ANL/ESD/TM-105

Contamination Source Review for Building E3613, Edgewood Area, Aberdeen Proving Ground, Maryland

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Summary

This report was prepared by Argonne National Laboratory (ANL) to document the results of a contamination source review of Building E3613 at the Aberdeen Proving Ground (APG) in Maryland. The report may be used to assist the U.S. Army in planning for the future use or disposition of this building. The review included a historical records search, physical inspection, photographic documentation, geophysical investigation, and collection of air samples. The field investigations were performed by ANL during 1994 and 1995.

Building E3613 (APG designation) is located in the Canal Creek Area of APG. The building was constructed in 1954 for use as a change house, office, and storage building in support of the white phosphorus smoke program. The building has not been used since 1988. During an inspection in 1988, asbestos was listed as the only potential contaminant.

The physical inspection and photographic documentation of Building E3613 were completed in November 1994. At the time of the inspection, Building E3613 was inactive and in disrepair. The single-story, rectangular structure contains five rooms and measures 16 ft 2 in. by 32 ft. The building is wood frame construction with a gabled roof. The exterior walls and roof are constructed of wood covered with asphalt sheeting. The building rests on a concrete foundation. The interior walls are 6-in.-thick wood, and the ceiling is assumed to be white drywall nailed to a wooden frame. Overhead steam pipes supported by vertical pipes traverse the area. Two concrete footings for guy wires that support the overhead steam pipes are located north and west of the building. Four additional vertical pipes exit the ground east of the building.

In December 1994, ANL staff conducted geophysical surveys in the immediate vicinity of Building E3613 by using several nonintrusive methods. Survey results suggest the presence of some underground objects near Building E3613, but they do not provide conclusive evidence of the source of geophysical anomalies observed during the survey.

Air quality samples were collected upwind, downwind, and inside Building E3613 in November 1994. Analytical results showed no distinguishable difference in the hydrocarbon and chlorinated solvent levels between the two background samples and the sample collected inside Building E3613. These results indicate that Building E3613 is not a source of volatile organic compound contamination.

No information was available regarding underground storage tanks associated with Building E3613.

On the basis of information collected and reviewed for Building E3613, it is the authors' judgment that no significant air contamination is associated with this building. The geophysical surveys indicate some anomalies in the vicinity of Building E3613 that warrant further investigation and evaluation. Suspect asbestos-containing insulation should be tested and properly managed.

1 Introduction

The U.S. Army Aberdeen Proving Ground (APG) commissioned Argonne National Laboratory (ANL) to conduct a contamination source review to identify and define areas of toxic or hazardous contaminants and to assess the physical condition and accessibility of APG buildings (Brubaker et al. 1994). The information obtained from the review may be used to assist the U.S. Army in planning for the future use or disposition of the buildings. The contamination source review consisted of the following tasks: historical records search, physical inspection, photographic documentation, geophysical investigation, and collection of air samples. This report provides the results of the contamination source review for Building E3613.

Located on Chesapeake Bay in Harford and Baltimore counties, Maryland, APG occupies approximately 30,000 acres. The facility is divided into the Aberdeen and Edgewood areas (Figure 1). The primary mission at APG has been the testing and evaluation of U.S. Army warfare materials. Since its beginning in 1917, the Edgewood Area of APG has been the principal location for chemical warfare agent research, development, and testing in the United States. APG was also used for producing chemical warfare agents during both world wars and has been a center for the storage of chemical warfare material (Nemeth 1989).

Many of the APG facilities constructed between 1917 and the 1960s are no longer used because of obsolescence and their poor state of repair. Because many of these buildings were used for research, development, testing, and/or pilot-scale production of chemical warfare agents and other military substances (such as incendiary materials or munitions containing these materials), the potential exists for portions of the buildings to be contaminated with these substances, their degradation products, and other laboratory or industrial chemicals. These buildings, and associated structures or appurtenances (e.g., underground or aboveground storage tanks, pipes, sumps), may contribute to environmental concerns at APG.

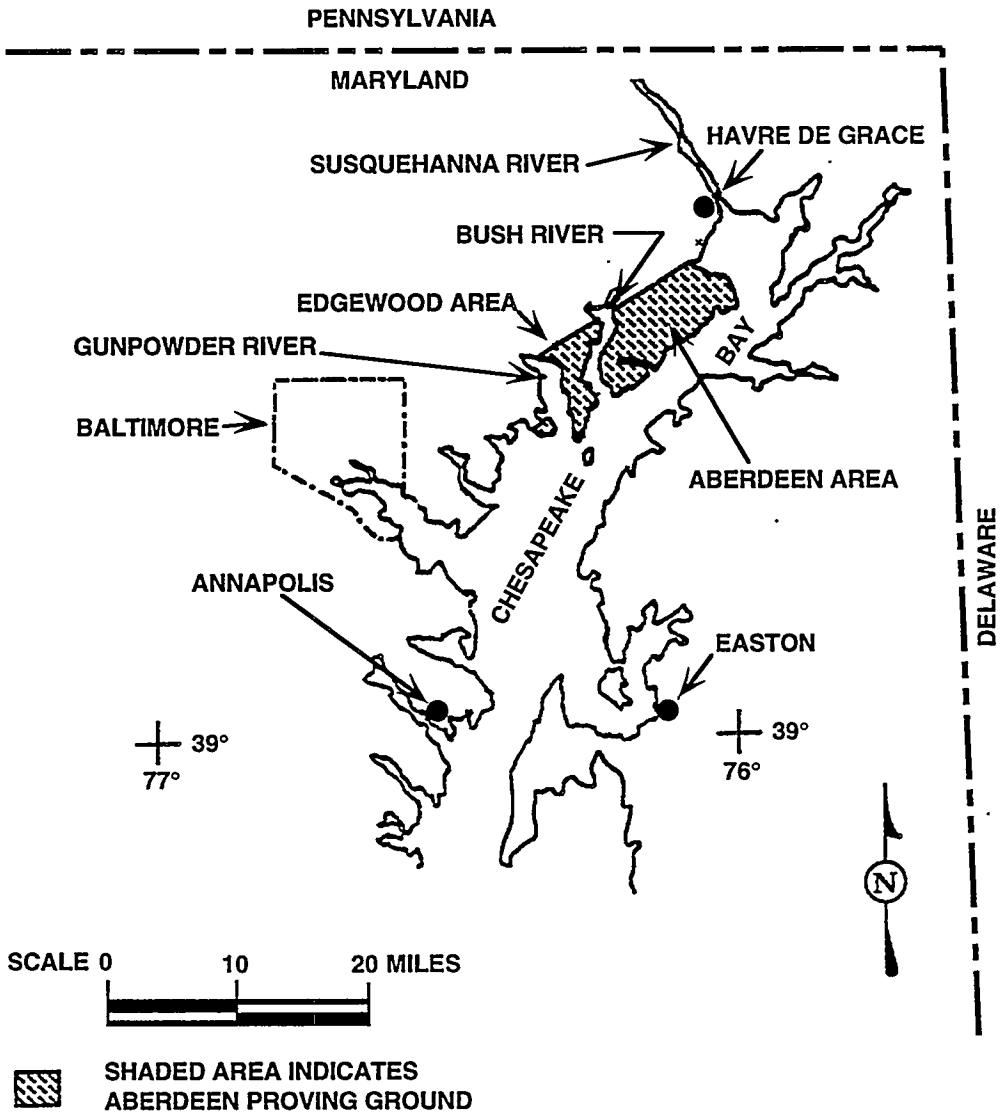


FIGURE 1 Map of Aberdeen Proving Ground Location

2 Methodology

Before the detailed building inspection, ANL personnel made a preliminary site visit to locate the building and obtain building records from APG, identify potential issues to be addressed in the health and safety plan, resolve any access restriction issues, and identify required support services.

Photographs were taken of the building's exterior and interior surfaces during the inspection in November 1994. The photographs followed a set sequence whenever possible. The exterior was photographed starting on the north side and continuing clockwise around the building; walls were photographed starting in the north or northwest corner of each room and continuing clockwise until reaching the starting point. The ceiling and floor of each room were also photographed.

The area around Building E3613 was examined during December 1994 using several nonintrusive geophysical survey methods, including total field magnetics, electrical conductivity (EM-31), time-domain electrical induction (EMF or EM-61), and ground-penetrating radar (GPR) techniques.

ANL staff collected air quality samples upwind, downwind, and inside of Building E3613 during November 1994. Organic compounds, from 24-liter samples, trapped in a sorbent polymer cartridge were thermally desorbed and analyzed by using a gas chromatograph equipped with a mass spectrometer. Compound identification was based on mass spectral interpretation and a computer search of the 140,000 compounds in the Wiley spectral library.

Detailed descriptions of the methodologies used for the geophysical investigation and air quality monitoring are provided in the appendices to this report.

3 Historical Records Search

Building E3613 (APG designation) is located in the Canal Creek Area of APG. The building was constructed in 1954 for use as a change house, office, and storage building in support of the white phosphorus smoke program. The building has not been used since 1988. During an inspection in 1988, asbestos was listed as the only potential contaminant (EAI Corporation 1989).

4 Building Description

This section presents a physical description of Building E3613 as it appeared at the time of ANL's November 1994 inspection. The physical description includes an account of the condition of the exterior and interior walls, roof, ceiling, and floor of the building.

4.1 Site Description

4.1.1 Location

Building E3613 is located approximately 420 ft north of Beach Point Road and 1,700 ft east of Ricketts Point Road in the Canal Creek Area of APG (Figure 2).

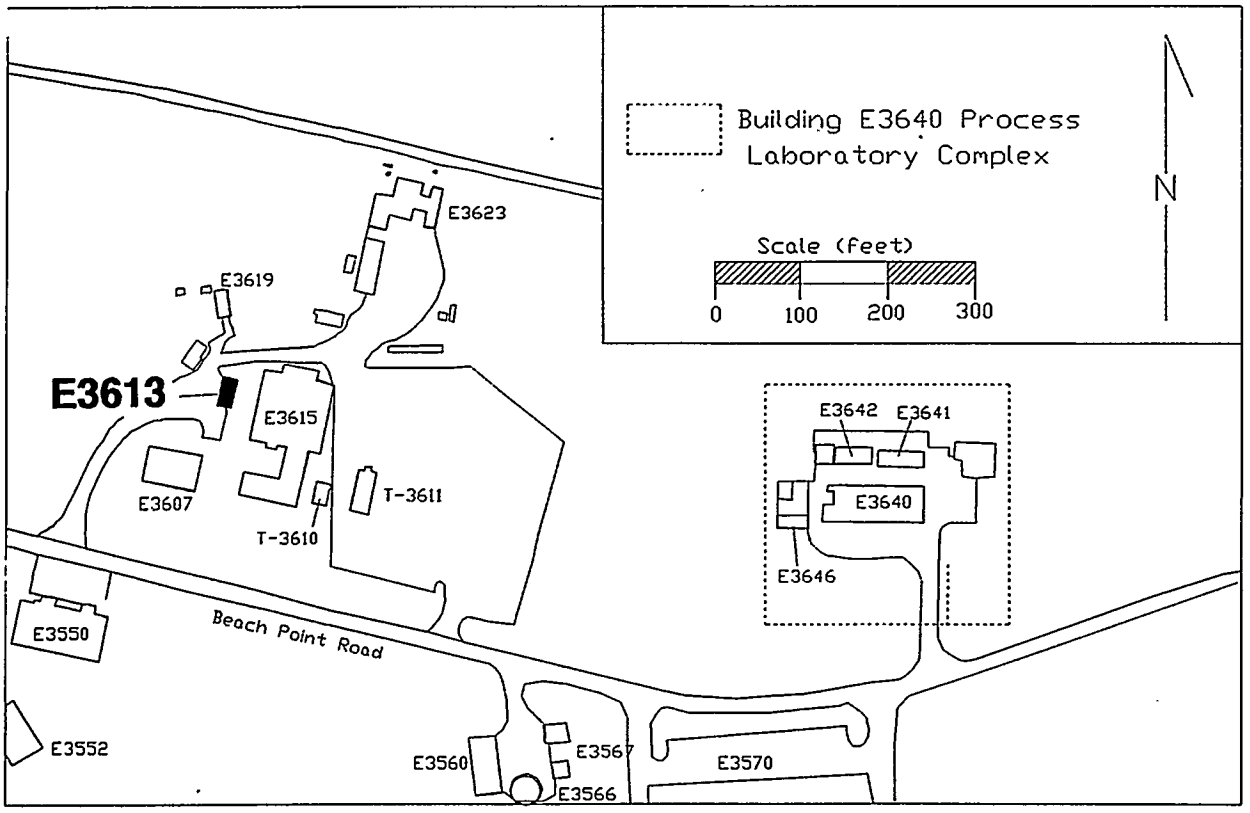


FIGURE 2 Map of Building E3613 Location

4.1.2 Proximity to Other Buildings

The abandoned foundation of Building E3619 is located northwest of Building E3613. Buildings E3615 and E3607 are located to the east and southwest of Building E3613, respectively (Figure 2).

4.1.3 Building Structure

Building E3613 is a five-room, single-story, rectangular structure. The exterior walls are asphalt sheeting constructed over a 2-in. by 4-in. wooden frame. The floor is a poured reinforced-concrete slab. Building E3613 has a gabled roof with asphalt sheeting over a wood frame. The interior walls are constructed of drywall over a wood frame made of 2-in. by 4-in. lumber. The exterior walls extend from the floor slab to the roof line. The ceiling is constructed of drywall over a wood frame. Figure 3 shows the floor plan of the building, developed from the ANL survey and historical documentation (EAI Corporation 1989). Figure 4 provides photographs of the building exterior.

4.1.4 Exterior Dimensions

The exterior horizontal dimensions for Building E3613 are 16 ft 2 in. by 32 ft. The building measures 11 ft high at the center of the north wall (Figure 4).

4.1.5 Topography

The surface surrounding Building E3613 is flat and dry. Concrete slabs measuring 5 ft by 3 ft are located at the west doorways. Two concrete slabs are located at the northernmost doorway: one directly in front and one placed diagonally to the north side. A single concrete slab is located directly in front of the southernmost doorway. One additional concrete slab is at the northeast corner of Building E3613. The area surrounding Building E3613 consists of lawn (cut grass) and trees.

4.1.6 Vegetation in the Immediate Vicinity

The vegetation surrounding Building E3613 consists primarily of lawn (cut grass) and trees. Three of these trees are located near the southeast corner of Building E3613.

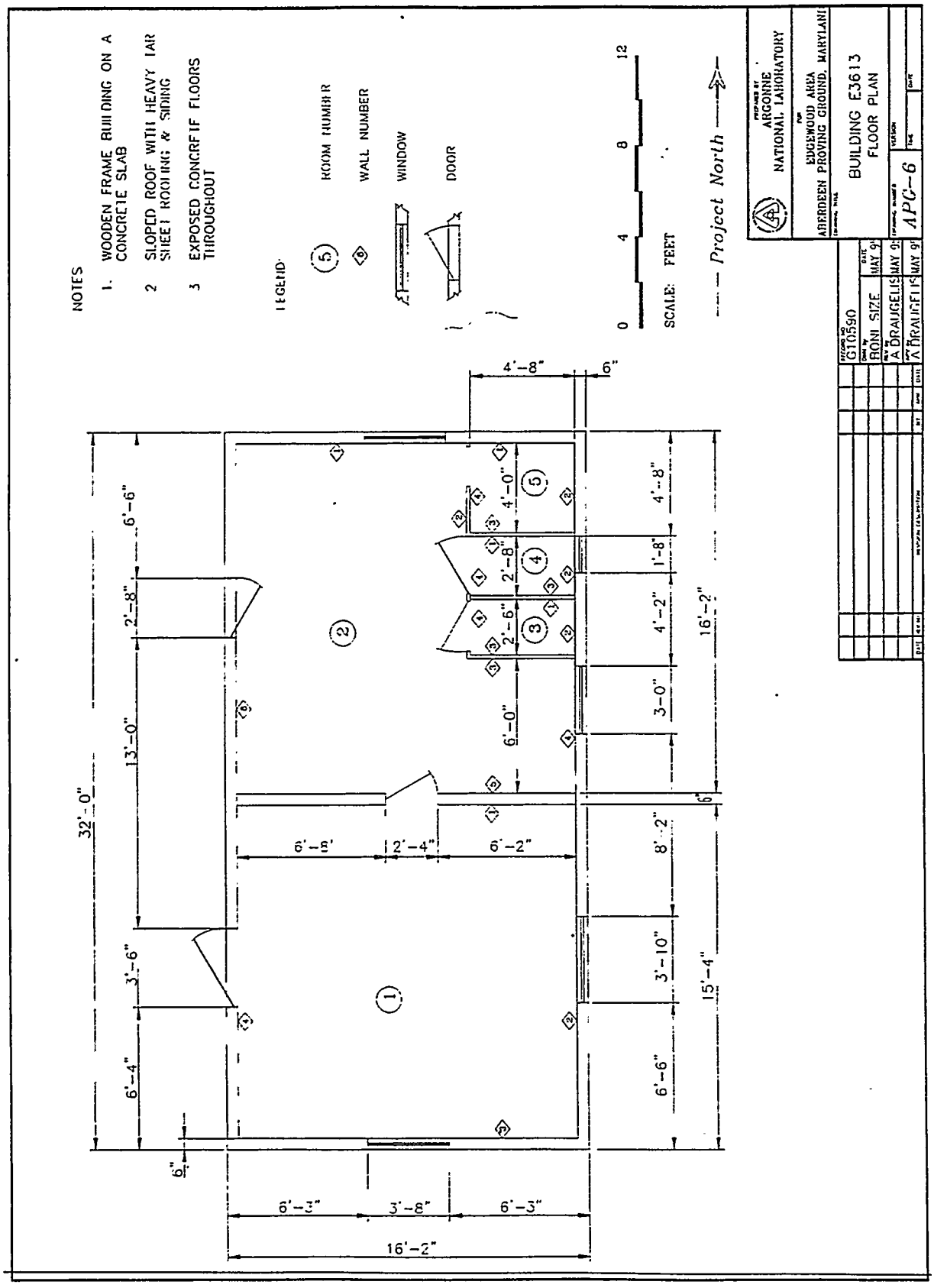


FIGURE 3 Building E3613 Floor Plan

A	North Elevation
C	South Elevation

East Elevation	B
West Elevation	D

FIGURE 4 Photographs of Building E3613 Exterior

4.1.7 External Aboveground Structures or Equipment

Two cables are anchored to the concrete slabs north of the northernmost doorway and at the northeast corner of Building E3613.

4.1.8 Connections with Adjacent Buildings

None.

4.1.9 Underground Structures

None.

4.1.10 Surface Drainage System

None.

4.1.11 Utility Access Points

External cables and piping associated with Building E3613 suggest that operating electrical lines, plumbing, and steam heat were present; however, no specific access points were identified because of the nonintrusive nature of the survey.

4.1.12 Exterior Piping

Two pipes are located on the north exterior elevation. A natural gas pipe measuring 1 in. in diameter extends vertically from the ground 6 in. from the north exterior wall to a height of 7 ft and enters the building 6 ft from the northern edge of the wall. An approximate 2-in.-diameter electric utility pipe runs below the roof line from the top of the gable to approximately 7 ft off the ground and 2 ft off the western edge of the building.

Five pipes are located on the east exterior elevation. One 1-in.-diameter pipe protrudes from the ground 6 in. from the east wall and 6 ft from the southern edge, and enters the building a few feet below the eaves. A 6-in.-diameter cast iron vent pipe runs vertically from the ground up through the roof 10 ft south of the northern edge of the east wall; the vent pipe extends 6 in. above the eaves. An 8-in.-diameter steam pipe was connected to the building at one time; the

pipe appears to enter the building at the roof line on the southern edge of the east exterior wall. This steam pipe, now broken, once ran along the entire length of the roof. Two cast iron pipes, 6 in. and 12 in. in diameter, extend 12 in. above the ground 1 ft north of the center of the east exterior elevation.

4.1.13 Nearby Roads and Sidewalks

Beach Point Road runs east to west approximately 420 ft to the south of Building E3613.

4.2 North Exterior Elevation

4.2.1 Dimensions

The north exterior elevation (Figure 4) measures 16 ft 2 in. long and 11 ft high.

4.2.2 Construction Materials

The north elevation is constructed of asphalt sheeting over a 2-in. by 4-in. wood frame.

4.2.3 Doors and Windows

One 44-in.-wide by 42-in.-high window is located on the north wall. The window is constructed of a wood frame with multiple panes of glass.

4.2.4 Piping

Two pipes are located on the north exterior elevation. A 1-in.-diameter natural gas pipe extends vertically from the ground 6 in. from the wall to a height of 7 ft and enters the building 6 ft from the northern edge of the north wall. A 2-in-diameter electric utility pipe runs below the roof line from the top of the gable to a location 7 ft off the ground and 2 ft off the western edge of the north wall.

4.2.5 Utility Connections

External cables and piping associated with Building E3613 suggest that operating electrical lines, plumbing, and steam heat were present; however, no specific access points were identified because of the nonintrusive nature of the survey.

4.2.6 External Equipment or Structures

None.

4.2.7 Vegetation

The area north of Building E3613 is covered by cut grass (lawn) and trees.

4.2.8 Overall Condition

Because of a lack of maintenance, the north exterior wall shows signs of deterioration and weathering. Oxidized metals and cracked, chipped, and peeling paint were observed.

4.3 East Exterior Elevation

4.3.1 Dimensions

The east exterior elevation (Figure 4) measures 32 ft long and 8 ft high.

4.3.2 Construction Materials

The east exterior wall is constructed of asphalt sheeting over a 2-in. by 4-in. wood frame.

4.3.3 Doors and Windows

Three windows are located on the east elevation: one multiple-pane window measures 46 in. wide by 42 in. high, a second multiple-pane window measures 36 in. wide by 30 in. high,

and one single-pane window measures 20 in. wide by 12 in. high. The windows are constructed of wood framework.

4.3.4 Piping

Five pipes are located on the east exterior elevation. One 1-in.-diameter pipe protrudes from the ground 6 in. from the east wall and 6 ft from the southern edge, and enters the building a few feet below the eaves. A 6-in.-diameter cast iron vent pipe runs vertically from the ground up through the roof 10 ft south of the northern edge of the east wall; the vent pipe extends 6 in. above the eaves. An 8-in.-diameter steam pipe was connected to the building at one time; the pipe appears to enter the building at the roof line on the southern edge of the east exterior wall. This steam pipe, now broken, once ran along the entire length of the roof. Two cast iron pipes, 6 in. and 12 in. in diameter, extend 12 in. above the ground 1 ft north of the center of the east exterior elevation.

4.3.5 Utility Connections

None.

4.3.6 External Equipment or Structures

None.

4.3.7 Vegetation

The area east of Building E3613 is covered by cut grass (lawn) and trees. Three trees are located near the southeast corner of the building.

4.3.8 Overall Condition

Because of a lack of maintenance, the east exterior wall shows signs of deterioration and weathering. Oxidized metals and cracked, chipped, and peeling paint were observed.

4.4 South Exterior Elevation

4.4.1 Dimensions

The south exterior elevation (Figure 4) measures 16 ft 2 in. long and 11 ft high.

4.4.2 Construction Materials

The south exterior wall is constructed of asphalt sheeting over a 2-in. by 4-in. wood frame.

4.4.3 Doors and Windows

One 44-in.-wide by 42-in.-high window is located on the south elevation. The window is constructed of a wood framework with multiple panes of glass.

4.4.4 Piping

None.

4.4.5 Utility Connections

None.

4.4.6 External Equipment or Structures

None.

4.4.7 Vegetation

The area to the south of Building E3613 is covered by cut grass (lawn) and trees. Three trees are located near the southeast corner of the building.

4.4.8 Overall Condition

Because of a lack of maintenance, the south exterior elevation shows signs of deterioration and weathering. Oxidized metals and cracked, chipped, and peeling paint were observed.

4.5 West Exterior Elevation

4.5.1 Dimensions

The west exterior elevation of Building E3613 (Figure 4) measures 32 ft long and 8 ft high.

4.5.2 Construction Materials

The west exterior wall is constructed of asphalt sheeting over a 2-in. by 4-in. wood frame.

4.5.3 Doors and Windows

There are two doors on the west elevation: one measures 42 in. wide by 90 in. high, and the other measures 32 in. wide by 90 in. high.

4.5.4 Piping

None.

4.5.5 Utility Connections

External cables and piping associated with Building E3613 suggest that operating electrical lines, plumbing, and steam heat were present; however, no specific access points were identified because of the nonintrusive nature of the survey.

4.5.6 External Equipment or Structures

None.

4.5.7 Vegetation

The area to the west of Building E3613 is covered by cut grass (lawn) and trees.

4.5.8 Overall Condition

Because of a lack of maintenance, the west exterior elevation shows signs of deterioration and weathering. Oxidized metals and cracked, chipped, and peeling paint were observed.

4.6 Roof

4.6.1 Type and Dimensions

Building E3613 has a gable wood-frame roof covered with asphalt sheeting (Figure 4); the roof measures 16 ft 2 in. by 32 ft.

4.6.2 Height

The height of the roof at the eaves is 8 ft; the height at the peak of the gable is 12 ft.

4.6.3 Surface Materials

The roof is covered with asphalt sheeting.

4.6.4 Support System

The roof is supported by a structural wood frame.

4.6.5 Condition

No leaks were observed at the time of ANL's investigation.

4.6.6 Equipment Located on Roof

None.

4.6.7 Chimneys, Roof Vents, or Vent Stacks

None.

4.6.8 Piping

A 6-in.-diameter cast iron vent pipe runs vertically from the ground up through the roof 10 ft south of the northern edge of the east wall. The vent pipe extends 6 in. above the eaves. A steam pipe measuring 8 in. in diameter was connected to the building at one time. The steam pipe enters the building at the roof line on the southern edge of the east exterior elevation. This steam pipe, now broken, once ran along the entire length of the roof.

4.7 Interior Floor Plan

4.7.1 Room Numbers and Dimensions

Building E3613 is a single-story, rectangular structure containing five rooms. Its interior dimensions are 31 ft long by 15 ft 2 in. wide. Figure 3 shows the floor plan of the building, developed from the ANL survey and historical documentation (EAI Corporation 1989).

4.7.2 Walls

The interior walls of Building E3613 are constructed of drywall over 2-in. by 4-in. wood framing.

4.7.3 Floor

The reinforced concrete floors throughout Building E3613 appear to be in fair condition. There is no evidence to suggest that the floor was modified. No major cracks were identified during the 1994 ANL investigation; however, areas of pocking were observed.

4.7.4 Floor Penetrations

One drain is associated with the shower in room 5. Piping for the urinal and toilet in rooms 3 and 4, respectively, penetrate the floor of Building E3613.

4.7.5 Interior Partitions

The interior walls separating the rooms in Building E3613 are constructed of 6-in.-thick wood (Figure 5).

4.7.6 Equipment or Supplies

Building E3613 contained miscellaneous office equipment and supplies at the time of the investigation. These items included boxes, shelving, desks, plywood, sinks, an electronic control panel box, a storage tank, a table, a fire extinguisher, a urinal, a shower head, a shower curtain, a wood pallet, and a toilet.

4.8 Room 1

4.8.1 Walls

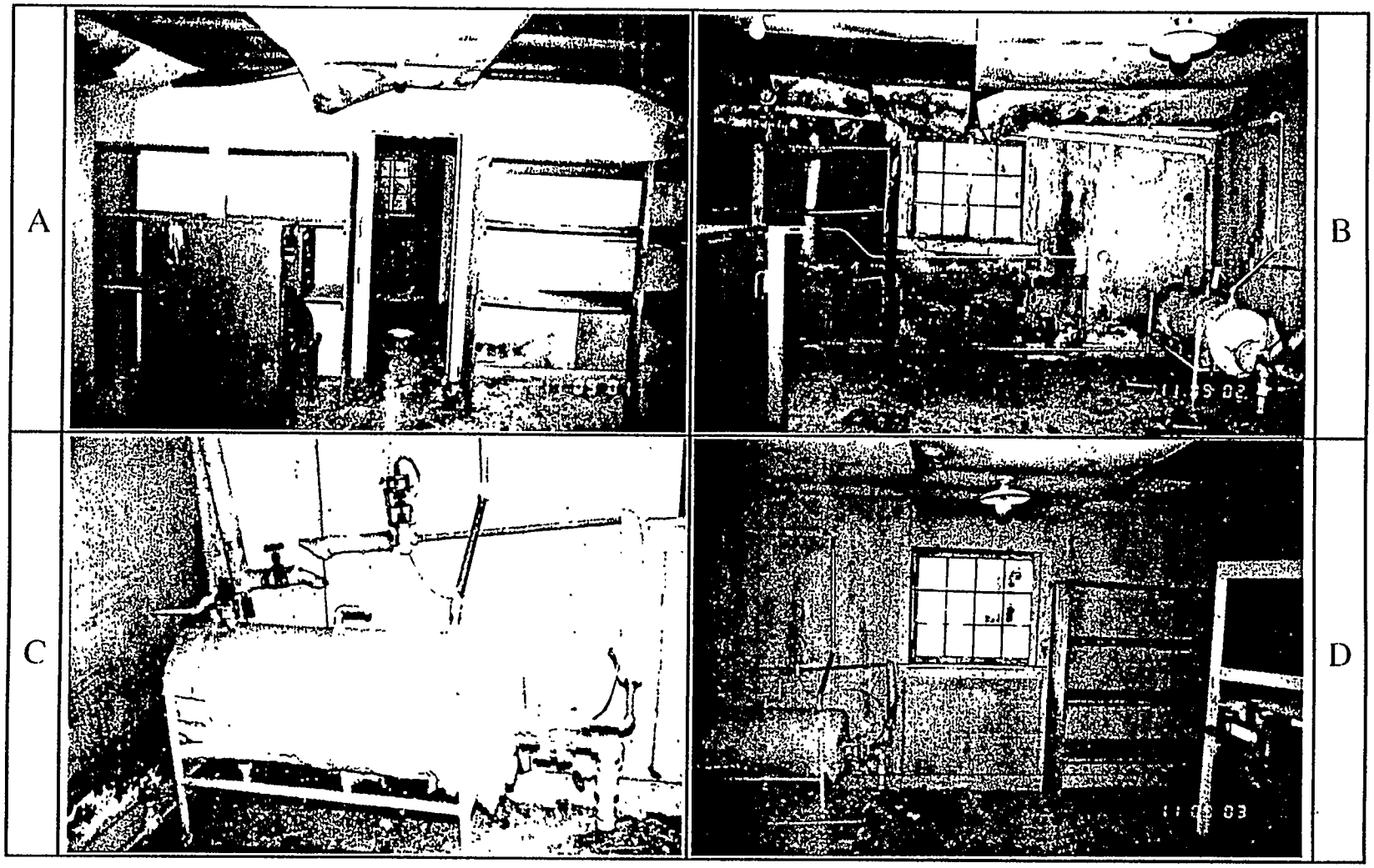
The walls are constructed of drywall over 2-in. by 4-in. wood framing (Figure 5).

4.8.2 Finish Materials

The interior walls of room 1 are painted white (Figure 6).

4.8.3 Piping

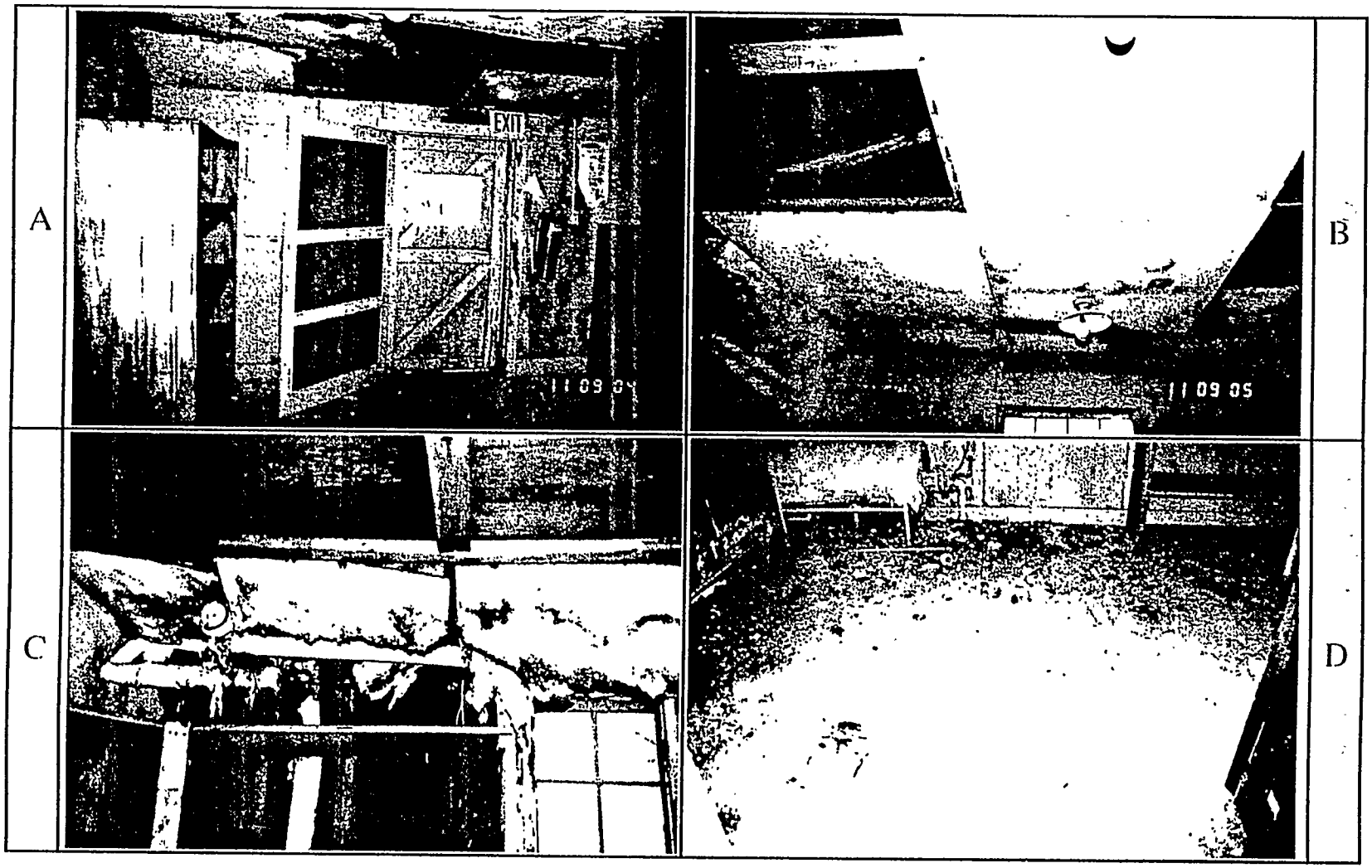
Two pipes measuring 2 in. in diameter and covered with suspected asbestos-containing insulating materials run vertically from a storage tank to the ceiling on wall 3. The pipes bend 90° and continue horizontally along the entire length of the ceiling of wall 2. The piping appears to



A	Walls 4, 1
C	Walls 2, 3

Walls 2, 3	B
Wall 3	D

FIGURE 5 Photographs of Room 1 — Walls



A	Walls 3, 4
C	Ceiling

Ceiling	B
Floor	D

FIGURE 6 Photographs of Room 1 — Walls, Ceiling, and Floor

again bend 90° and continue halfway down wall 2. A 1-in.-diameter electrical conduit runs vertically to the ceiling from an electrical switch located 2 ft north of the doorway and 5 ft above the floor on wall 4 (Figures 5 and 6).

4.8.4 Equipment

Room 1 contains an approximately 400-gal storage tank, an electronic control panel box, a fire extinguisher, and shelving.

4.8.5 Doors and Windows

Room 1 of Building E3613 has two wood-frame windows containing multiple panes of glass: one measures 46 in. wide by 42 in. high and the other measures 44 in. wide by 42 in. high. Room 1 contains two doors: one, measuring 42 in. wide by 90 in. high, opens to the exterior from the west wall, and the other, 28 in. wide by 90 in. high, opens into room 2 from the north wall.

4.8.6 Ceiling and Floor

The ceiling of room 1 is assumed to be white drywall nailed to a wooden framework (Figure 6). The floor in room 1 is assumed to be a poured, reinforced-concrete slab (Figure 6).

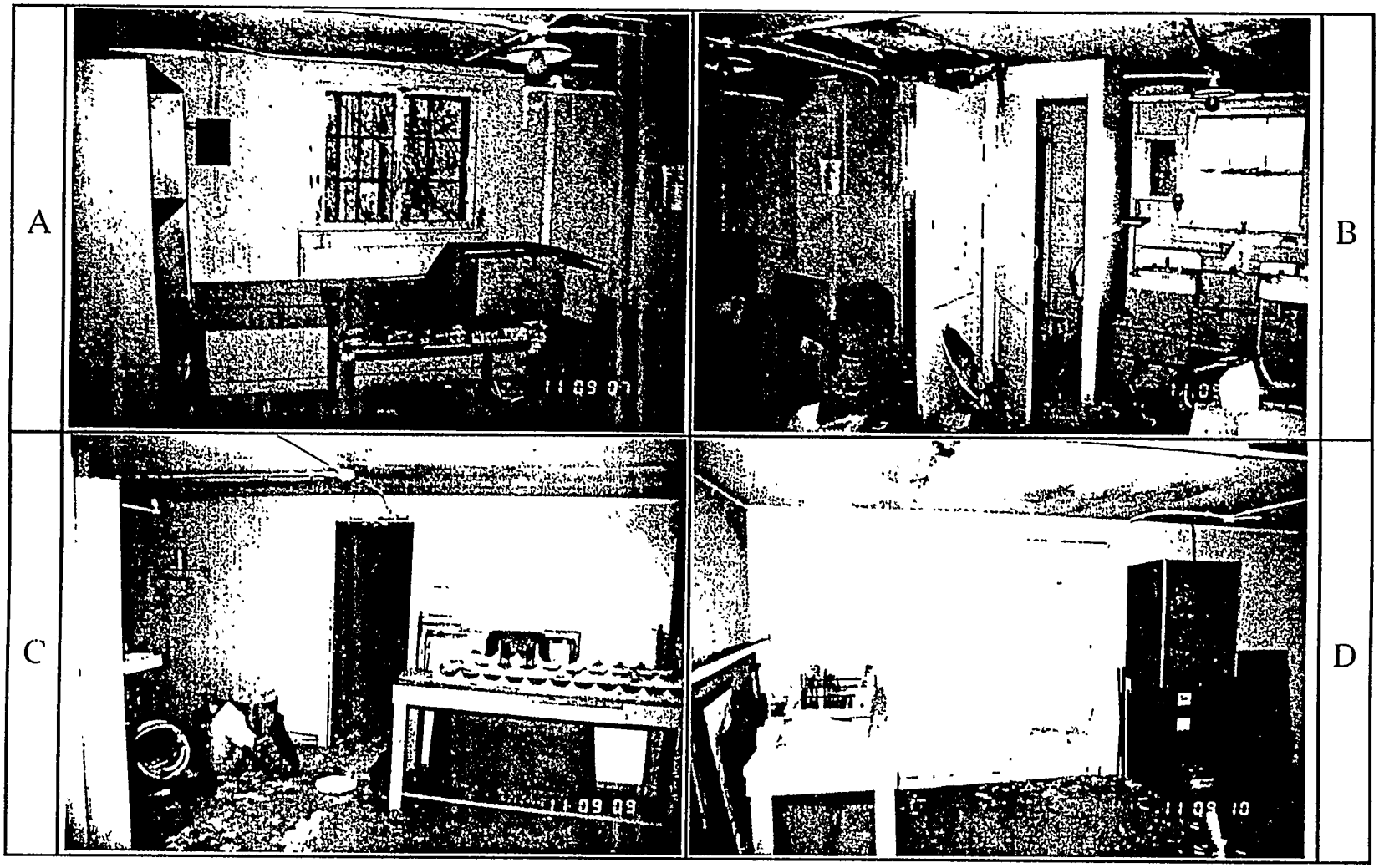
4.9 Room 2

4.9.1 Walls

The walls in room 2 are constructed of drywall over 2-in. by 4-in. wood framing (Figure 7).

4.9.2 Finish Materials

The interior walls are painted white.



A	Walls 1, 2
C	Walls 2, 4, 5

Walls 1, 2, 3, 4	B
Walls 6, 1	D

FIGURE 7 Photographs of Room 2 — Walls

4.9.3 Piping

Four pieces of electrical conduit measuring 1 in. in diameter originate in a fuse box 2 ft west of the window and 6 ft above the floor on wall 1. A piece of 1-in.-diameter electrical conduit extends upward to the ceiling from an electrical switch located 6 in. from the door to room 5 and 5 ft from the floor on wall 2. Four 2-in.-diameter utility pipes extend horizontally along the length of wall 4: three are beneath the two sinks and one is located 6 in. below the ceiling. A piece of electrical conduit measuring 1 in. in diameter runs vertically to the ceiling from an electrical switch located 6 in. north of the doorway and 5 ft above the floor on wall 6 (Figure 7).

4.9.4 Equipment

Room 2 contains cardboard boxes, shelving, plywood, two desks, two sinks, and a table.

4.9.5 Doors and Windows

Room 2 has four doors. Two 28-in.-wide by 90-in.-high doors connect rooms 2 and 3 on wall 2, and rooms 1 and 2 on wall 5. Two 32-in.-wide by 90-in.-high doors connect rooms 2 and 4 on wall 2 and room 2 with the west exterior of the building on wall 6. A doorway on wall 2 connects rooms 2 and 5. Room 2 contains two wood-frame windows with multiple panes of glass: one window measures 44 in. wide by 42 in. high, and the other measures 36 in. wide by 30 in. high (Figures 3 and 8).

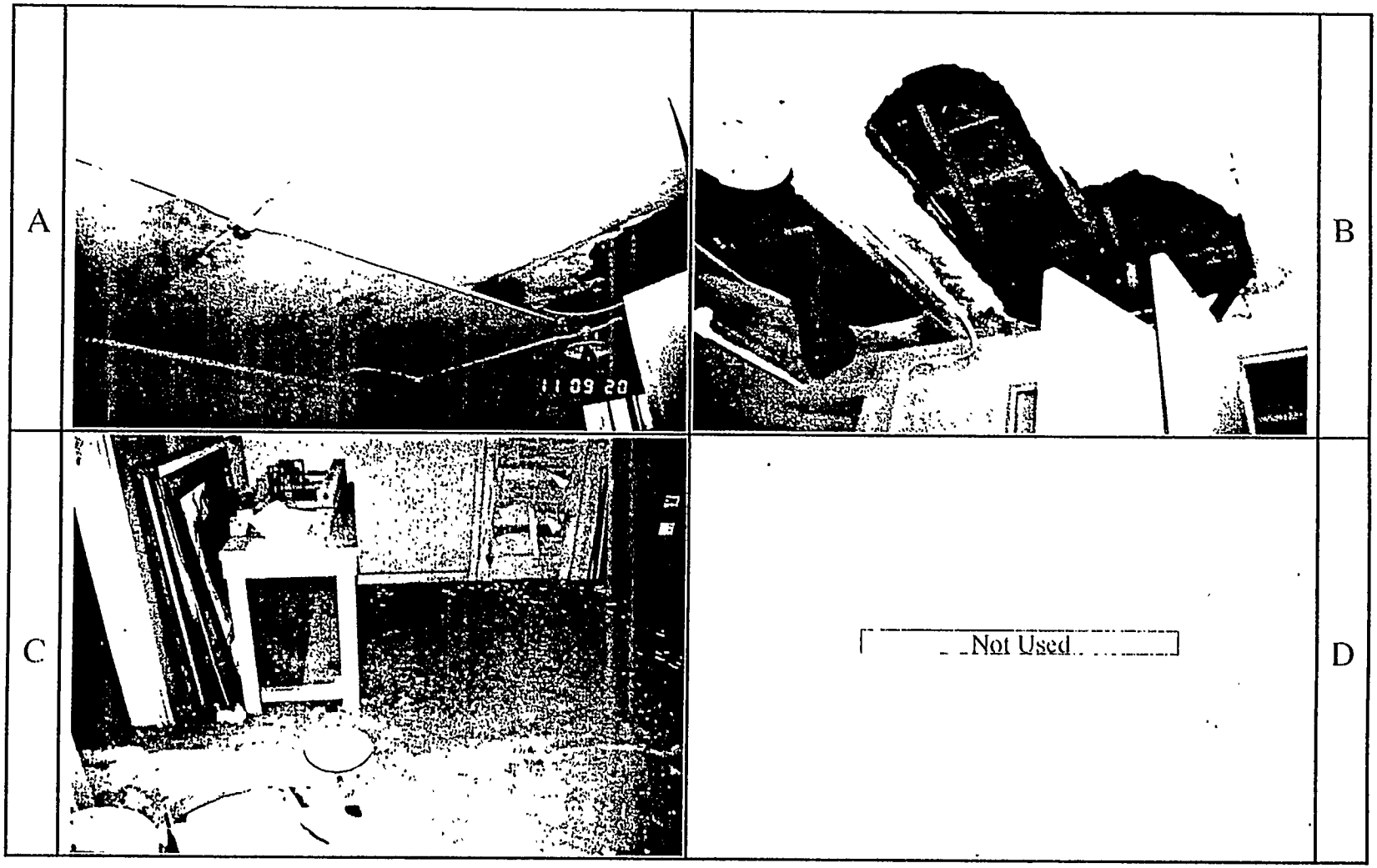
4.9.6 Ceiling and Floor

The ceiling in room 2 is white drywall nailed to a wooden framework (Figure 8). The floor in room 2 is a poured, reinforced-concrete slab.

4.10 Room 3

4.10.1 Walls

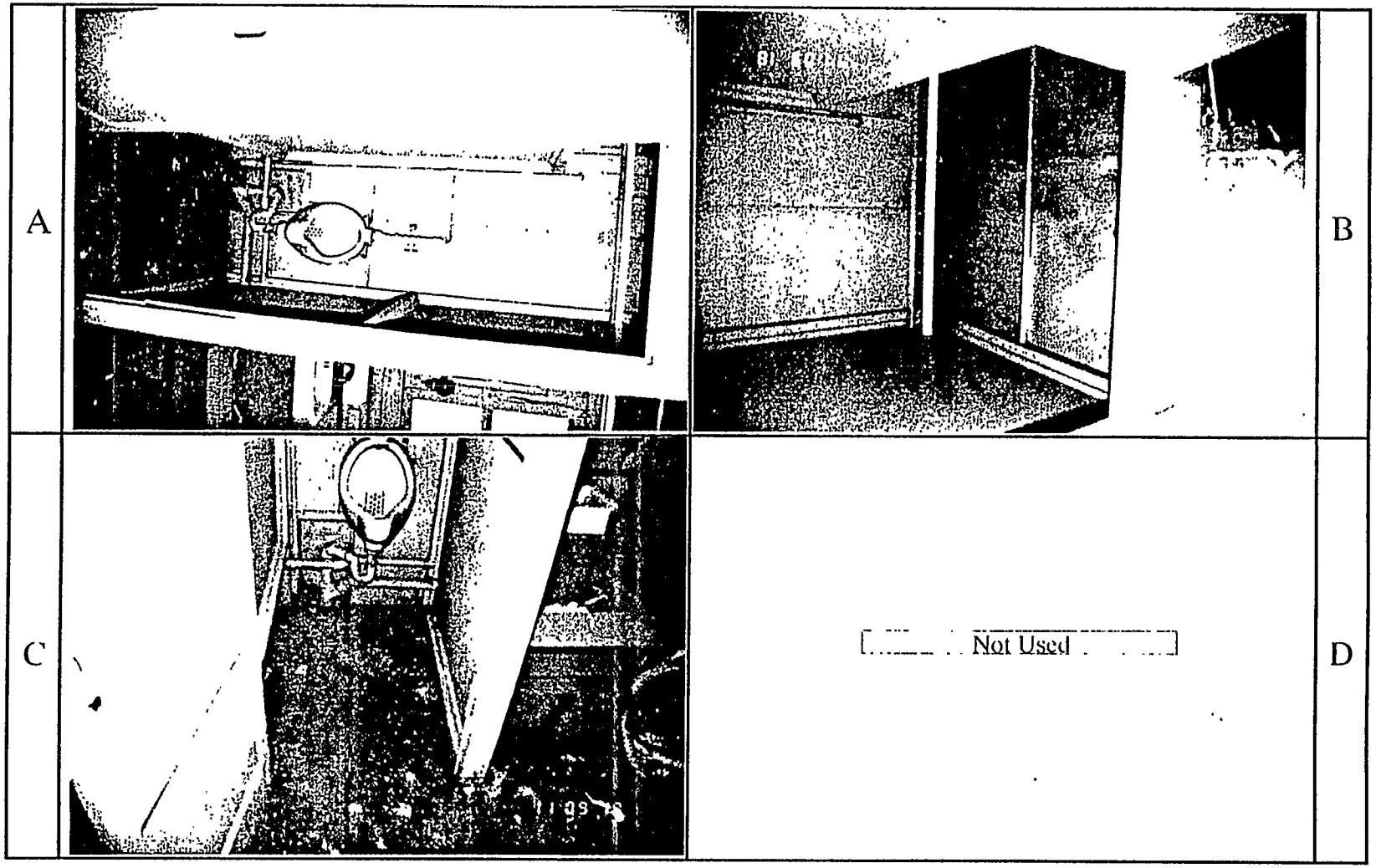
The walls in room 3 are constructed of drywall over a 2-in. by 4-in. wood frame (Figure 9).



A	Ceiling
C	Floor

Ceiling	B
Not Used	D

FIGURE 8 Photographs of Room 2 — Ceiling and Floor



A	Walls 1, 2, 3, 4
C	Floor

Ceiling	B
Not Used	D

FIGURE 9 Photographs of Room 3

4.10.2 Finish Materials

The interior walls are painted white.

4.10.3 Piping

Two utility pipes measuring 2 in. in diameter extend horizontally along the length of wall 2: one is located beneath the urinal and one 6 in. below the ceiling. A 4-in.-diameter pipe exits the bottom of the urinal and enters the floor 1 ft from the northeast corner of the room. This pipe also has a Y-connection located immediately above the floor connecting to an approximately 4-in.-diameter pipe that runs horizontally through wall 3. A 1-in.-diameter pipe runs vertically from the floor to 18 in. below the ceiling in the northeast corner of room 3. Connected to this pipe 4 ft above the floor is a second 1-in.-diameter pipe that extends horizontally to a point immediately above the urinal, where it turns and extends downward into the top of the urinal (Figure 9).

4.10.4 Equipment

A urinal is located on wall 2.

4.10.5 Doors and Windows

A 28-in.-wide by 90-in.-high door on wall 4 connects rooms 2 and 3.

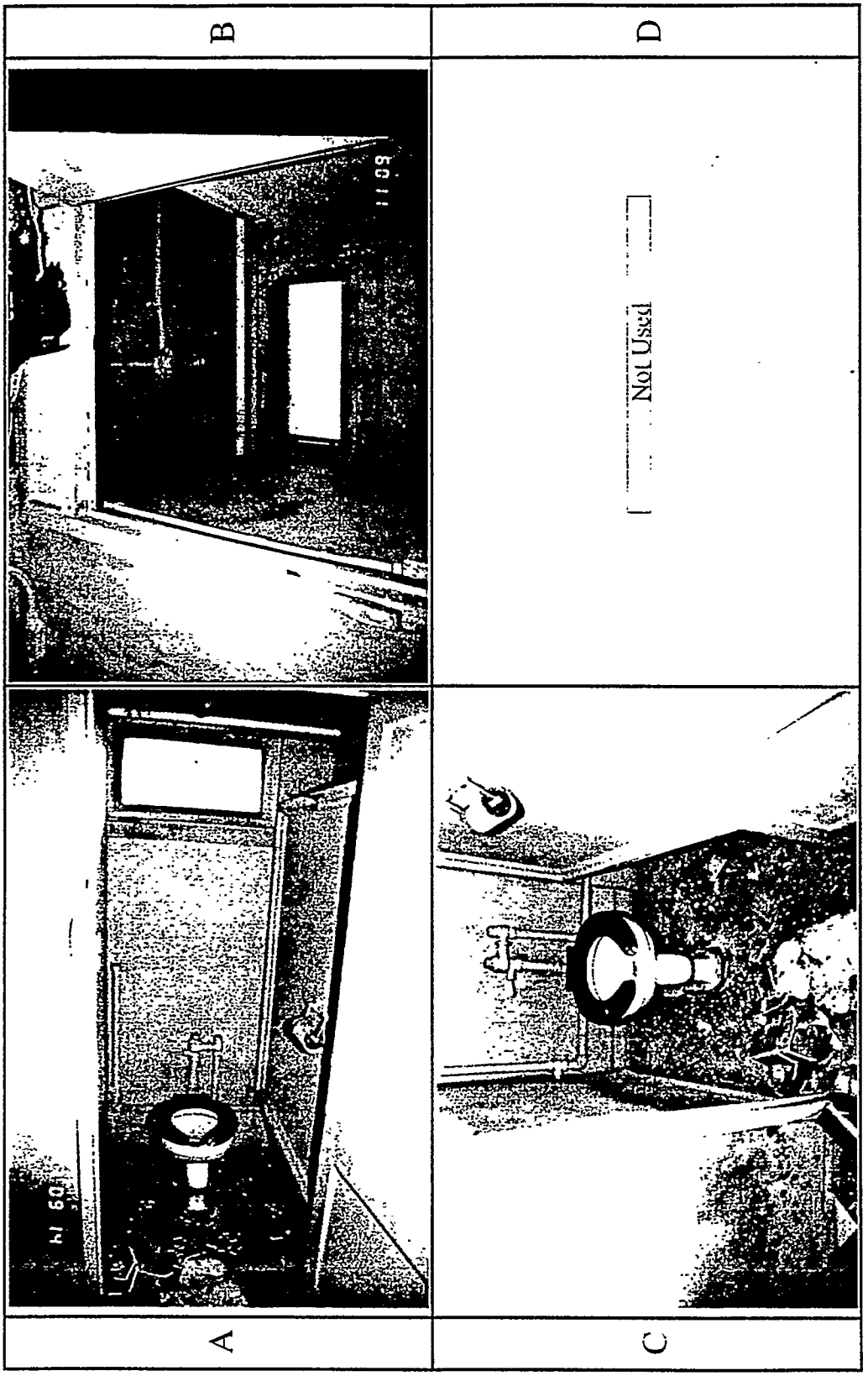
4.10.6 Ceiling and Floor

The ceiling in room 3 is white drywall nailed to a wooden framework (Figure 9). The floor in room 3 is a poured, reinforced-concrete slab.

4.11 Room 4

4.11.1 Walls

The walls in room 4 are constructed of drywall over 2-in. by 4-in. wood framing (Figure 10).



A	Walls 1, 2, 3, 4
C	Floor

Ceiling	B
Not Used	D

FIGURE 10 Photographs of Room 4

4.11.2 Finish Materials

The interior walls are painted white.

4.11.3 Piping

A 3-in.-diameter pipe extends horizontally along the length of wall 2 approximately 1 ft above the floor. This pipe bends 90° at the northeast corner of room 3 and extends upward to a point 4 ft above the floor. Two 3 in. diameter pipes extend up from the rear of the toilet along the wall to a point 3 ft above the floor, where they are joined together by a pipe approximately 3 in. in diameter and 6 in. long (Figure 10).

4.11.4 Equipment

A toilet is located along wall 2.

4.11.5 Doors and Windows

On wall 4, a 32-in.-wide by 90-in.-high door connects rooms 2 and 4 (Figure 10). Room 4 contains one 20-in.-wide by 12-in.-high window with a single pane of glass.

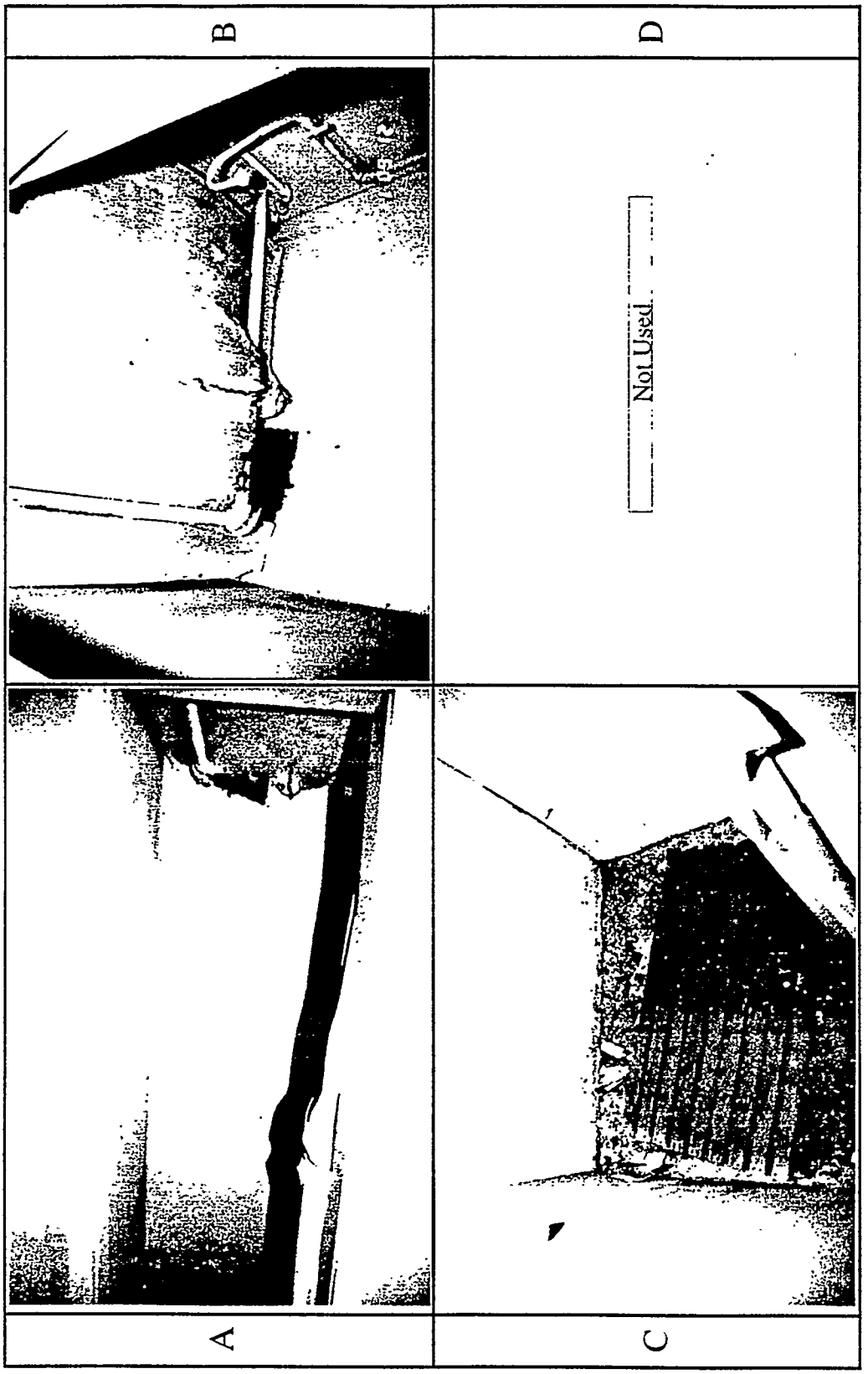
4.11.6 Ceiling and Floor

The ceiling in room 4 is white drywall nailed to a wooden framework. The floor in room 4 is a poured, reinforced-concrete slab (Figure 10).

4.12 Room 5

4.12.1 Walls

The walls in room 5 are constructed of drywall over 2 in. by 4 in. wood frame (Figure 11).



A	Walls 1, 2, 4
C	Floor

Ceiling	B
Not Used	D

FIGURE 11 Photographs of Room 5

4.12.2 Finish Materials

The interior walls of room 5 are painted white.

4.12.3 Piping

A 1-in.-diameter pipe extends upward from 1 ft above the floor in the southeast corner of wall 3 until it turns and runs horizontally 2 ft below the ceiling for a distance of 2 ft until it ends at the shower head. A 1-in.-diameter pipe runs horizontally approximately 6 in. from the ceiling along wall 2 (Figure 11).

4.12.4 Equipment

Room 5 contains a shower head on wall 3, a shower curtain on wall 4, and a wood pallet on the floor.

4.12.5 Doors and Windows

One doorway (26 in. wide) extends floor to ceiling and connects rooms 2 and 5. The doorway is covered by a curtain (Figure 11).

4.12.6 Ceiling and Floor

The ceiling in room 5 is white drywall nailed to a wooden frame (Figure 11). The floor in room 5 is a poured, reinforced-concrete slab.

4.13 Ceiling

4.13.1 Construction and Condition

The ceiling of Building E3613 is white drywall nailed to a wooden frame. Although the ceiling was not leaking at the time of the inspection, extensive staining of the ceiling panels was assumed by ANL to be caused by water damage. In addition, sections of the drywall are missing, exposing the wood framework and piping above the ceiling (Figures 5-11).

4.13.2 Piping and Equipment

Rooms 1 and 2 each contain two fluorescent light fixtures located 4 ft off walls 1 and 3, respectively, and centered between walls 2 and 4. A 1-in.-diameter pipe connects these light fixtures to all the other light fixtures in Building E3613, to the fuse box, and to the electrical switches. A single fluorescent light fixture is located 2 ft diagonally from the northeast corner of room 3. This fixture is also connected by electrical conduit to the other electrical fixtures in the building. A 4-in.-diameter pipe in room 5 extends from wall 3 approximately 1 ft west of wall 2, and then bends 90° 1 ft from wall 1 and proceeds the length of wall 2 (Figure 11). This pipe is covered by suspected asbestos-containing insulation.

5 Geophysical Investigation

ANL personnel conducted a geophysical survey of the area surrounding Building E3613 in December 1994. Several nonintrusive geophysical survey methods were used, including magnetics, electrical conductivity, EMF, and GPR techniques.

Results of the geophysical surveys were as follows:

- EMF and GPR anomalies were observed 35 ft south and 10 ft west of the southeast corner of Building E3613, at a depth of about 2.4 ft.

- Strong GPR reflections were detected 12 ft south of the southeast corner of Building E3613. An EMF anomaly at 1.8 ft was centered 10 ft south of the southeast corner of Building E3613. The source of this anomaly is unknown.

- Isolated GPR and EMF anomalies with unknown sources were also detected.

The geophysical surveys suggest the presence of some underground objects near Building E3613 but do not provide conclusive evidence of the sources of the anomalies detected. Appendix A provides the geophysical report.

6 Air Quality Monitoring

ANL staff collected air quality samples upwind, downwind, and inside of Building E3613 during November 1994. Analytical results showed no distinguishable difference in the levels of hydrocarbons and chlorinated solvents between the two background samples and the sample taken inside Building E3613. These results indicate that Building E3613 is not a source of volatile organic compound contamination. The air quality monitoring letter report (with data) is provided in Appendix B.

7 Underground Storage Tanks

No information on underground storage tanks associated with Building E3613 is available.

8 Conclusions

On the basis of information collected and reviewed by ANL for Building E3613, it is the authors' judgment that no significant air contamination is associated with this building. Results of the geophysical surveys indicate some anomalies in the vicinity of Building E3613 that warrant further investigation and evaluation. Suspect asbestos-containing insulation material should be tested and properly managed.

9 References

Brubaker, K.L., J.M. Dougherty, and L.D. McGinnis, 1994, *Initial Building Investigation at Aberdeen Proving Ground, Maryland: Objectives and Methodology*, ANL/ESD/TM-61, Argonne National Laboratory, Argonne, Ill.

EAI Corporation, 1989, *Historical Records Search and Site Survey of the Edgewood Area Building — Final Report*, prepared for U.S. Army Chemical Research, Development, and Engineering Center, Aberdeen Proving Ground, Maryland, under contract no. DAAIS-87-D0021.

Nemeth, G., 1989, *RCRA Facility Assessment Report, Edgewood Area, Aberdeen Proving Ground, Maryland*, unnumbered report prepared for Aberdeen Proving Ground, Maryland.

Appendix A:

Preliminary Report — Environmental Geophysics: Building E3613 Decommissioning, Aberdeen Proving Ground

Preliminary Report — Environmental Geophysics: Building E3613 Decommissioning, Aberdeen Proving Ground

by

M.A. Glennon, M.D. Thompson, C.R. Daudt, M.A.Benson,
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August 1995

Sponsored by

U.S. Army
Aberdeen Proving Ground, Maryland

Contents

Figures

Preliminary Report — Environmental Geophysics: Building E3613 Decommissioning, Aberdeen Proving Ground

Abstract

The immediate vicinity surrounding Building E3613, a potentially contaminated site in the Canal Creek area of Aberdeen Proving Ground, was examined using several nonintrusive, geophysical surveys, including total-field magnetic, electrical conductivity (EM-31), time-domain electrical induction (EMF or EM-61), and ground-penetrating radar (GPR) techniques. Geophysical anomalies are associated with Building E3613 and the surrounding anthropogenic structures. A possible sewerline, south of E3613 and parallel to the overhead steampipe, is detected by GPR and conductivity anomalies. GPR and EMF anomalies between buildings E3613 and E3615 could be sourced by two buried metal pipelines. North of the survey area, EMF and magnetic anomalies follow a surface depression and could be sourced by a sewer pipe. At about (120, 120), strong magnetic and GPR anomalies are observed. Nearby, other GPR and magnetic anomalies are detected but do not coincide. A smaller GPR and magnetic anomaly are also detected at (160, 108). The source of these anomalies is unknown.

1 Introduction

The following materials consist of preliminary observations relative to an environmental geophysics study at the building E3613, located in the Canal Creek Area, Aberdeen Proving Ground (Figure 1). These studies were conducted by ANL staff in mid-December 1994.

E3613 was built in 1954 and was used as a change house and office and storage building in support of the white phosphorus smoke program. The building was abandoned in 1988. E3613 measures 16 ft 1 in. × 32 ft 1in. and was built on a concrete foundation with wooden walls. A domestic 1.5 in. waterline and a 4 in. sewerline serviced E3613. No toxic work was conducted at the site and the building is classified as having unknown contamination. During an inspection in 1988, asbestos was listed as the only potential contaminant (EAI Corporation, 1989).

Overhead steam pipes supported by vertical pipes traverse the area. Two concrete footings that support the overhead steam pipes with guy wires are located north and west of the building. In addition, four vertical pipes exit the ground east of the building. The abandoned foundation of E3619 is located in the northwest corner of the survey area and Buildings E3615 and E3607 are located to the east and southwest of E3619, respectively.

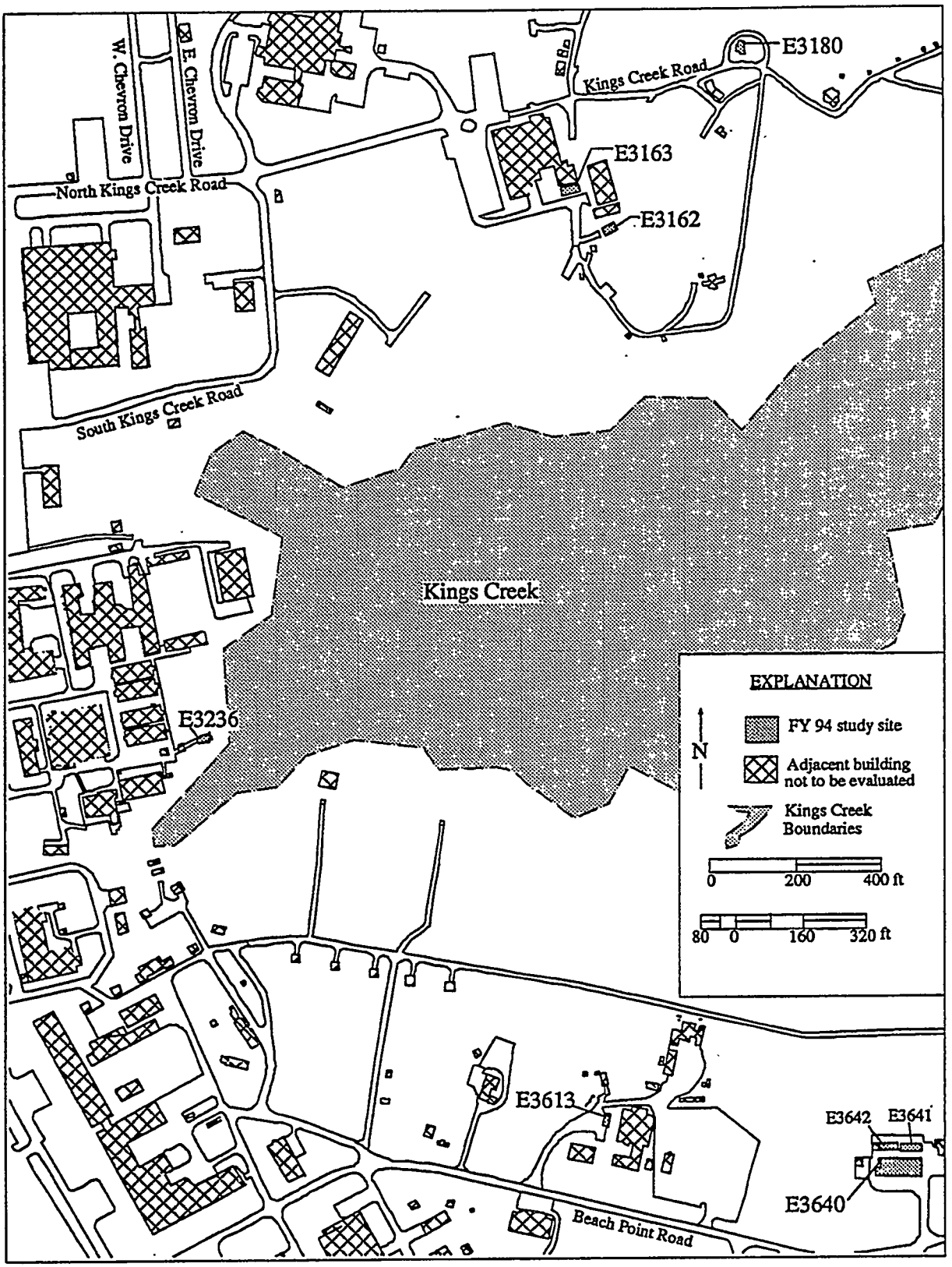

FIGURE 1 General Site Map of the Kings Creek Area, Aberdeen Proving Ground, Maryland

2 Instrumentation

A grid was positioned so that its southwestern grid corner was located at coordinates X=100, Y=100 and was oriented so that its axes were parallel to the edges of the building, which are aligned approximately east-west and north-south. Positive X and Y coordinates are measured approximately east and north of the starting coordinate (Figure 2). For convenience, a location of X=100, Y=150 will be represented as (100, 150). Within the fenced area, physical properties of the subsurface were measured with four instruments along transects parallel to the X and Y axes. Instruments and transects include:

1. Continuously recording, total-field magnetometer, (EG&G Geometrics G822L), with Y transects spaced 5 ft apart and X tie lines spaced 20 ft apart.

2. Geonics EM conductivity meter (EM-31), with Y transects spaced 5 ft apart and X transects spaced 5 ft apart.

3. Time-Domain Geonics EM (EM-61), designed for detection of metals, with Y transects spaced 5 ft apart and X tie lines spaced 10 ft apart. In addition, a single profile along the X direction was conducted north of the building. The location of this profile relative to Building E3613 is not well constrained because the area was not initially planned as part of the area to be surveyed. Positions of anomalies along this profile are probably accurate to within 20 ft.

4. Ground-Penetrating radar GSSI SIR-2, with Y transects spaced 10 ft apart and X tie lines spaced 10 ft apart.

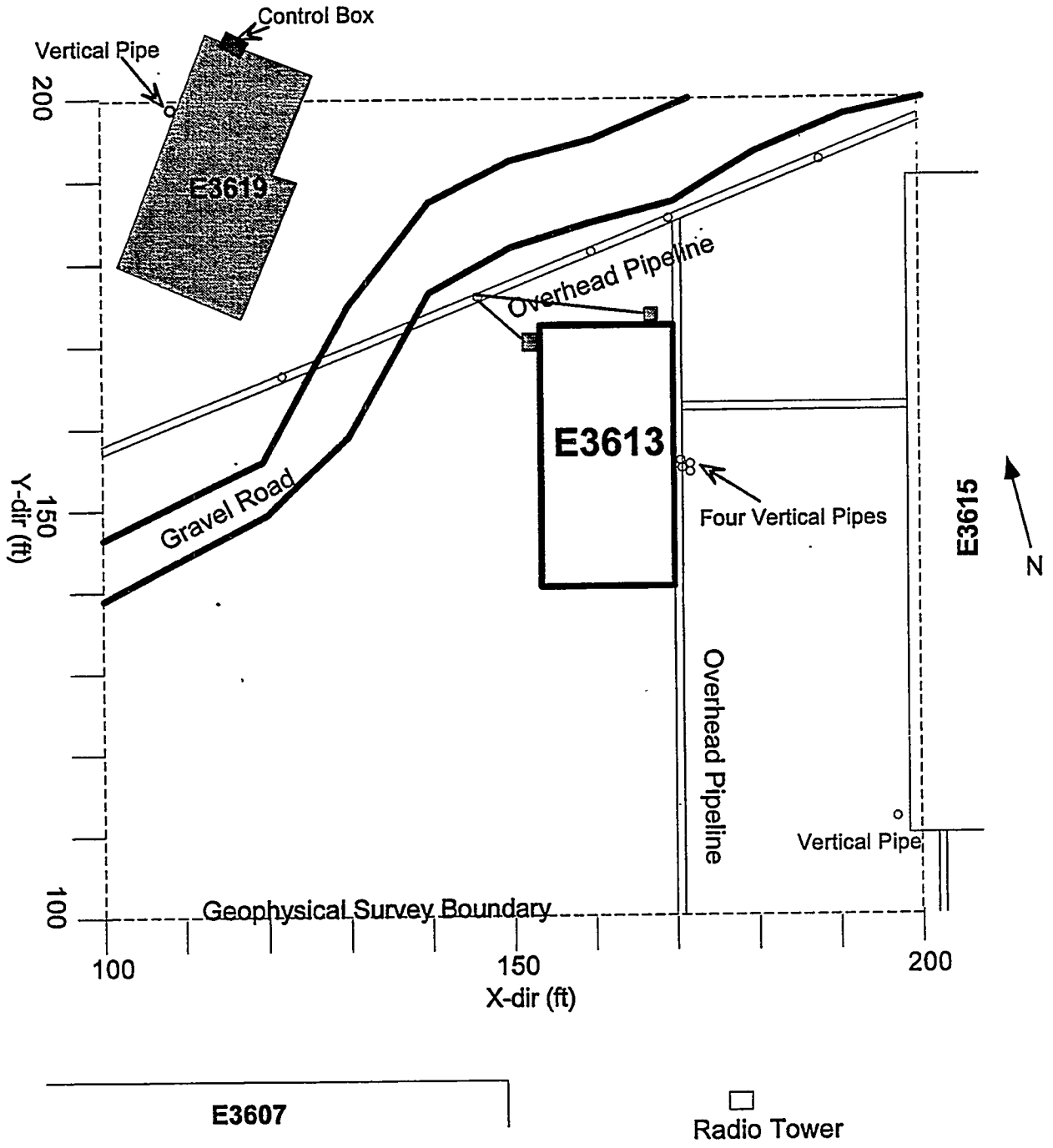

FIGURE 2 Detailed Location Map of Building E3613

3 Total Field Magnetics: G-822L

The magnetic field around Building E3613 is shown in Figure 3. Magnetic anomalies are associated with overhead steam pipes and the foundation in the northwest corner of the survey area. The anomalies at the southern end of the survey area at X=100 and X=135-145 are caused by Building E3607.

A prominent magnetic anomaly extends from (120, 120) to about (125, 115). Near-surface GPR anomalies are also observed at about (120, 120) and (130, 115). Lower-amplitude point magnetic anomalies are also detected at (145, 95), (130, 105) and (110, 138). The cause of these anomalies is unknown.

A point source positive anomaly at (160, 108) is 10 ft west of the overhead steam pipe and may not be related to that feature because a small hyperbolic GPR anomaly is also observed at this location. Other unexplained magnetic anomalies are observed south of E3619 and along line Y=200 between about X=120 and X=148.

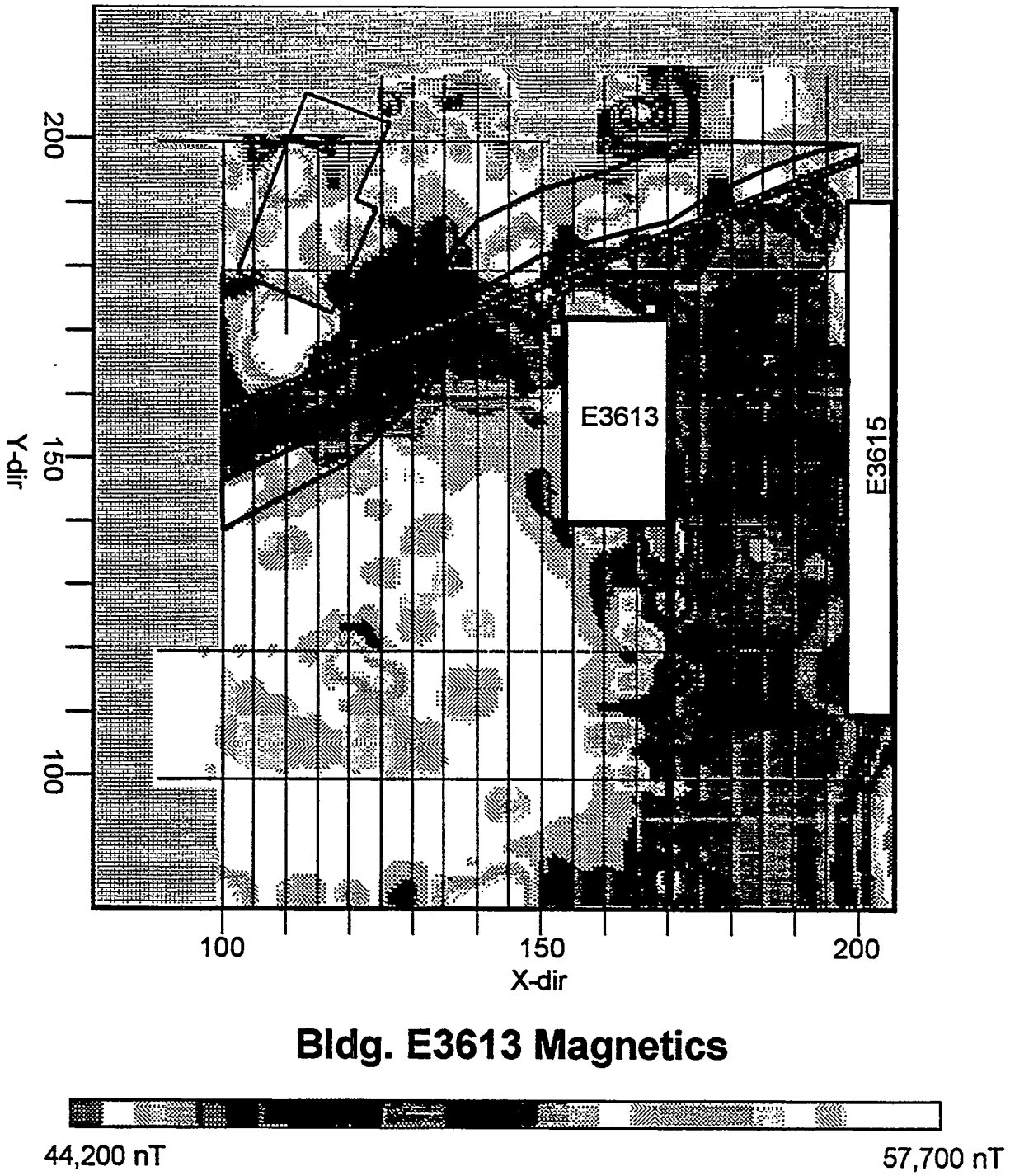

FIGURE 3 Total Magnetic Field Anomaly Map (Also depicted are the positions of data points collected along the geophysical profiles. Overhead steam pipes are plotted in blue and the gravel road is depicted with thick black lines.)

4 Terrain Conductivity Measurements: EM-31

Two illustrations are used to define conductivity anomalies because of the azimuthal bias inherent in the EM-31; therefore, Figures 4 and 5 are used to illustrate E-W lineaments, and N-S lineaments, respectively. Each figure is plotted with a 5 mS/m contour interval.

Between buildings E3613 and E3615, a complex pattern of EM-31 anomalies is observed in Figures 4 and 5. However, the buildings and the overhead steam pipes cause interference in the EM-31 signals, making it difficult to detect buried materials. Furthermore, no other data set detected an anomaly in this area. The conductivity minimums at (150, 185) and (170, 190) are probably caused by a combination of metals associated with the overhead steam pipe and amphibolitic road grade material (Figure 4).

Figure 4 shows a prominent conductivity high just south of E3619. This anomaly was also detected as a magnetic high and EM-61 high and could be sourced by metals associated with the overhead steam pipe and the foundation of Building E3619.

A prominent N-S trending anomaly is observed at about X=175 (Figure 5), parallel to the overhead steam pipe. Strong GPR anomalies are also detected along three east-west lines (Y=110 through Y=130) at about X=175. Since this anomaly is not detected with the magnetometer or the EM-61 instruments, it is probably sourced by a non-metallic large-diameter cylindrical object, such as a clay sewer pipe. A similar conductivity anomaly was interpreted to be a clay or concrete sewer pipe at the Ghost Town complex (McGinnis et al. 1994).

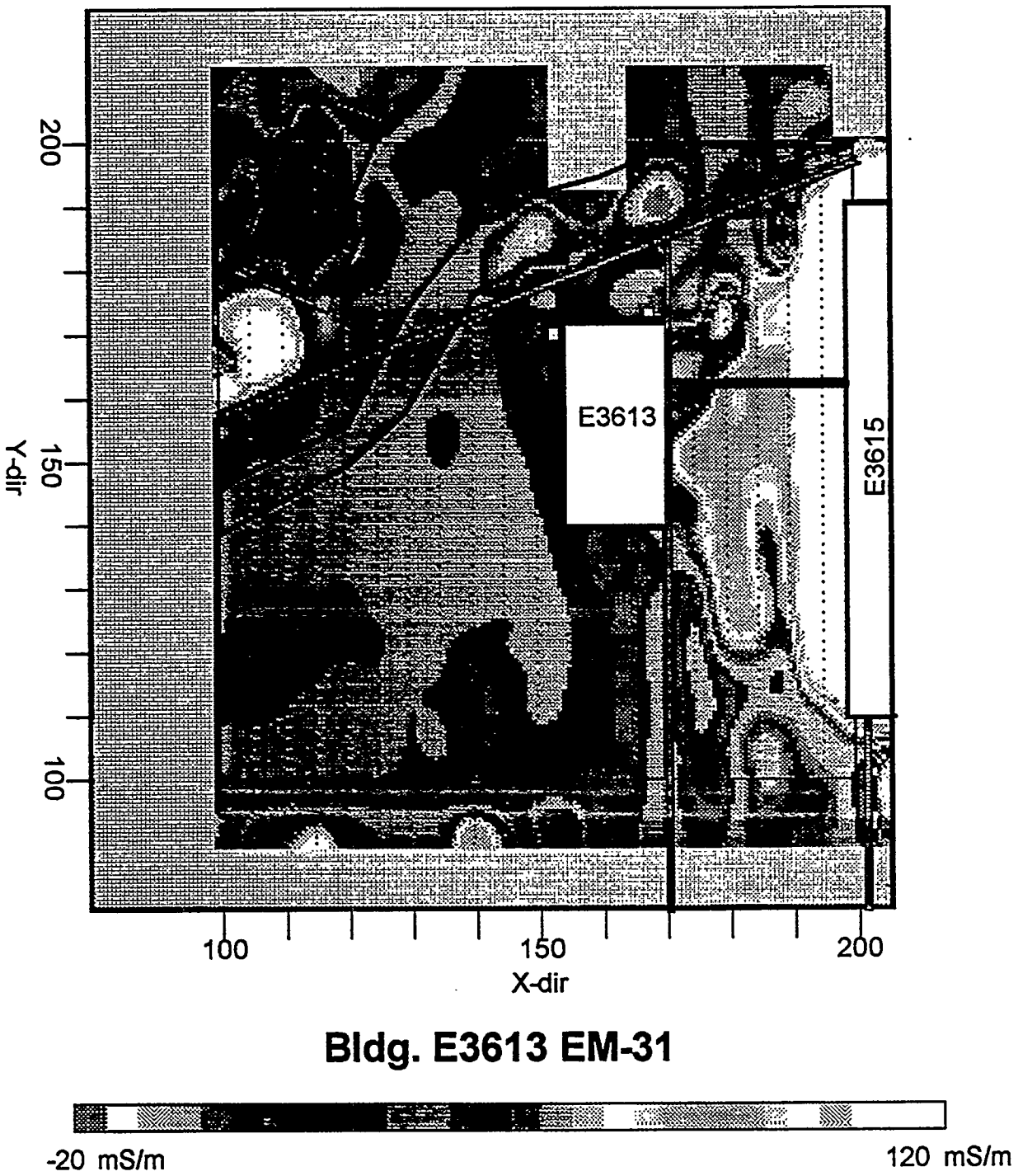

FIGURE 4 N-S EM-31 Transects (Also depicted are the positions of data points collected along the geophysical profiles. Overhead steam pipes are plotted in blue and the gravel road is depicted with thick black lines.)

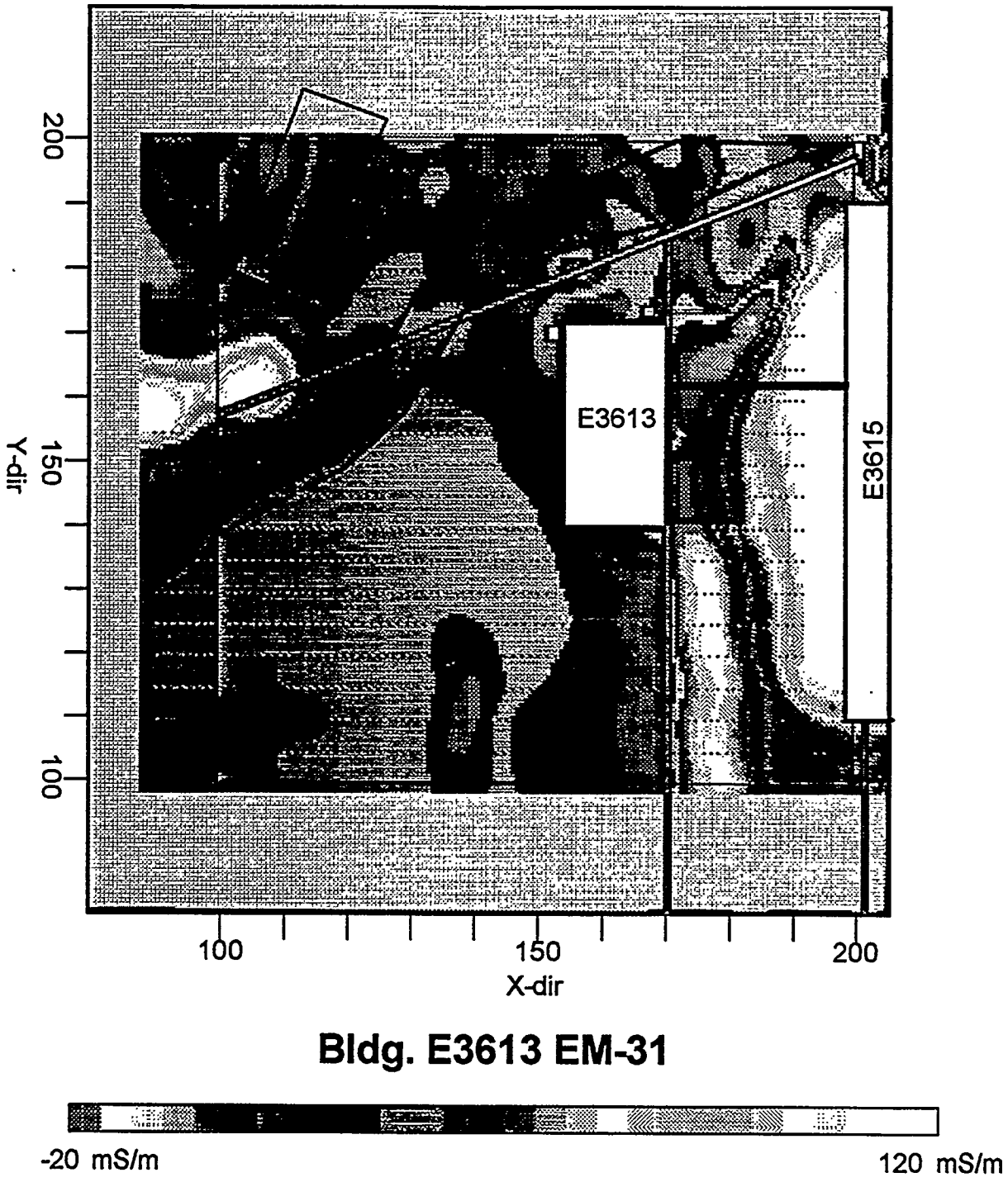

FIGURE 5 E-W EM-31 Transects (Also depicted are the positions of data points collected along the geophysical profiles. Overhead steam pipes are plotted in blue and the gravel road is depicted with thick black lines.)

5 Induced EMF Measurements: EM-61

A color-contour map constructed from EM-61 lower coil data is shown in Figure 6. EMF anomalies are associated with building E3613, the foundation of E3619 and the overhead steam pipes. The positive anomalies along Y=80 are associated with Building E3607.

Southeasterly-trending EMF highs are located between buildings E3613 and E3615, south of the east-west-trending overhead steam pipe. Hyperbolic GPR anomalies are also detected along a similar trend on EW transects (Figure 7). The EMF positive parallel to and just west of 3615 correlates with a series of hyperbolic GPR anomalies (Figure 7), suggesting a possible buried metallic pipe at this location.

As discussed earlier, a strong EMF positive is observed south of E3619 (Figure 6) that correlates with both conductivity and magnetic observations. EMF highs on the northwest corner of the foundation of E3619 match the locations of a control box and a vertical pipe (Figure 2). A magnetic high (Figure 3) is also observed near the EM-61 anomaly (Figure 6) along the eastern edge of the foundation.

Along the northern edge of the survey area, an EMF high between (150, 200) and (165, 210) follows the trend of a surface depression that was noted by ANL personnel, but not tied in to the survey grid. Isolated magnetic anomalies are also observed at (147, 200) and (160, 210) (Figure 3). These observations suggest that the depression is underlain by buried metals, such as a sewer pipe. Toward the northwest, an EMF positive is observed near (105, 220). The source of this anomaly is unknown.

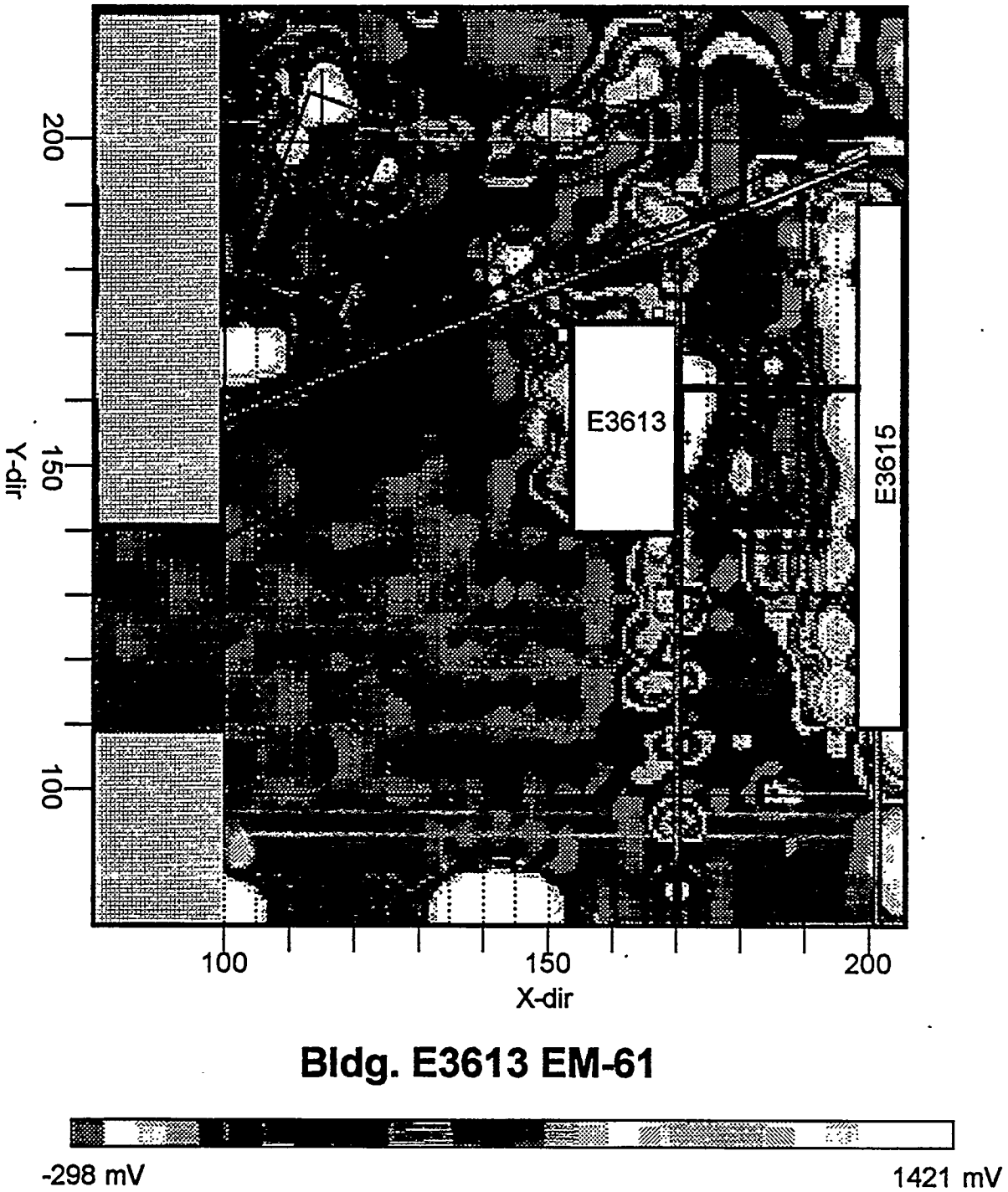

FIGURE 6 EM-61 Millivolt Anomaly Map (Also depicted are the positions of data points collected along the geophysical profiles. Overhead steam pipes are plotted in blue and the gravel road is depicted with thick black lines.)

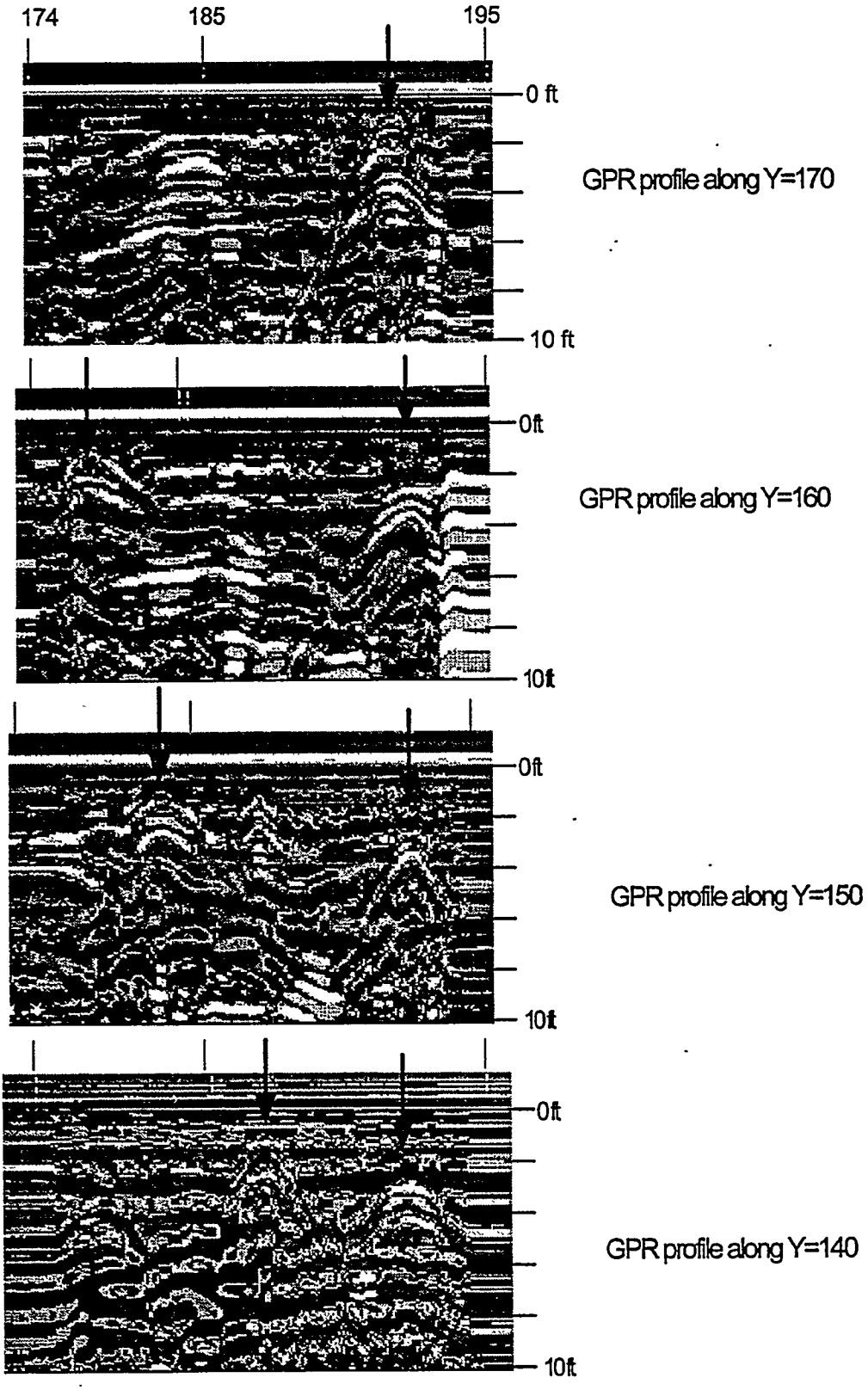

FIGURE 7 Ground Radar Images along Transects Parallel to the X-Axis between Buildings E3615 and E3613 (Arrows show two sets of observed anomalies. The maximum penetration depth is estimated at 7 ft.)

6 Ground-Penetrating Radar Measurements

Good penetration was observed over most of the site, with resolution down to about seven feet below the ground surface. Near about X=192, clear hyperbolic GPR anomalies parallel Building E3615 from about Y=170 to about Y=140 (Figure 8). This trend may extend southward as subtle hyperbolas are also observed along lines Y=120-130 at about X=190 (Figure 9). An EM-61 high follows the same pattern (Figure 6). A second set of GPR anomalies appears to follow the trend of EM-61 anomalies (Figure 7) located on a diagonal between E3613 and E3615. This anomaly is not present along profiles Y=170 or Y=120. Both anomalies have their origins within 2 feet of the surface and could indicate the presence of buried pipelines. The near-surface anomaly along profile Y=150 at about X=188 is not detected with other geophysical profiles and may be sourced by an antenna bump.

Along profiles Y=110-130, strong hyperbolic GPR anomalies (Figure 8) are observed at about X=175, near the north-south trending conductivity low (Figure 5). According to the review of building history by EAI Corp. (1989) a 4 in. sewer line services E3613, which could be the source of the observed anomalies. The strong reflections at about X=170 along profiles Y=120 -130 are probably sourced by the overhead steam pipe.

Other GPR anomalies are observed on profiles run along the X survey direction (Figure 9). Near-surface anomalies are observed at (120, 138), (130, 138) and (140, 135), however, anomalies were not detected by other geophysical instruments in this area. Strong magnetic anomalies (Figure 4) are observed near the GPR anomalies at (120, 122) and (130, 115). According to EAI Corp. (1989), Building E3613 was serviced by a 1.5 in. waterline. ANL personnel report that a water tower is located west of the geophysical survey area. However, lineations, which would suggest a buried pipe, are not well-defined by the data. The sources of these anomalies are unknown.

Between Y=170 and Y=190, hyperbolic anomalies are detected on profiles oriented EW (Figure 9) and on one profile oriented NS (not shown). These anomalies have a deeper origin than those discussed earlier. Other geophysical instruments did not detect anomalies in this region. Therefore, this anomalous GPR signal may not have anthropogenic origins and may represent undulations in the former land surface.

Along profile X=150, strong reflections are observed near Y=180 (Figure 10). Magnetic (Figure 3), EM-31 (Figure 4) and EMF (Figure 6) anomalies are also observed in the area. These anomalies may be related the overhead steam pipe located south of the anomalies. A weak GPR anomaly is observed near Y=100 (Figure 10) that is not validated by other evidence. Similar anomalies (not shown) are observed at (140, 100); (100, 140); and (130, 170); and (160, 108). The cause of these anomalies is unknown. Other GPR disturbances define the perimeter of the foundation of E3613.

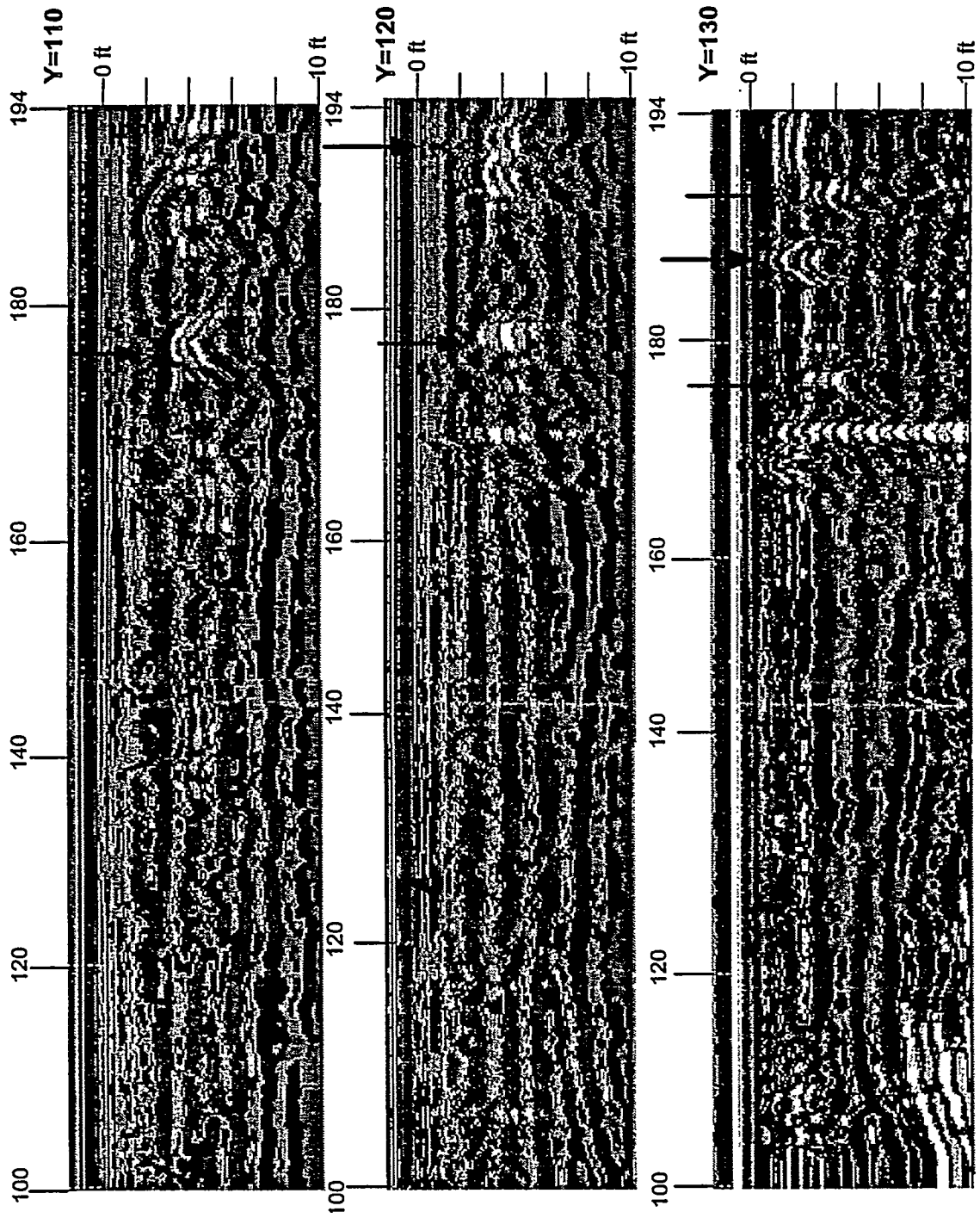

FIGURE 8 Ground Radar Images along Transects Parallel to the X-Axis South of E3613 (Strong hyperbolic GPR anomalies near X=175 correlate with a conductivity low [Figure 5]. The maximum penetration depth is estimated at 7 ft.)

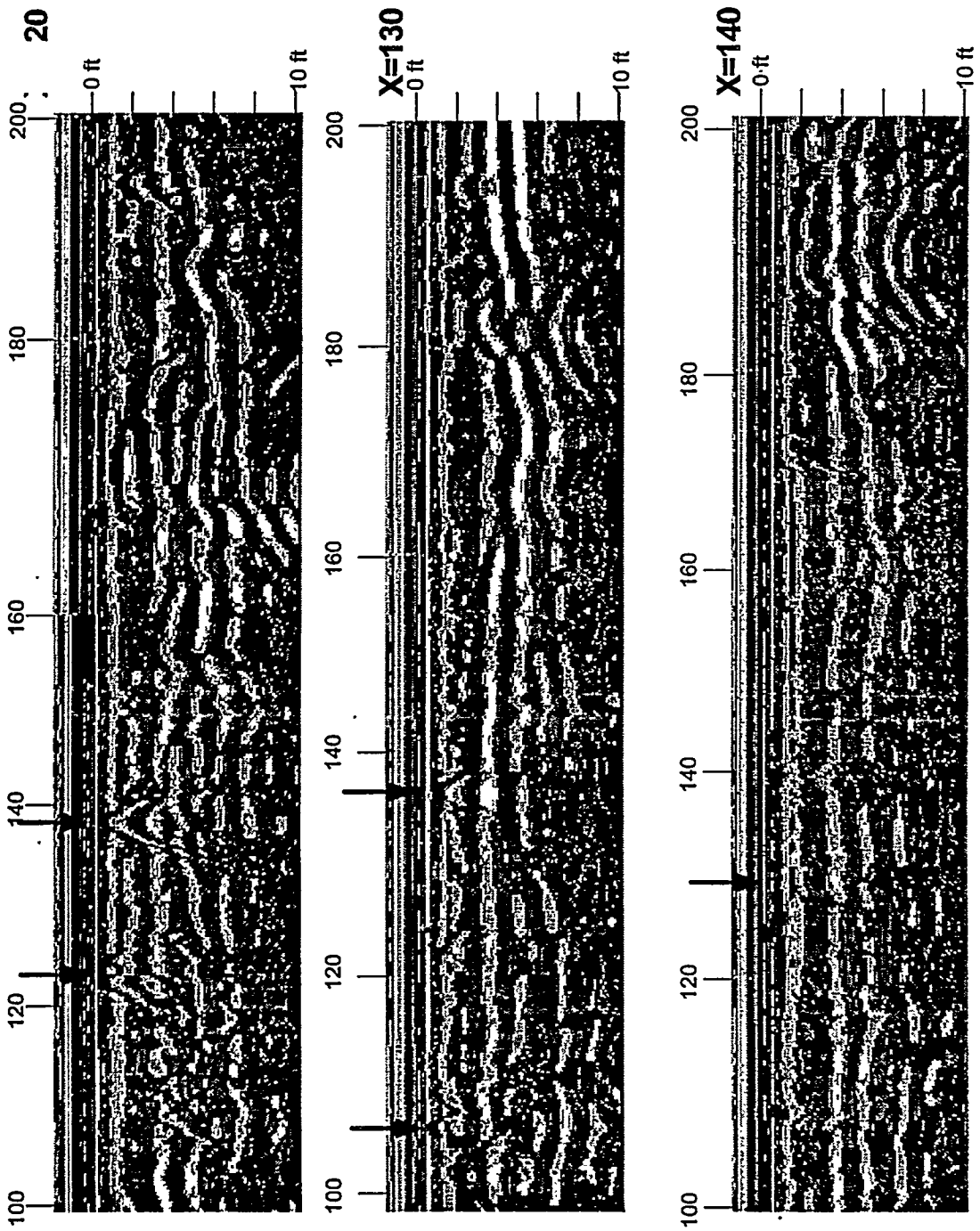

FIGURE 9 Ground Radar Images along Transects Parallel to the Y-Axis West of E3613 (Two distinct sets of GPR anomalies are present. A deep anomaly is observed near 180 N, and a shallower anomaly, near 140 N. A third anomaly is present at the southern end of the transect. The maximum penetration depth is estimated at 7 ft.)

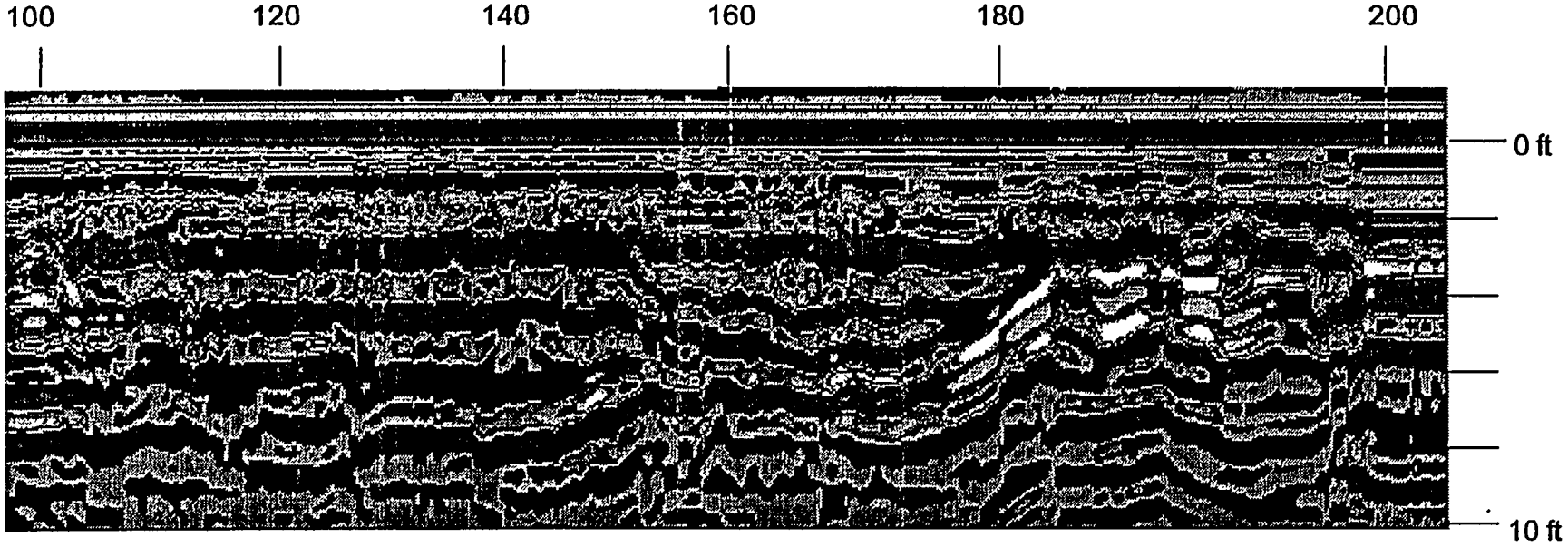

FIGURE 10 Ground Radar Image along Line X=150 Showing Strong Reflections at About X=180 (The maximum penetration depth is estimated at 7 ft.)

7 Discussion

Southeast of E3619, a conductivity low (Figure 5) resides near a series of clear GPR anomalies (Figure 8). EM-61 or magnetic surveys did not detected this anomaly, suggesting a non-metallic source. Using knowledge gained from a similar study conducted at the Ghost Town Complex, we interpret this combination of anomalies as a clay or concrete sewer line that extends from about (175, 140) to at least (175, 100). Furthermore, EAI Corp. (1989) states that a 4 in. sewer pipe serviced E3613.

EMF anomalies are observed parallel to E3615 and along a southwesterly diagonal between E3613 and E3616. These anomalies follow the trend of near-surface GPR hyperbolas (Figures 9 and 10). Conductivity anomalies are also observed in this area, however, interference from the buildings and the overhead steam pipes obscure signals from buried materials. Magnetic anomalies are not observed in this area, suggesting a nonmagnetic source. Buried metal pipes could explain the EMF and GPR anomalies. No information is available on utilities servicing E3615.

North of Y=200, magnetic and EM-61 anomalies occur between X=150 and X=165, along a surface depression. These anomalies could be caused by buried metal pipe, such as a sewer pipe. GPR and EM-31 data are unavailable at this location.

GPR and magnetic anomalies centered at (120, 120) are not detected with either the EM-31 or EM-61 surveys. Other near-surface GPR hyperbolas seem to follow a trend between about (120, 140) and (140, 130), but this trend was not detected by other geophysical surveys. Although a water tower is located west of E3613 and a 1.5 in. water pipe serviced the building (EAI Corp., 1989), lineations are not well-defined by the data. The sources of these anomalies are unknown.

Between X=120 to 140, deep-seated deep GPR hyperbolas are observed near Y=180 and are probably sourced by a former land surface (Figure 9). At (150, 180), strong GPR reflections are observed near conductivity, EMF and magnetic anomalies. A combination of metals associated with the overhead steam pipe and amphibolitic road grade material can explain these observations.

Isolated GPR hyperbolas are also observed but are generally weak and do not correlate with other geophysical observations. GPR and magnetic anomalies are observed at (160, 108), far enough west of the overhead steam pipe to suggest a different source. We do not offer an interpretation for these signals.

Finally, magnetic (Figure 3), EM-31 (Figure 4), and EM-61 (Figure 6) anomalies are detected south of the foundation of E3619 and could be caused from a combination of interference from the foundation of E3613 and the overhead steam pipes.

8 Conclusions

Site geophysical surveys consisting of EM-61 millivolt, total field magnetics, EM-31 conductivity and ground-penetrating radar around Building E3613 permit the following conclusions:

- GPR and EM-31 anomalies are centered on X=175 between Y=140 and Y=100. This anomaly is most likely sourced by a clay or concrete sewer line.
- Two linear GPR and EMF anomalies between buildings E3613 and E3615 are probably sourced by buried metal pipes.
- Near (120, 120) strong magnetic and GPR anomalies are observed. Other near-surface GPR anomalies are found nearby that seem to follow a trend. The source of these anomalies is unknown.
- North of the geophysical survey area, magnetic and EMF anomalies are observed along a surface depression. suggesting a buried metallic pipe in this area.
- Relatively deep-seated GPR anomalies are observed between (120, 170) and (140, 190) along transects parallel to both the X and Y direction. Because other geophysical anomalies were not detected in this region, these anomalies may be sourced by a former land surface.
- Magnetic, EM-61 and EM-31 anomalies are observed south of the foundation of E3619. In addition, magnetic and EMF anomalies are observed on transects conducted over the foundation.

Appendix B:

Air Quality Monitoring Report

ARGONNE NATIONAL LABORATORY INTRA-LABORATORY MEMO

April 5, 1995

TO: Eric Zimmerman

FROM: John Schneider JFS

SUBJECT: **Building 3613 Air Monitoring for Volatile Organic Compounds Results**

Building 3613 was constructed in 1954 and used as an office and change house in support of the white phosphorus smoke program.

Air samples were collected and analyzed on-site at APG by ANL during the week of November 14, 1994. Samples were collected by drawing ambient air through a Tenax TA sorbent polymer sampling cartridge (4 mm I.D. x 11.5 cm) traps at the rate of 200mL for 120 minutes, yielding a 24 L sample volume. The cartridges were analyzed by thermally desorbing the trapped organic compounds with a Dynatherm model 900 ACEM thermal desorption unit on to a Hewlett-Packard 5890 series II gas chromatograph (GC) equipped with a Hewlett-Packard 5972 mass spectrometer (MS).

The MS was used for detecting and identifying organic compounds desorbed from the Tenax traps. Spectra were obtained by scanning from 45 to 400 atomic mass units at a rate of two scans every second. Identifications were based on mass spectral interpretation and computer searching of the 140,000 compound Wiley spectral library. A standard mixture of volatile organics containing toluene at 200 ng/uL and other aromatic hydrocarbons, was run daily to assure that the instrument was operating properly. All quantitations are estimates, using the assumption that analyte response factors should be similar to toluene in the standard mixture of volatile organics.

The majority of the volatile organic compounds found during the ANL air monitoring are commonly found in any building (hydrocarbons and chlorinated solvents). The following compounds were the major components found in the air samples:

Compound	E3613 N Rm	S Room	SE (downwind)	SW (upwind)
Benzene	0.11 ng/L	0.10 ng/L	0.09 ng/L	0.09 ng/L
Toluene	0.17 ng/L	0.14 ng/L	0.09 ng/L	0.09 ng/L
Hexanal	0.01 ng/L	ND	0.03 ng/L	0.01 ng/L
Tetrachloroethene	0.02 ng/L	0.02 ng/L	ND	ND
Ethyl Benzene	0.03 ng/L	0.03 ng/L	0.02 ng/L	0.02 ng/L
Xylenes	0.10 ng/L	0.09 ng/L	0.04 ng/L	0.06 ng/L
Alpha Pinene	0.19 ng/L	0.14 ng/L	0.09 ng/L	0.06 ng/L
Benzaldehyde	0.10 ng/L	0.10 ng/L	0.37 ng/L	0.37 ng/L
Phenol	0.04 ng/L	0.02 ng/L	0.09 ng/L	0.09 ng/L
Beta Pinene	0.08 ng/L	0.08 ng/L	0.03 ng/L	0.02 ng/L
Methyl Phenyl Ketone	0.07 ng/L	0.09 ng/L	0.34 ng/L	0.31 ng/L

Figures 1 and 2 are total ion chromatograms (TIC) of the air samples taken in E3613. Figures 3 and 4 are TICs of the outside air samples. Table 1 is the air sampling data sheet.

The analysis indicates that building E3613 is not a source of volatile organic compound contamination.

JFS:lls
Attachments

cc: D.E. Edgar

File : A:\A261.D
Operator : lar
Acquired : 19 Nov 94 2:10 pm using AcqMethod PILOT
Instrument : 5972 - In
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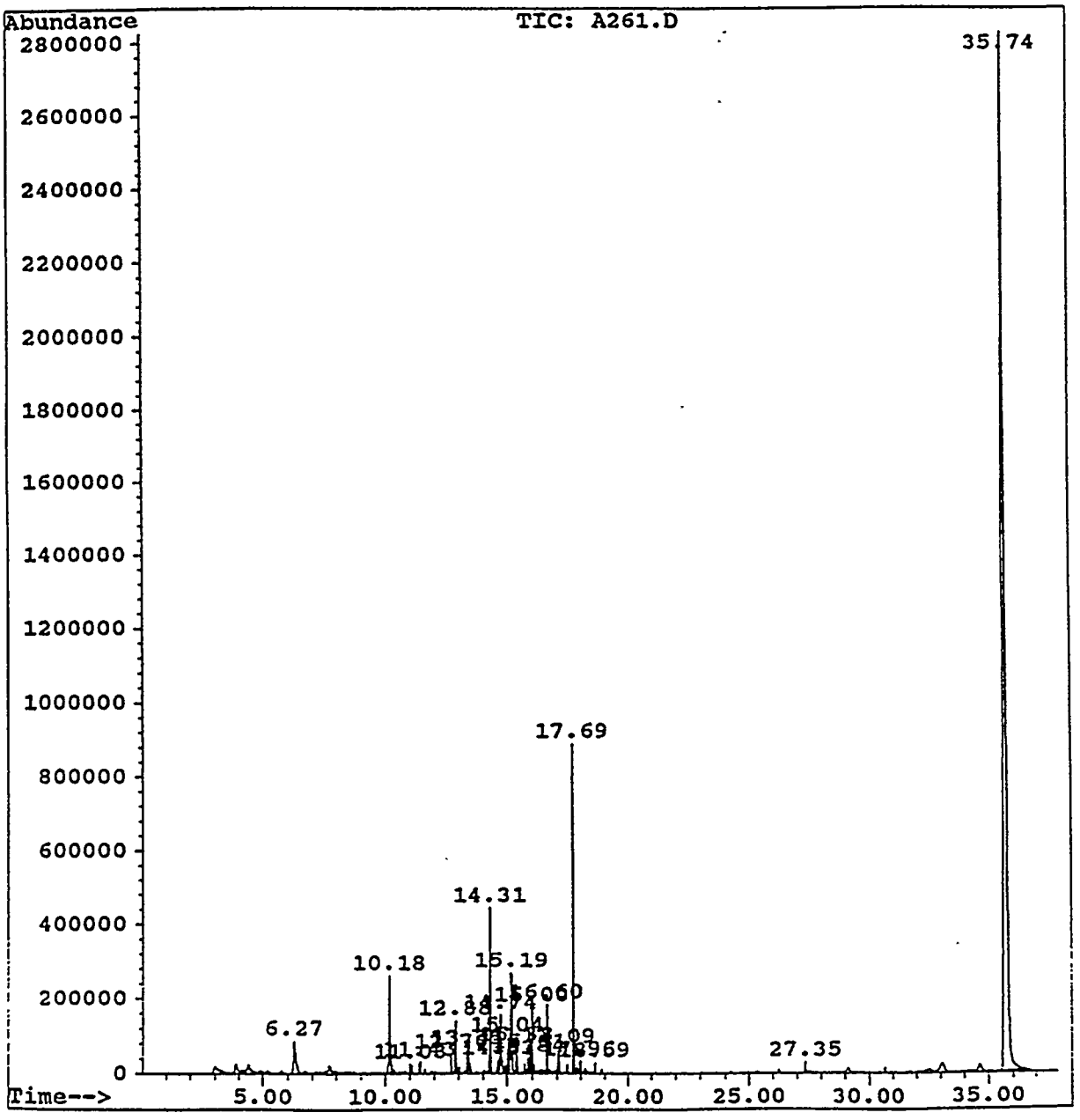
Vial Number: 1



File : A:\A262.D
Operator : lar
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Instrument : 5972 - In
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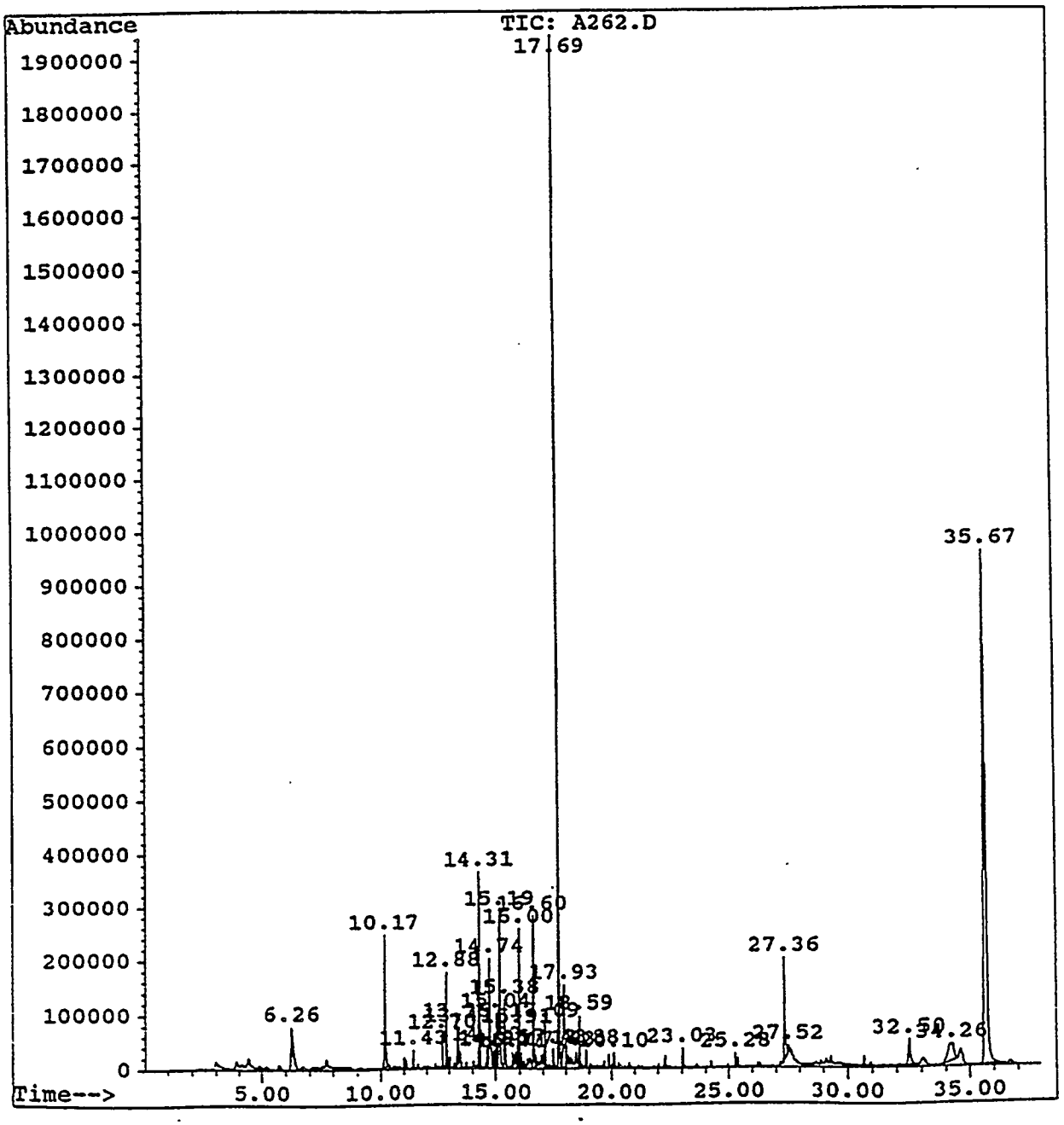
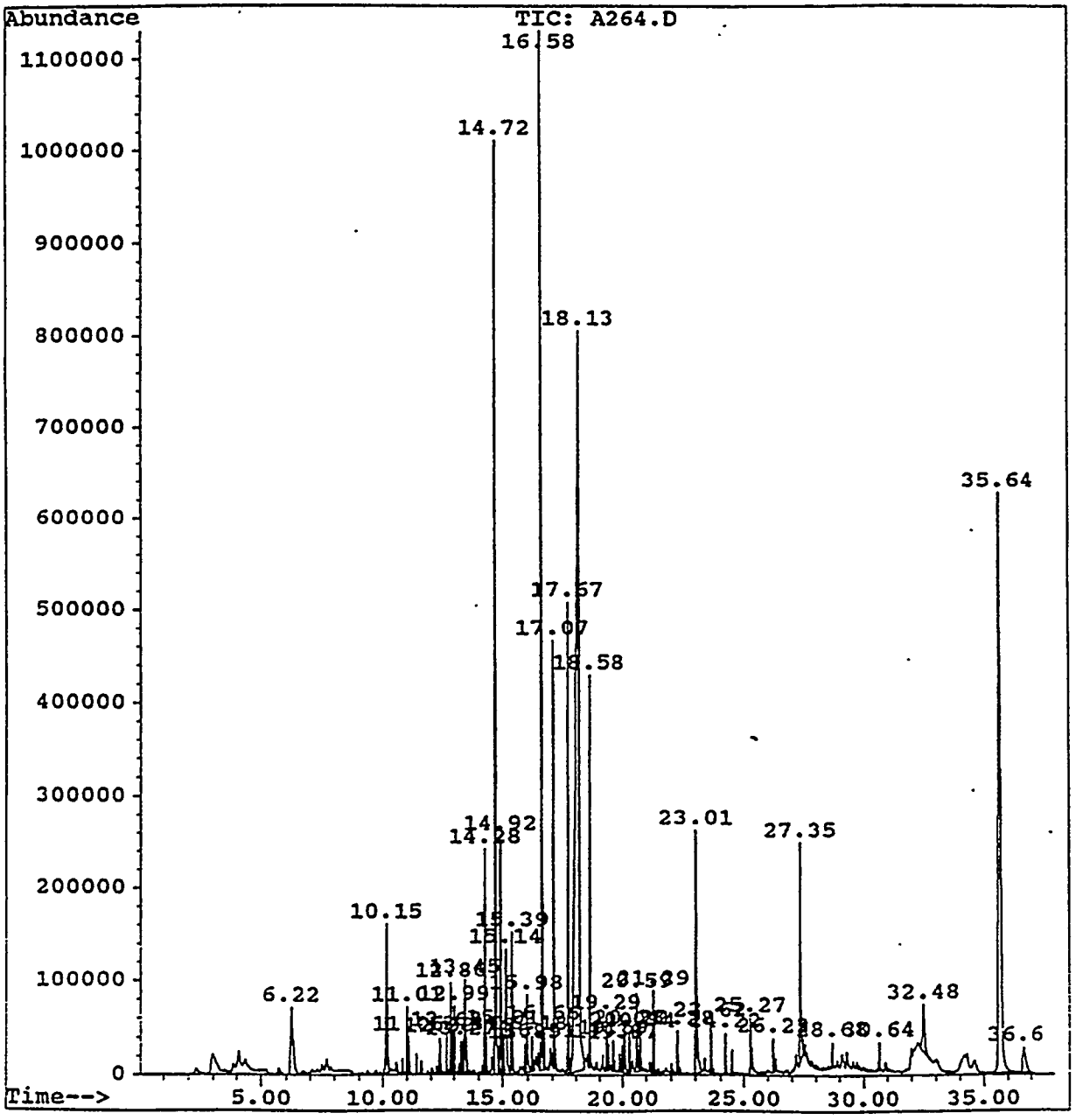
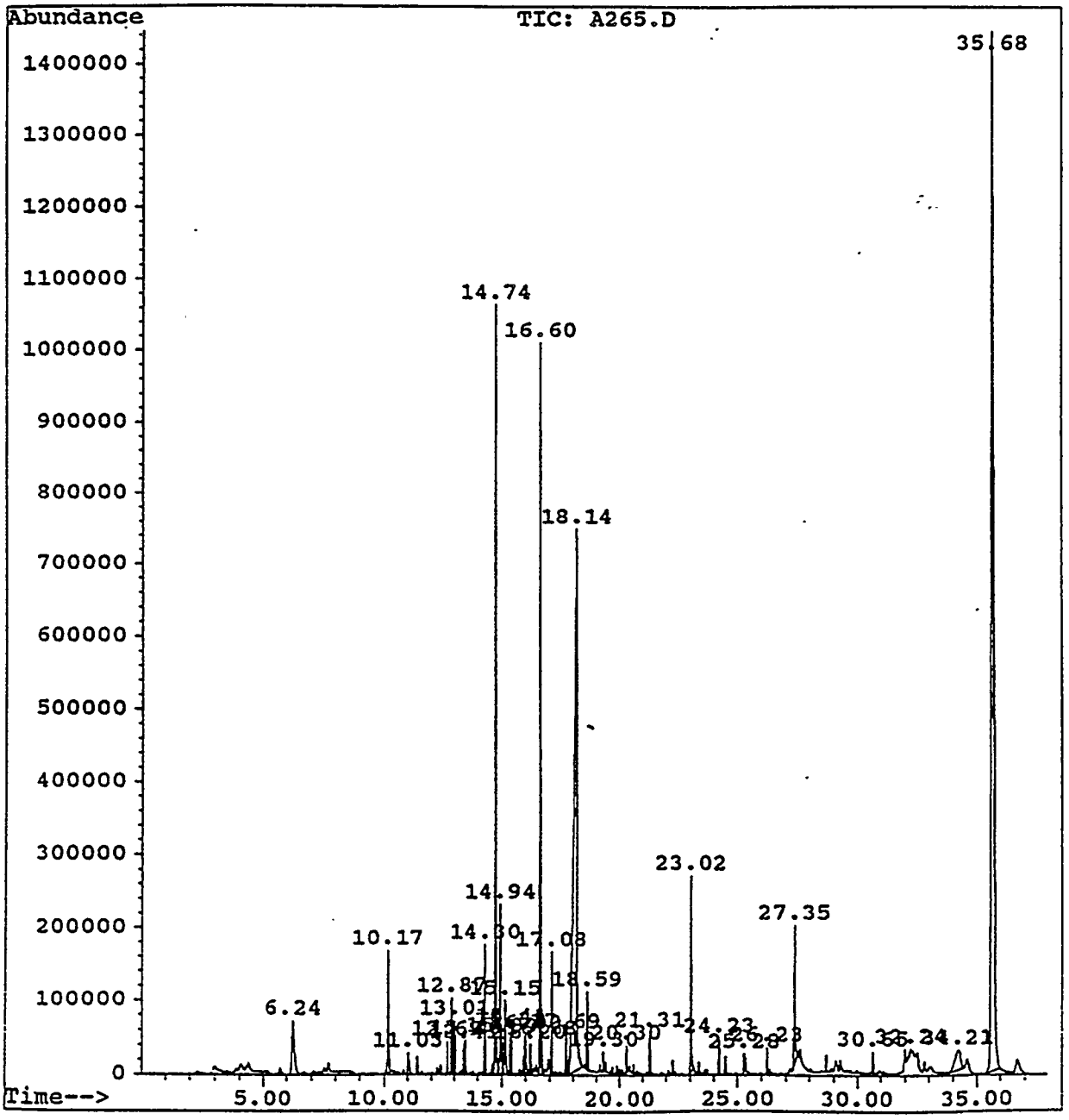
Misc Info : start, 200mL/min end,facing north, north wal
Vial Number: 1



File : A:\A264.D
Operator : lar
Acquired : 19 Nov 94 4:40 pm using AcqMethod PILOT
Instrument : 5972 - In
Sample Name: 264(43) E3613 downwind, 9:20-11:20 200mL/min
Misc Info : start, 200mL/min end, facing SW, SE
Vial Number: 1



File : A:\A265.D
Operator : lar
Acquired : 19 Nov 94 3:51 pm using AcqMethod PILOT
Instrument : 5972 - In
Sample Name: 265(45) E3613 upwind, 9:10-11:10 200mL/min
Misc Info : start, 200mL/min end, facing SW, SW
Vial Number: 1



Air Sampling Data Sheet

Sample [illegible] #[illegible]

Date: [illegible] **Site:** [illegible] **Researchers:** [illegible]

Sample			Sampling Specifications							Location				Ambient Conditions		
			Sampling Time		Flow Rate		Pump							Temp-		
Number	Building	Room	Start	End	Initial	Final	Setting	Pump ID #	Manifold	Height	Distance #1	Distance #2	Facing	ature	Pressure	Humidity
[illegible]	[illegible]	North [illegible]	9:[illegible] a.m.	11:[illegible]	[illegible] ml/min	[illegible] ml/min	P 1.50	2	8A	15"	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]
[illegible]	[illegible]	North [illegible]	9:10 a.m.	[illegible]	[illegible] ml/min	[illegible] ml/min	P 1.50	2	8B	15"	"	"	[illegible]	[illegible]	—	[illegible]
[illegible]	[illegible]	South [illegible]	9:[illegible] a.m.	[illegible]	[illegible] ml/min	200 ml/min	P 1.50	2	8C	16"	8' From [illegible]	8' From S. [illegible]	[illegible]	60°F	—	30%
[illegible]	[illegible]	South [illegible]	9:10 a.m.	[illegible]	[illegible] ml/min	200 ml/min	P 1.50	2	8D	16"	"	"	[illegible]	60°F	—	30%
[illegible]	[illegible]	[illegible]	9:20 a.m.	11:20 a.m.	200 ml/min	200 ml	P 1.50	5	5A	20"	11' From S.E. Corner	—	East	60°F	—	30%
[illegible]	[illegible]	[illegible]	9:[illegible] a.m.	[illegible] a.m.	[illegible] ml/min	200 ml/min	P 1.50	5	5B	20"	5' From S.E. Corner	—	S.W.	60°F	—	30%
[illegible]	[illegible]	[illegible]	9:40	10:40 [illegible]	[illegible] ml/min	200 ml/min	P 1.20	3	4A	16"	5' From S. wall	15' From [illegible]	Ceiling	71°F	South [illegible]	27%
[illegible]	[illegible]	[illegible]	9:40 a.m.	[illegible] a.m.	[illegible] ml/min	200 ml/min	P 1.5	3	4B	"	15' From S wall	15' From [illegible] wall	Ceiling	71°F	South of [illegible]	27%
[illegible]	[illegible]	[illegible]	9:[illegible]	[illegible]	300 ml/min	200 ml/min	P 1.5	4	1B	16"	0' From S.E. Corner	—	Ceiling	81°F	—	[illegible]%
[illegible]	[illegible]	[illegible]	9:[illegible]	11:[illegible] a.m.	200 ml/min	250 ml/min	P 1.9	1	2B		16' From [illegible] Wall	10' From N Wall	Ceiling	60°F	--	[illegible]%