological Work Permit
TD	ANL-E Technology Development Division
TLD	Thermoluminescent Dosimeter
WMO	ANL-E Waste Management Operations
yd	yard