LA-UR-05-0775

The Decommissioning of TA-3-16, the Ion Beam Facility (IBF)

Historic Building Survey Report No. 241

Los Alamos National Laboratory

February 1, 2005
Survey No. 886

Prepared for the Department of Energy,
National Nuclear Security Administration,
Los Alamos Site Office

prepared by

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ENV-ECO Cultural Resources Team (CRT)
Environmental Stewardship (ENV) Division
LOS ALAMOS NATIONAL LABORATORY

Introduction

The Department of Energy, National Nuclear Security Administration, Los Alamos Site Office proposes to decommission, decontaminate, and eventually demolish a historic Los Alamos National Laboratory (LANL) accelerator facility located on Department of Energy land at Technical Area (TA) 3 (Maps 1 and 2). The Ion Beam Facility (IBF) was built in 1951 to support essential post-World War II scientific research and houses LANL's original vertical and tandem Van de Graaff accelerators.

The following information has been prepared as part of a notification of potential adverse effect to the IBF (TA-3-16). The proposed decontamination and decommissioning (D&D) action is part of LANL's routine phasing out of aging properties and will result in the eventual demolition of the IBF. D&D activities will adversely affect the attributes that make this building eligible for the National Register of Historic Places.

This report is intended to provide the background information necessary to initiate the Section 106 consultation process; additional documentation will follow when a treatment plan is developed and final mitigation measures are determined. This report contains a description of the proposed action, historical background information, a brief property description, building integrity and contamination information, and a recommendation for National Register of Historic Places eligibility. Building floor plans and selected photographs are included in Appendix A.

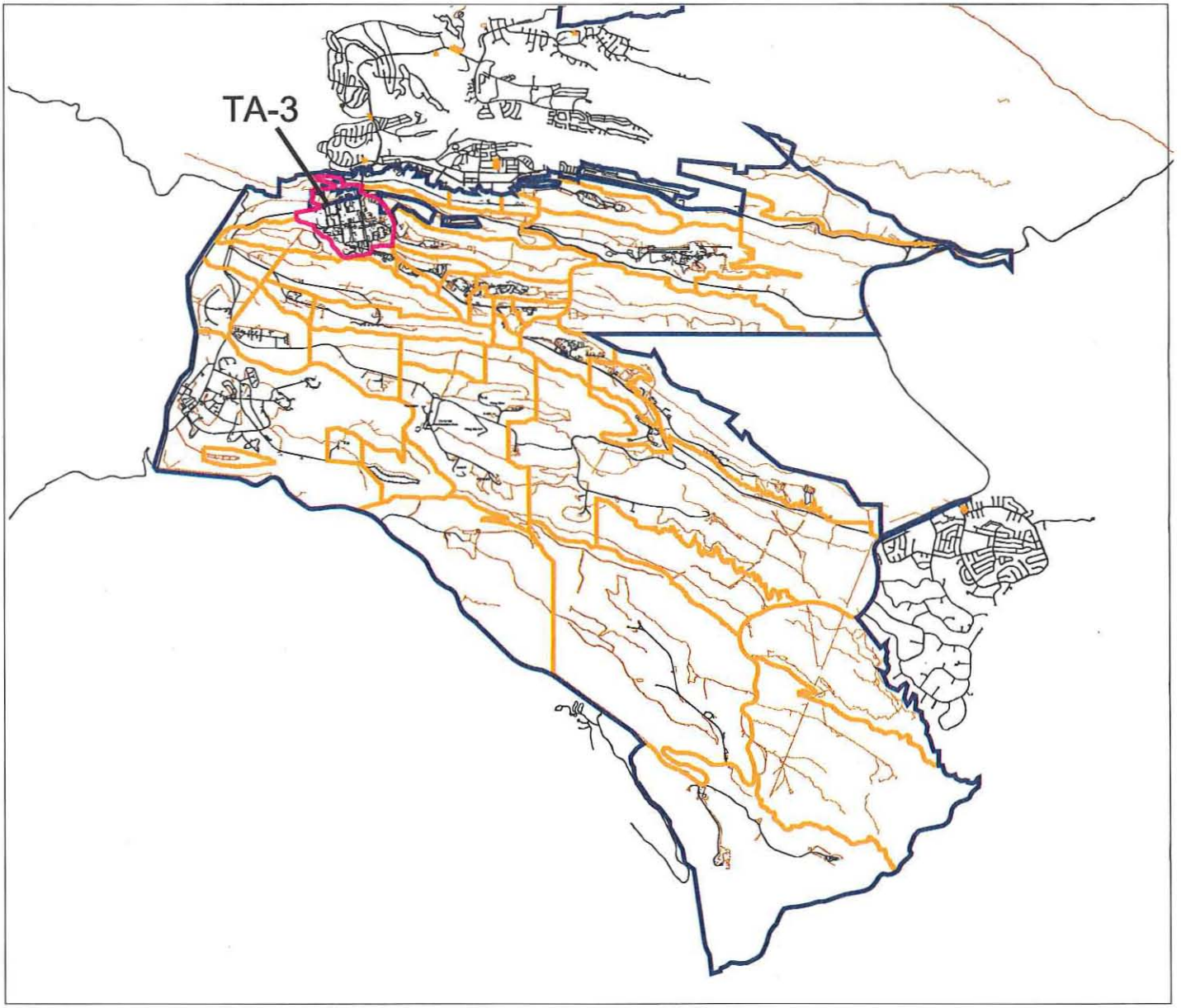
The State Historic Preservation Officer is requested to concur with the eligibility determination contained in this report and to concur that the proposed D&D action will adversely affect building TA-3-16.

Project Description

Between August 2002 and January 2005, several historic building surveys have been conducted at TA-3-16 by Kari Garcia and Ellen McGehee, Ecology Group, LANL; Ken Towery, Site and Project Planning Group, LANL; and John Ronquillo, Sigma Science, Inc.

TA-3-16 is scheduled for clean up and eventual demolition because it is an aging facility that can no longer provide the support needed for crucial LANL research functions. For this reason, the Department of Energy has relocated the research formerly done at TA-3-16 to other facilities at Los Alamos and throughout the Department of Energy complex. Due to the nature of past operations, the IBF is contaminated with tritium and other hazardous wastes and cannot be reused for another function.

The IBF is currently vacant and all experimental equipment is in "safe shutdown" mode. Personnel from the Ecology Group and from the Information, Records & Media Services Group salvaged operational records and other historical documents related to the use of



Los Alamos
National Laboratory
Cultural ResourcesTeam
ENV-ECO Ecology Group

1:110000

5000 0 5000 10000 15000 Feet

1000 0 1000 2000 3000 4000 5000 Meters

N
W E
S

Tech Area 3
LANL Boundary
LANL Tech Area Boundary
Roads
Roaddirt
Parkpave
Parkdirt

TA-3

Map 1

Los Alamos
National Laboratory

Cultural Resources Team
ENV-ECO Ecology Group

1:6000

200 0 200 400 600 800 1000 Feet

60 0 60 120 180 240 300 Meters

N
W E
S

- LANL Tech Area Boundary
- LANL Boundary
- Buildings/Structures
- Buildings/Structures
- Drainage
- Township, Section, Range
- USGS 7.5 Minute Quad
- Trails
- Roads
- Roaddirt
- Parkpave
- Parkdirt
- Fences

TA-3-16
Ion Beam Facility

Map 2

the IBF. These records are currently archived at the LANL Archives and Records Center. Additionally, in preparation for the decommissioning of TA-3-16, a metal mechanical building built in 1965 (TA-3-208) and several transportable buildings have been removed or will be decommissioned in the near future. Although these buildings are exempt from review under the terms of Department of Energy's programmatic agreement with the New Mexico State Historic Preservation Office concerning the management of historic properties at LANL (MOU DE-GM32-00AL77152), medium-format, black and white archival photographs of the exterior of the IBF and the facility's environs were taken before the removal of these buildings.

Historical Background Information

Technical Area 3

TA-3, South Mesa Site, is a large technical area located on top of South Mesa, across Los Alamos Canyon from the town of Los Alamos, New Mexico. TA-3 functions as the administrative center of LANL. The IBF (TA-3-16), the main administrative building (TA-3-43), the Oppenheimer Study Center, the Otowi Building, and numerous office and laboratory buildings are located at this technical area. The LANL administrative building, study center, and Otowi Building are located in a centrally located complex of buildings that serve as a focal point for visitors to the Laboratory.

TA-3 was developed during the Manhattan Project for use as a firing site. Facilities associated with the earliest use of TA-3 included a shop, magazine buildings, and buildings for the storage and assembly of scientific hardware. The wartime technical area was decommissioned and cleared in 1943. The early Laboratory's administrative functions were relocated from downtown Los Alamos (old TA-1) to TA-3 during the 1950s. Construction began at TA-3 in 1950 on buildings that were to replace the wartime facilities located in the Los Alamos townsite. The first buildings, including the IBF, became operational between mid-1951 and late-1952. A second stage of construction at TA-3 occurred during the mid- to late-1950s. Several major buildings were completed during these years, including the Laboratory's main administration building (Garcia and McLain 1999).

Accelerators, Nuclear Physics, and the Manhattan Project

Accelerators are key to the study of nuclear physics and thus are vital to the understanding of the development of nuclear weapons at Los Alamos. Accelerators speed up atoms, breaking them apart into subatomic particles, and allow scientists to investigate nuclear structure and nuclear forces, principally using radioactive elements such as uranium and plutonium. The Van de Graaff accelerator was one of the most important innovations in American nuclear technology. Invented in 1929 by Princeton University physicist Robert J. Van de Graaff, this new accelerator delivered a steady beam of particles that made it an ideal source for nuclear studies in the range of energies for fast neutron research. Its energy could be focused on a small target and varied at will

and allowed scientists to study nuclear processes as a function of bombarding energy (Seidel 1995).

Manhattan Project scientist Joe McKibben brought the first Van de Graaff accelerator to Los Alamos from the University of Wisconsin in 1943 (Hawkins *et al.* 1983). This first accelerator provided charged particles for nearly every conceivable neutron experiment and served a major role in the development of the first nuclear bombs during World War II (LASL 1964).

The Ion Beam Facility (TA-3-16)

In February 1946, the Laboratory named Joe McKibben the head of Group P-9, which placed him in charge of Van de Graaff construction at Los Alamos. During 1946, McKibben and his scientists tested new versions of the Van de Graaff that would not only continue existing experiments but would allow the Laboratory to experiment with different forms of neutrons and study reactions at high energies. Not least, having the world's most advanced Van de Graaff would also help the Laboratory keep many of the world's top physicists in Los Alamos. By 1946, the Laboratory had developed and begun to build a new Van de Graaff that used an 8-million-volt generator for power (LASL 1966; Hawkins *et al.* 1983).

The Van de Graff accelerators at TA-3-16 allowed scientists to do advanced research on nuclear energy. Starting in 1951 with the first operation of the vertical Van de Graaff, the newly constructed IBF became the home of accelerator research at post-war Los Alamos. The Laboratory continued its groundbreaking nuclear physics experiments at the IBF, which would eventually house two accelerators: the vertical Van de Graaff as well as a horizontal or "tandem" Van de Graaff. McKibben designed the vertical Van de Graaff between 1946 and 1950—a machine that allowed the acceleration of ions to 8 to 9 million electron volts (MeV). In its day, Los Alamos's vertical machine was the highest voltage Van de Graaff in the world. Over the years, the Laboratory made upgrades to the IBF and added the powerful tandem accelerator in 1965 (LANL n.d.). In 1970, the vertical accelerator received an upgrade allowing it to work at 10 MeV (LASL 1970). Overall, the Van de Graaff accelerators at TA-3-16 played an instrumental role in the continued development of nuclear weapons at Los Alamos and are key to the understanding of Laboratory history and the history of the nuclear age (Figures 1–4).

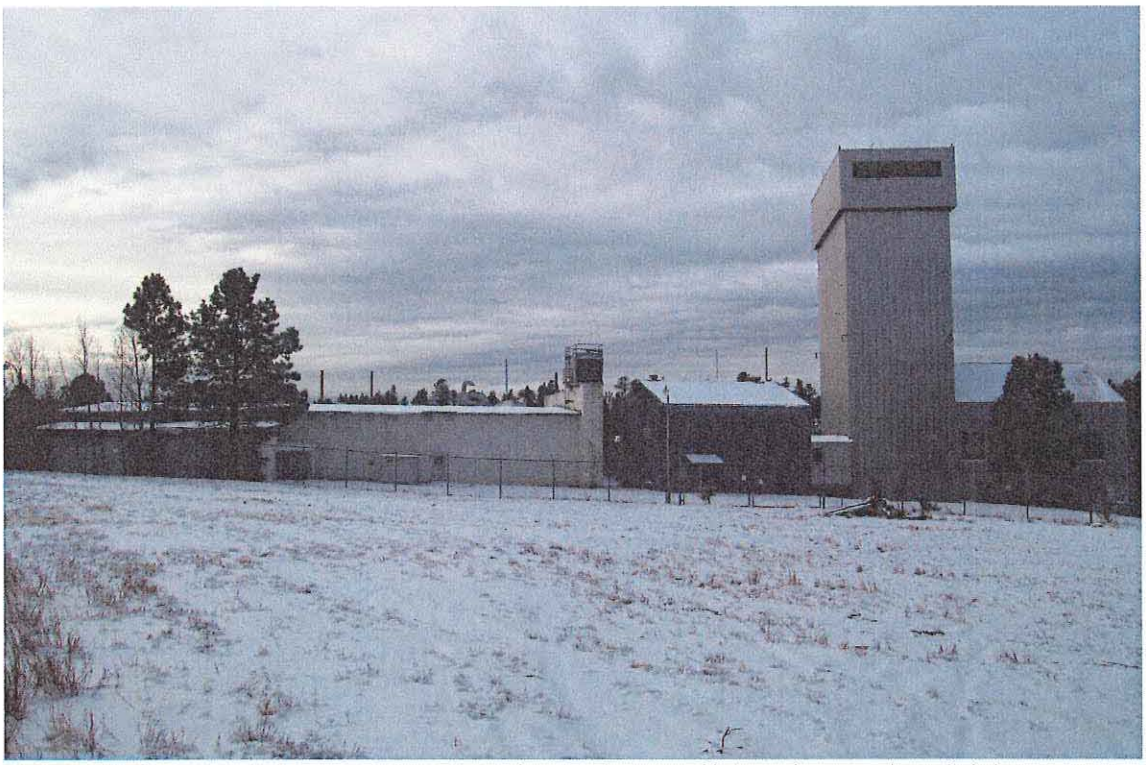


Figure 1. TA-3-16, Vertical Van de Graaff Accelerator (on right), Office Portion (on left)

Figure 2. TA-3-16, Front Entrance (office portion)

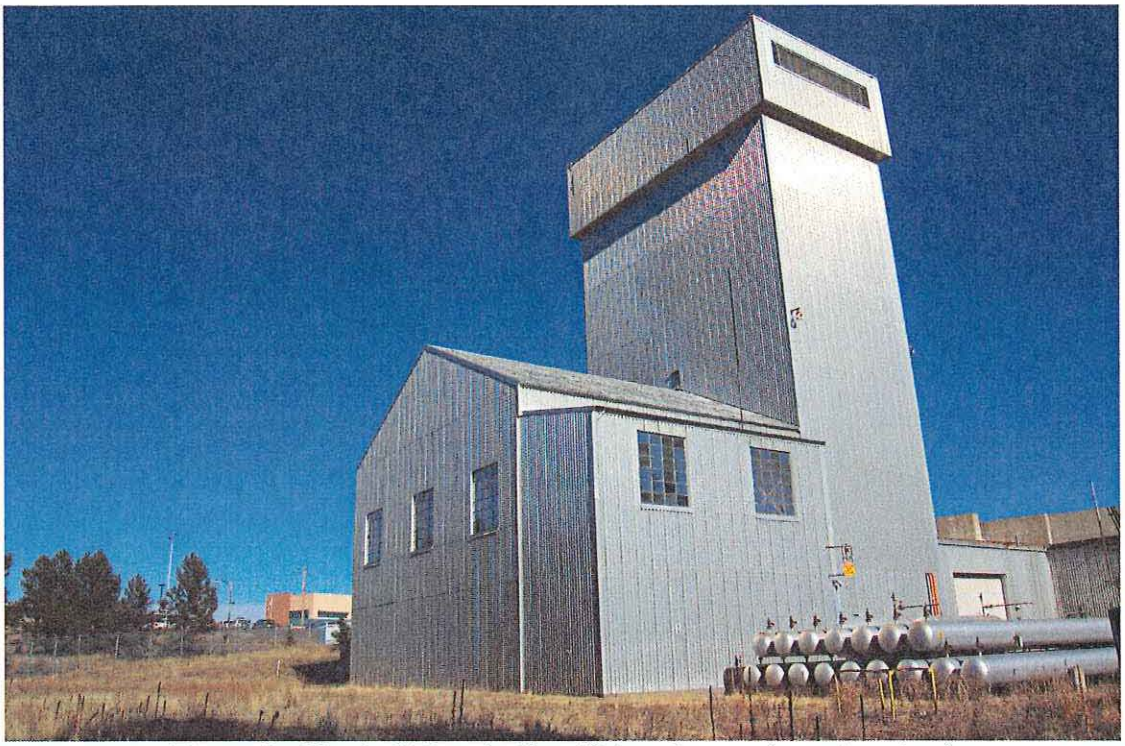


Figure 3. Vertical Van de Graaff Accelerator (exterior view)

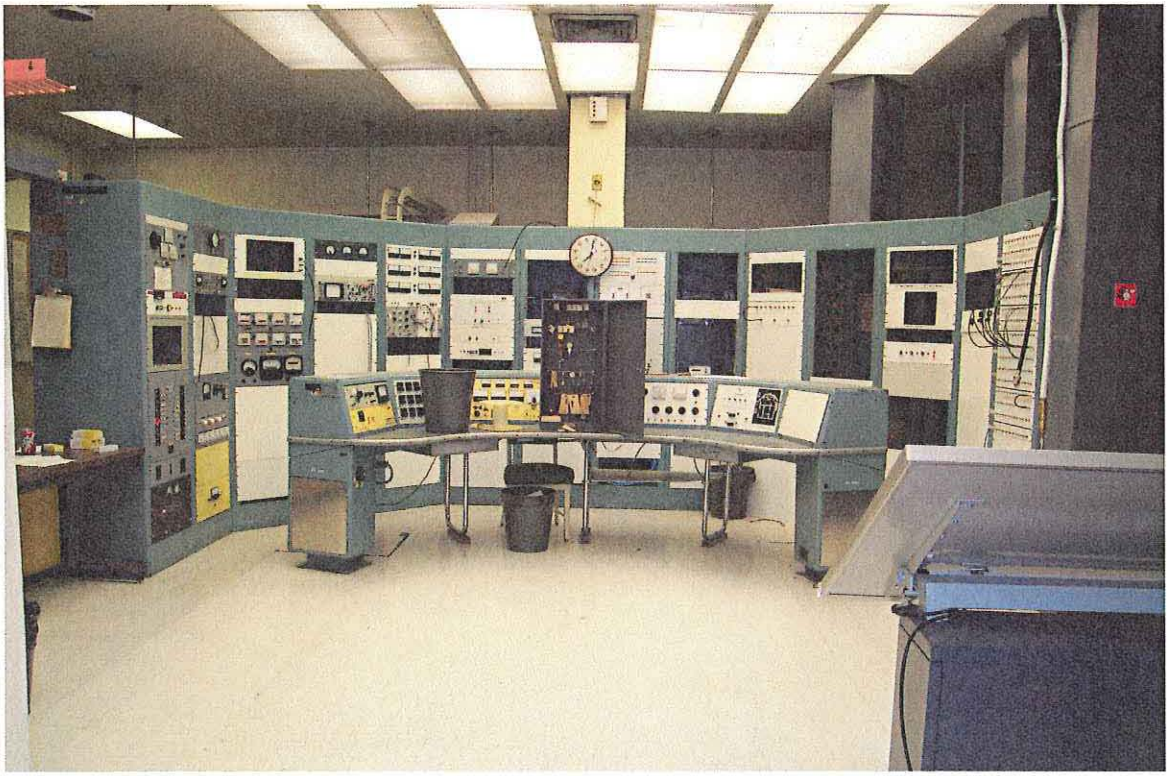


Figure 4. Van de Graaff Accelerator Control Room

Property Description

Building TA-3-16 is identified using the current LANL system of placing the TA prefix before the building number. Historically, however, the "SM" prefix (for South Mesa Site) was used in front of the building number, and some of the drawings included in this report may use the old system of building identification. For example, the term "SM-16" may be used in place of TA-3-16.

A brief architectural description of the IBF is provided below. A site form for building TA-3-16 will be included in a subsequent report once a treatment plan to resolve the adverse effects has been developed.

TA-3-16

The main portions of the IBF were built in the early 1950s. Due to its unique design, the building's function has been limited to supporting ion beam research. The building's footprint is approximately 200 ft by 250 ft.

The IBF layout consists of three distinct wings with associated basement areas: a ground floor office wing on the east third of the building, a laboratory/control room wing in the center/south third of the building, and the tower wing on the west third of the building. TA-3-16's unique tower enclosure creates a striking elevation and is visible throughout the TA-3, South Mesa area. The tower wing is separated from the other portions of the building by a massive concrete radiation containment wall. Two additions on the south side are also apparent.

The eastern portion of TA-3-16 is the office area and is at grade level with a split-level equipment room to the south. This portion of the building is cast-in-place concrete with engaged concrete columns and beams. The foundation system consists of concrete footings, stem walls, and basement walls, with concrete slab on grade and elevated concrete slabs over the basement areas. The construction method demonstrates a monolithic pour of the structural components, walls, and concrete roof. The roof is a low-slope structure of concrete construction with multiple layers of built-up roofing and metal flashing,

The center portion of the IBF is also cast-in-place concrete, similar in construction method to the eastern portion. The basement of the center portion also contains a utility tunnel, which served as a fallout shelter when the building was occupied. Attached to the center portion of the building at the south elevation, a pre-engineered steel building addition has been added. It consists of steel columns and beams with galvanized steel-rib wall and roof panels.

The west portion of the building is the tower facility. This construction is a heavy-duty steel frame industrial structure. The exterior of this portion, unlike the center section, is covered with aluminum panels. The tower is seven stories high with a window bay at the uppermost level.

Access to the facility is gained from a paved approach area on the south through personnel and equipment-sized doors. The front door of the facility is on the east side. Metal or concrete canopies cover the personnel entries. Mechanical equipment on the roof, including a condenser tower, exhaust fans, and vents, are visible from a distance. The exterior colors are white paint over concrete on the office (front) portion, with exposed galvanized and aluminum panels and unpainted concrete on the other surfaces of the building.

Integrity Issues and Potential for Contamination

Most of the office equipment and some of the control panels have been removed from the IBF. Other than this loss of interior integrity, the building has not been significantly modified since its period of significance. The two accelerators and associated laboratory equipment are still located inside the building. As noted above, Laboratory personnel have removed the facility's operating records and these are stored at the LANL Archives.

The following hazardous materials are (or could potentially be) found in TA-3-16: asbestos, lead, tritium, and mixed waste from the acceleration experiments.

Eligibility Recommendation

TA-3-16 is eligible for nomination to the National Register of Historic Places. This determination is made under Criterion A of the National Historic Preservation Act of 1966, due to its association with important events during the Cold War years at Los Alamos (U.S. Department of Interior 1991). The Van de Graaff accelerators were some of most significant scientific tools at Los Alamos for conducting nuclear experiments; these accelerators played a major role in pure physics research and in experiments related to the development of America's nuclear arsenal during the 1950s and 1960s.

TA-3-16 is also eligible for the National Register under Criterion C, architectural and engineering significance, due to the building's unique design and its association with world-class Van de Graaff accelerators (Figures 5 and 6).

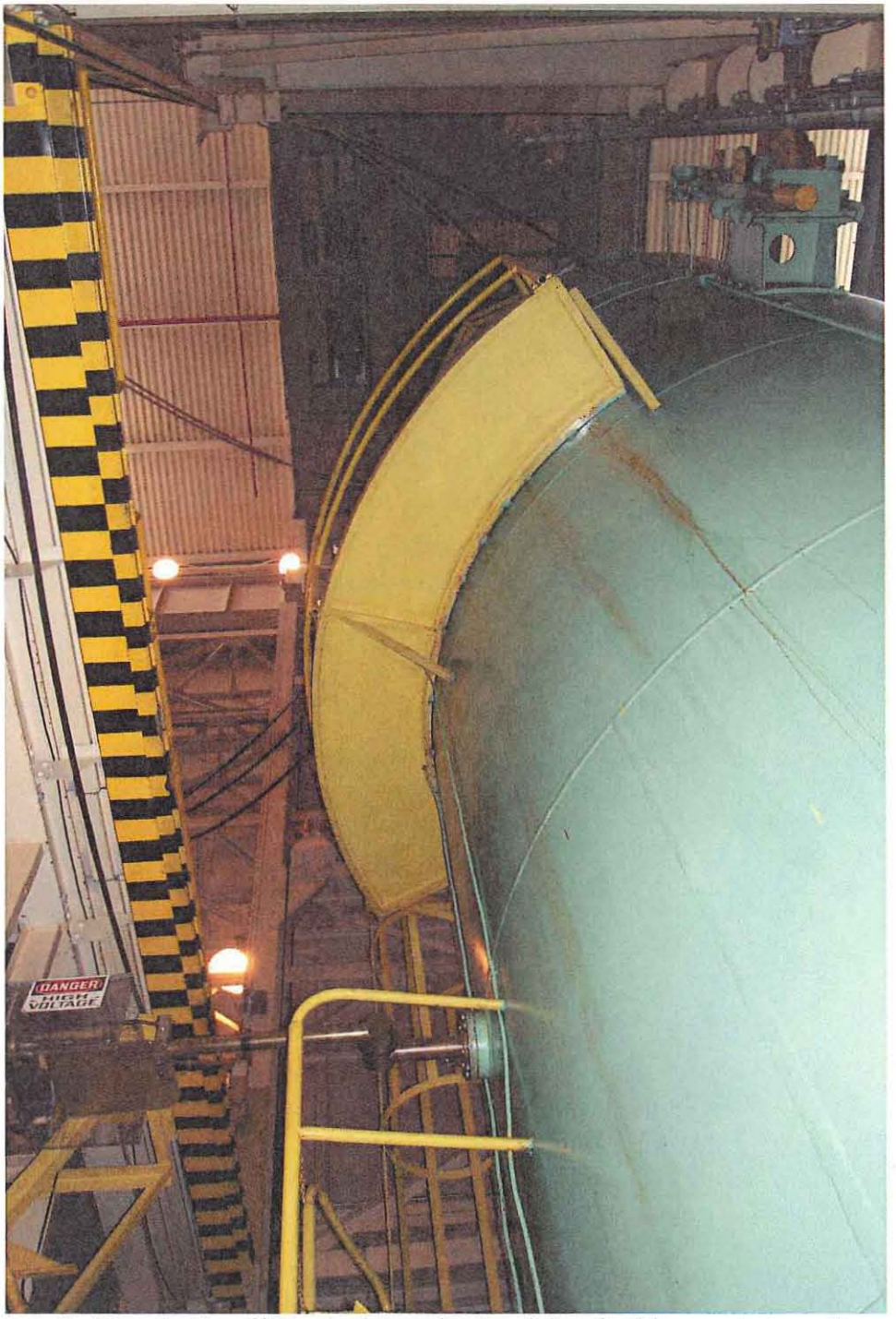


Figure 5. Van de Graaff Vertical Accelerator (view looking up to top of tower)

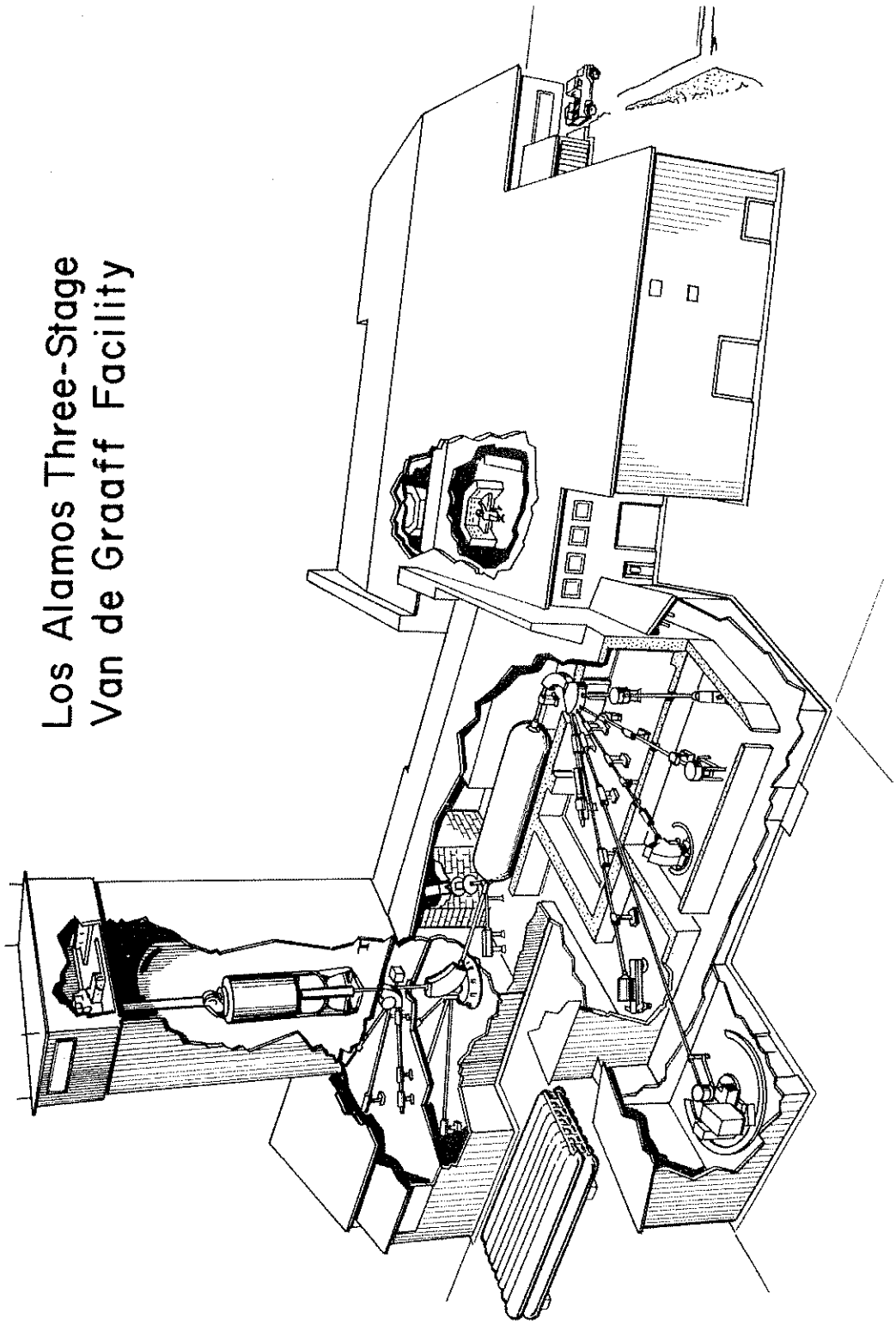


Figure 6. The IBF

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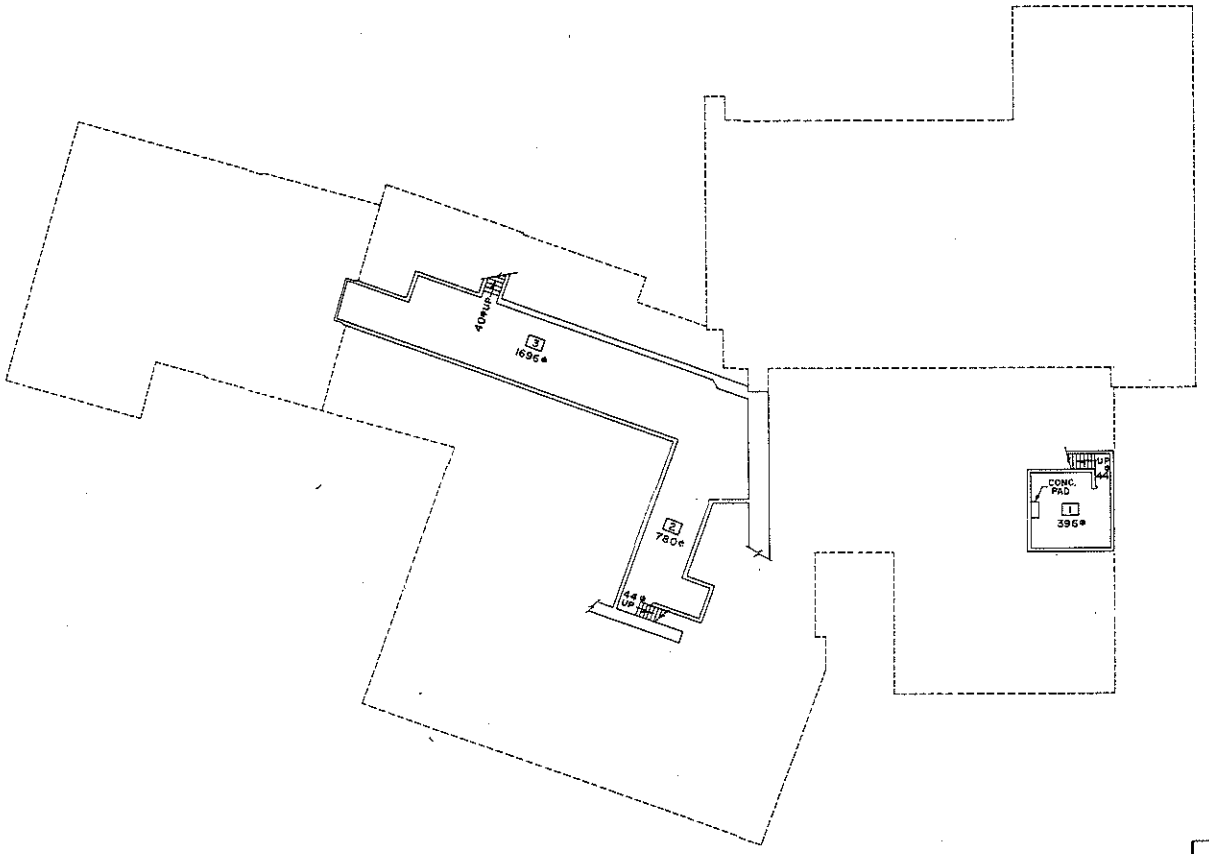
Appendix A

Floor Plans and Selected Photographs: TA-3-16



1/16" = 1'-0" 0 10 20 30 40 50
GRAPHIC SCALE

REV.	DATE	REVISION	BY	CKD.	APP.
3	6-7-84	REVISED TO STATUS OF 6-7-84	HSN		

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FACILITIES ENGINEERING DIVISION

VAN DE GRAAF LABORATORY

SUB BASEMENT FLOOR PLAN

BLDG. SM-16 TA-3

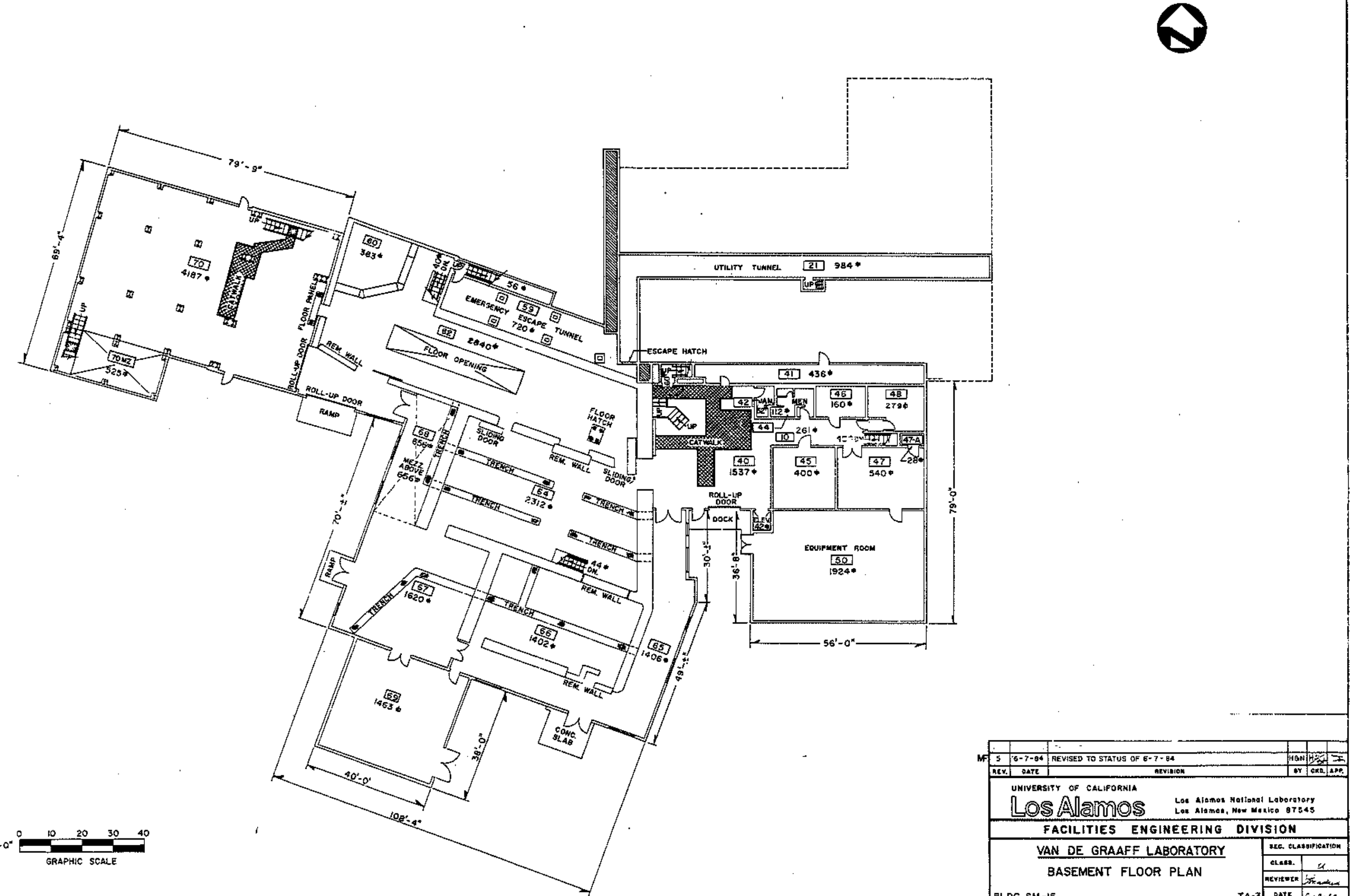
SEC. CLASSIFICATION: CLASS. U
REVIEWER: [illegible]
DATE: 6-8-84

SUBMITTED	RECOMMENDED	APPROVED
[signature]	[signature]	[signature]

DRAWN: BREMER
CHECKED: [signature] HSN

DATE: 3-16-84
SHEET NO. 1 OF 5
DRAWING NO. ENG-R3390

SUB BASEMENT FLOOR TOTAL SQ. FT. 3000



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FACILITIES ENGINEERING DIVISION

VAN DE GRAAFF LABORATORY
BASEMENT FLOOR PLAN

BLDG. SM-16 TA-3

SEC. CLASSIFICATION	
CLASS.	U
REVIEWER	
DATE	6-8-86

SUBMITTED	RECOMMENDED	APPROVED

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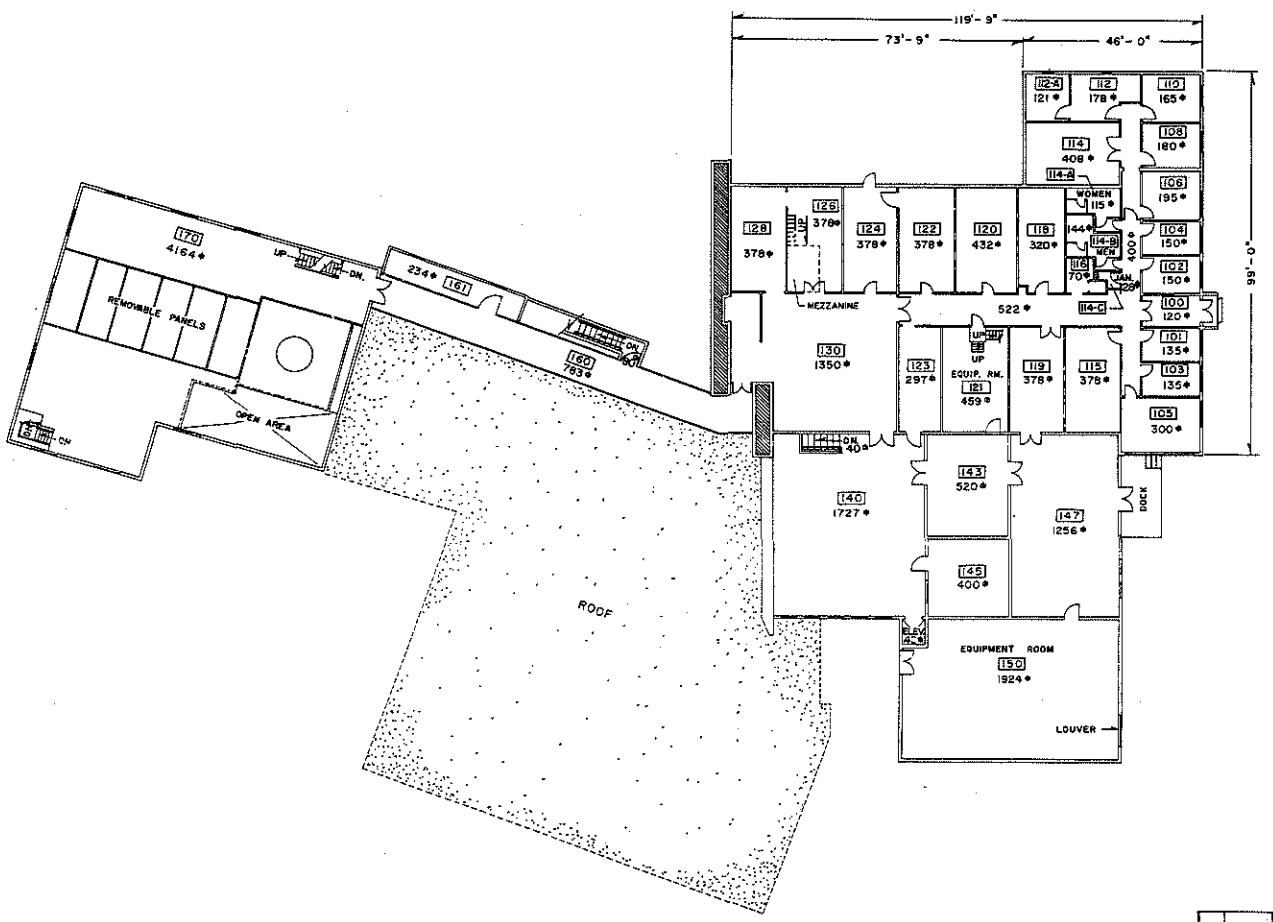

1/16" = 1'-0"

0 10 20 30 40 50

GRAPHIC SCALE

FIRST FLOOR TOTAL 19,812 S.F.

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FACILITIES ENGINEERING DIVISION

VAN DE GRAAFF LABORATORY

FIRST FLOOR PLAN

BLDG. SM-16 TA-3

SEC. CLASSIFICATION
CLASS. U
REVIEWER
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SUBMITTED	RECOMMENDED	APPROVED

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DATE 3-16-64
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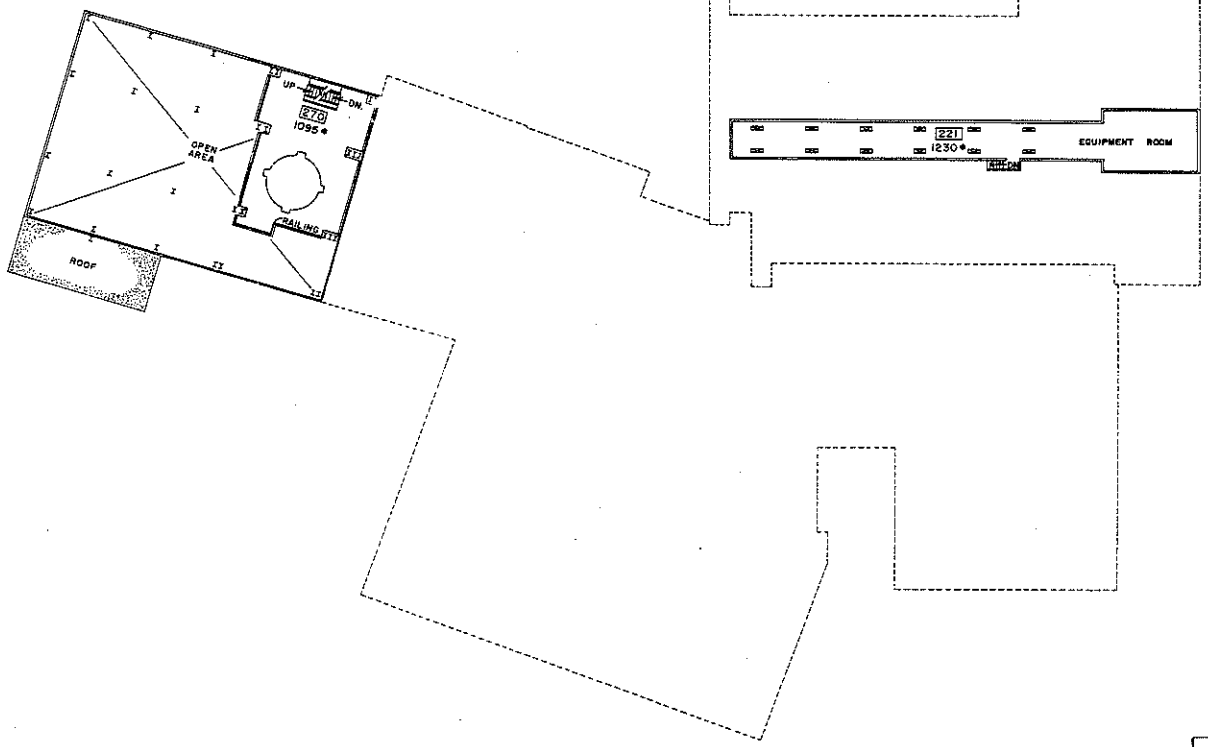

1/16" = 1'-0"

0 10 20 30 40 50

GRAPHIC SCALE

SECOND FLOOR TOTAL SQ. FT 2325

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SECOND FLOOR PLAN

BLDG. SM-16 TA-3

SEC. CLASSIFICATION
CLASS. U
REVIEWER
DATE 6-8-84

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CHECKED

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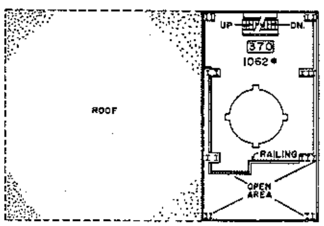
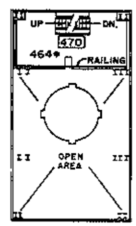
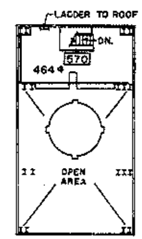


3RD FLOOR PLAN



4TH FLOOR PLAN



5TH FLOOR PLAN

1/16" = 1'-0" 0 10 20 30 40 50

GRAPHIC SCALE

SUB BASEMENT	FLOOR	TOTAL	SQ. FT.	3000
BASEMENT	FLOOR	TOTAL	SQ. FT.	25,153
FIRST	FLOOR	TOTAL	SQ. FT.	19,812
SECOND	FLOOR	TOTAL	SQ. FT.	2325
THIRD	FLOOR	TOTAL	SQ. FT.	1062
FOURTH	FLOOR	TOTAL	SQ. FT.	464
FIFTH	FLOOR	TOTAL	SQ. FT.	464
		TOTAL	SQ. FT.	52,280

REV.	DATE	REVISION	BY	CKD.	APR.
4	6-7-84	REVISED TO STATUS OF 6-7-84	HBN		

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FACILITIES ENGINEERING DIVISION

VAN DE GRAAFF LABORATORY

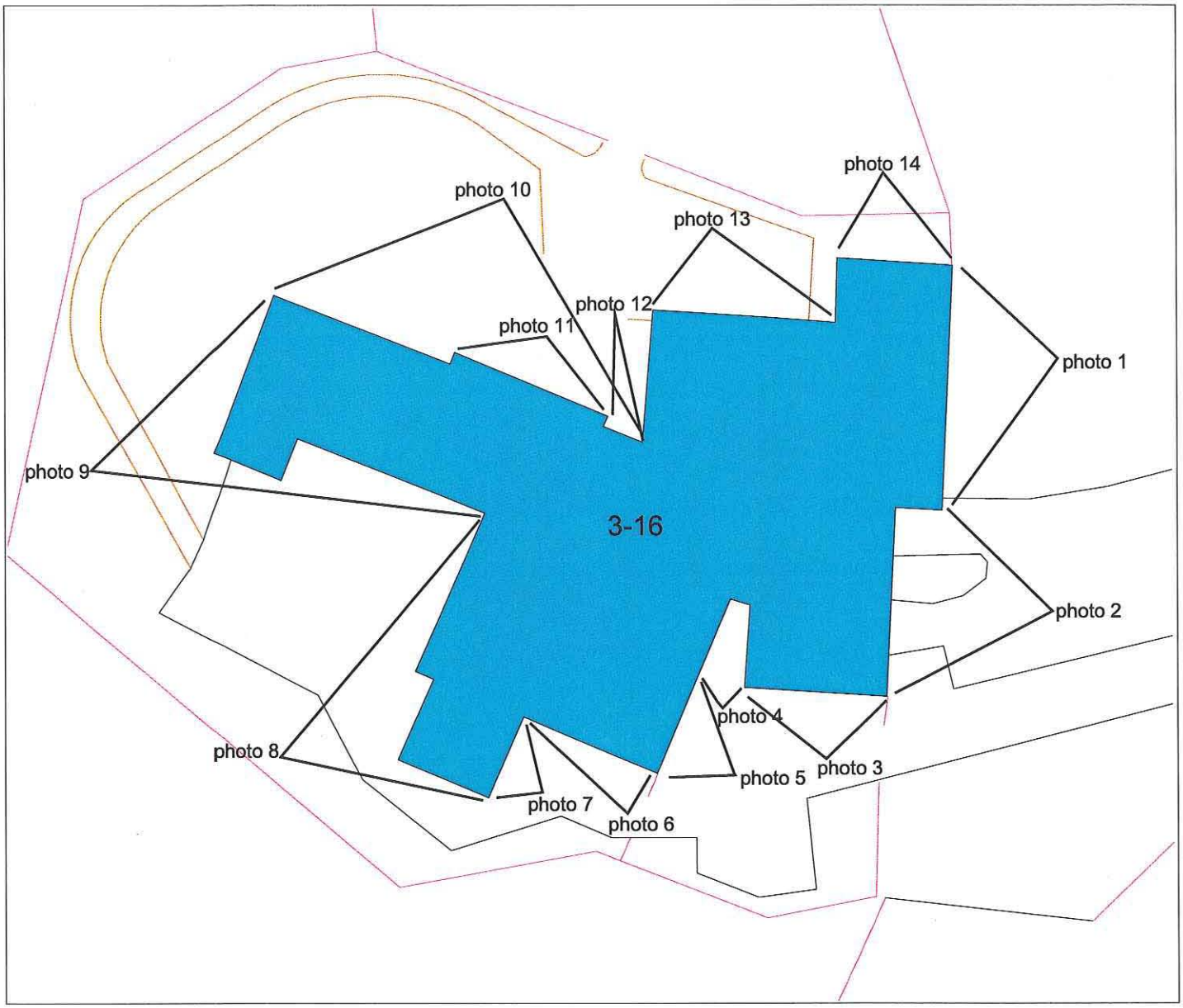
3RD, 4TH & 5TH FLOOR PLAN

BLDG. SM-16 TA-3

SEC. CLASSIFICATION — CLASS. U — REVIEWER — DATE 6-8-84

SUBMITTED — RECOMMENDED — APPROVED

DRAWN BREMER — CHECKED — DATE 3-17-64 — SHEET NO. 5 OF 5 — DRAWING NO. ENG-R3394



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Cultural Resources Team
ENV-ECO Ecology Group

1:800

40 0 40 80 Feet

10 0 10 20 Meters

N
W E
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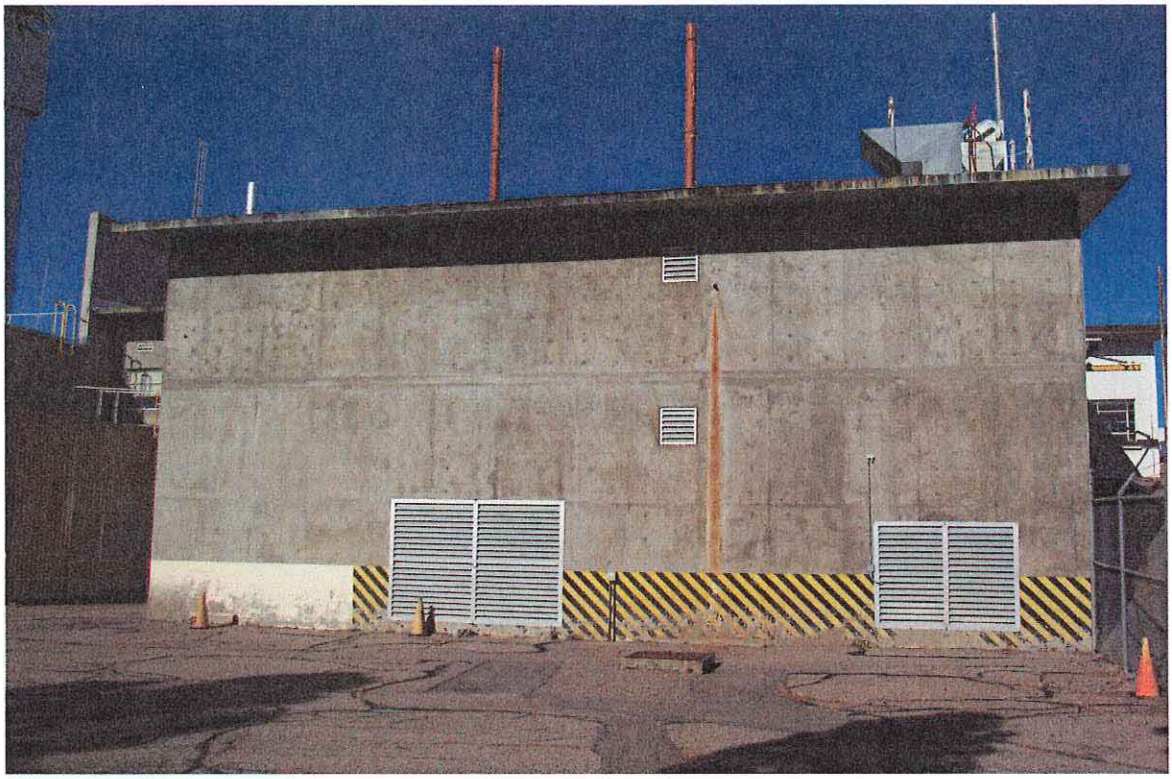
LANL Tech Area Boundary
LANL Boundary
Buildings/Structures
Drainage
Township, Section, Range
USGS 7.5 Minute Quad
Roads
Roaddirt
Parkpave
Parkdirt
Fences

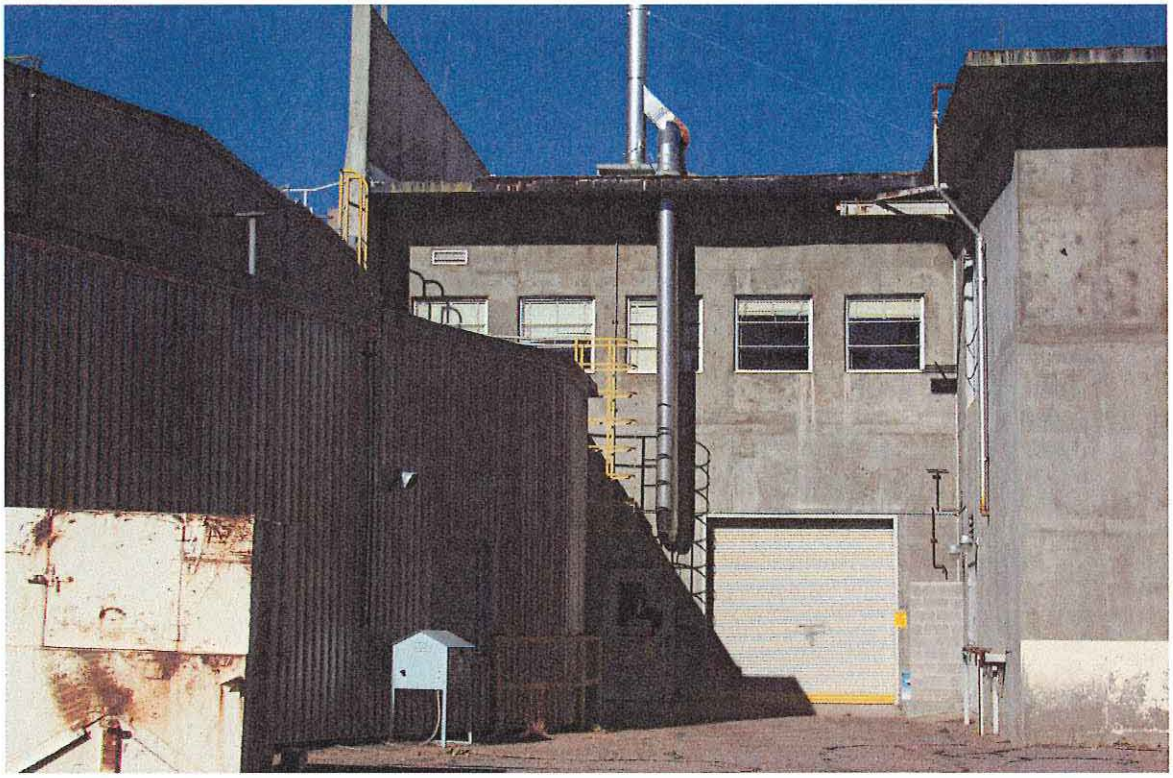
TA-3-16

TA-3-16, East elevation, north half, photo 1

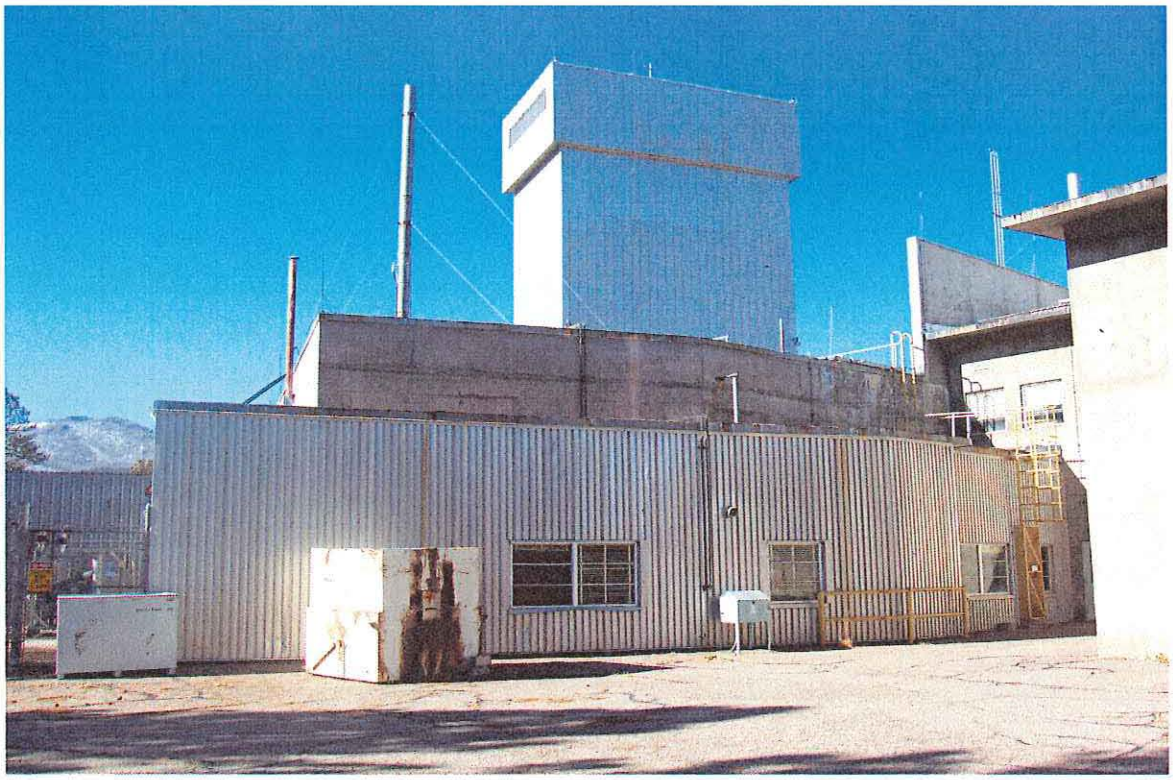
TA-3-16, East elevation, south half, photo 2



TA-3-16, South elevation, east portion, photo 3

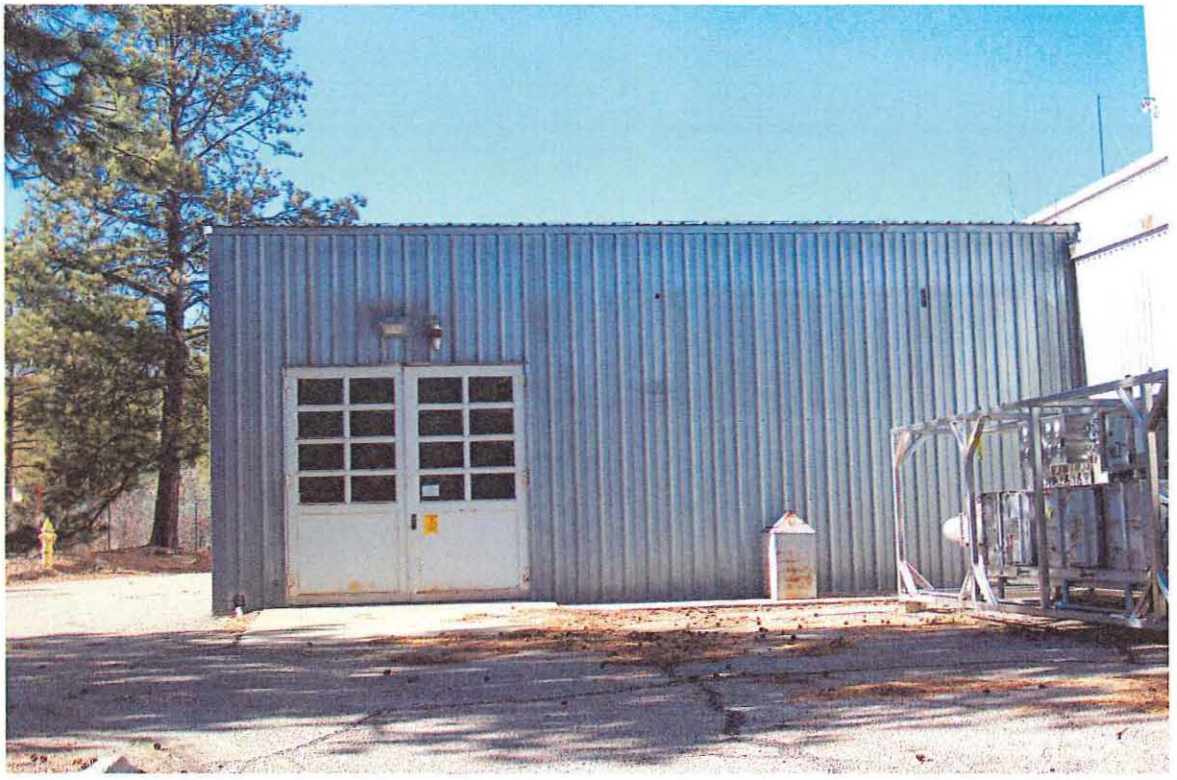


TA-3-16, South elevation, east portion, photo 4

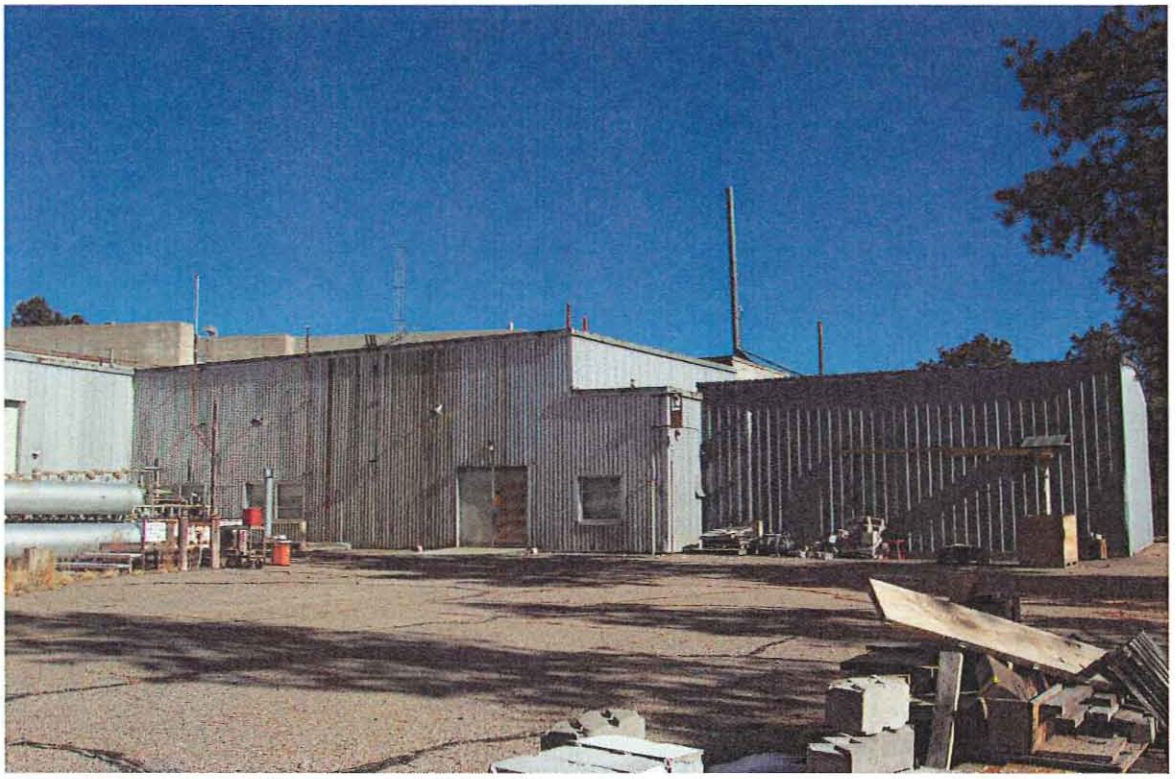


TA-3-16, East elevation, photo 5

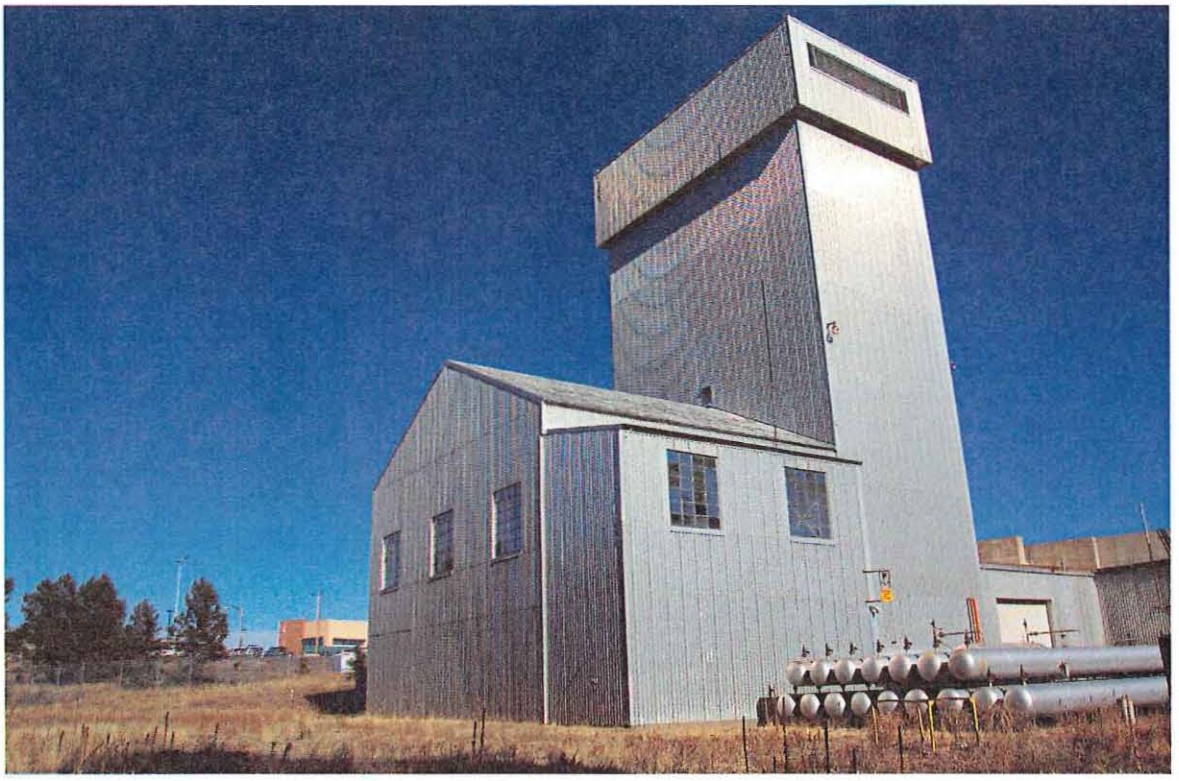
TA-3-16, South elevation, eastern portion, photo 6



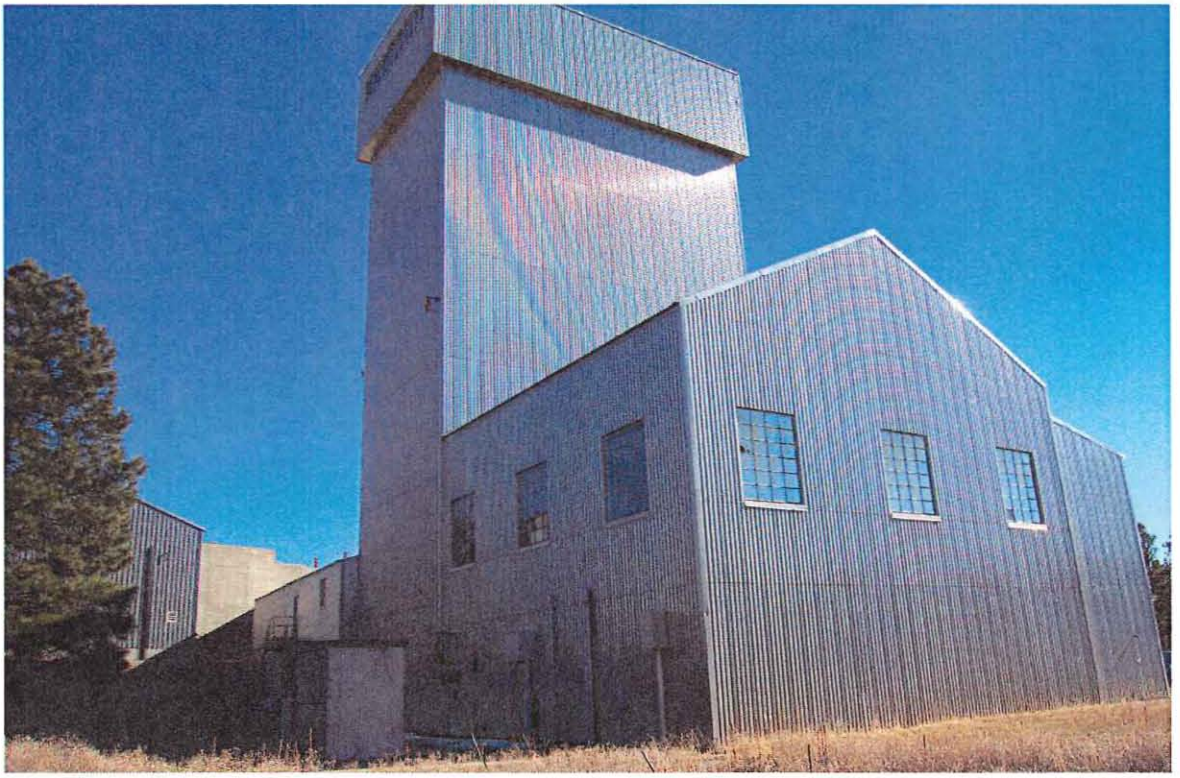
TA-3-16, East elevation, photo 7



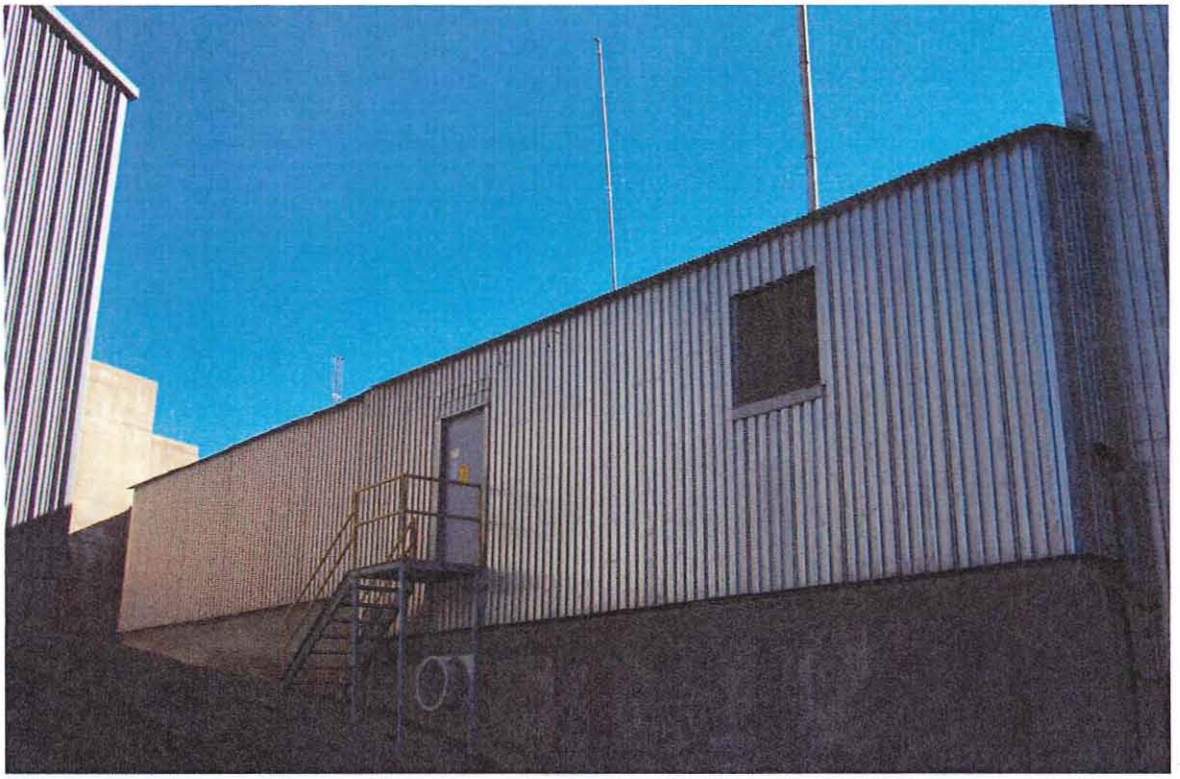
TA-3-16, West elevation, photo 8



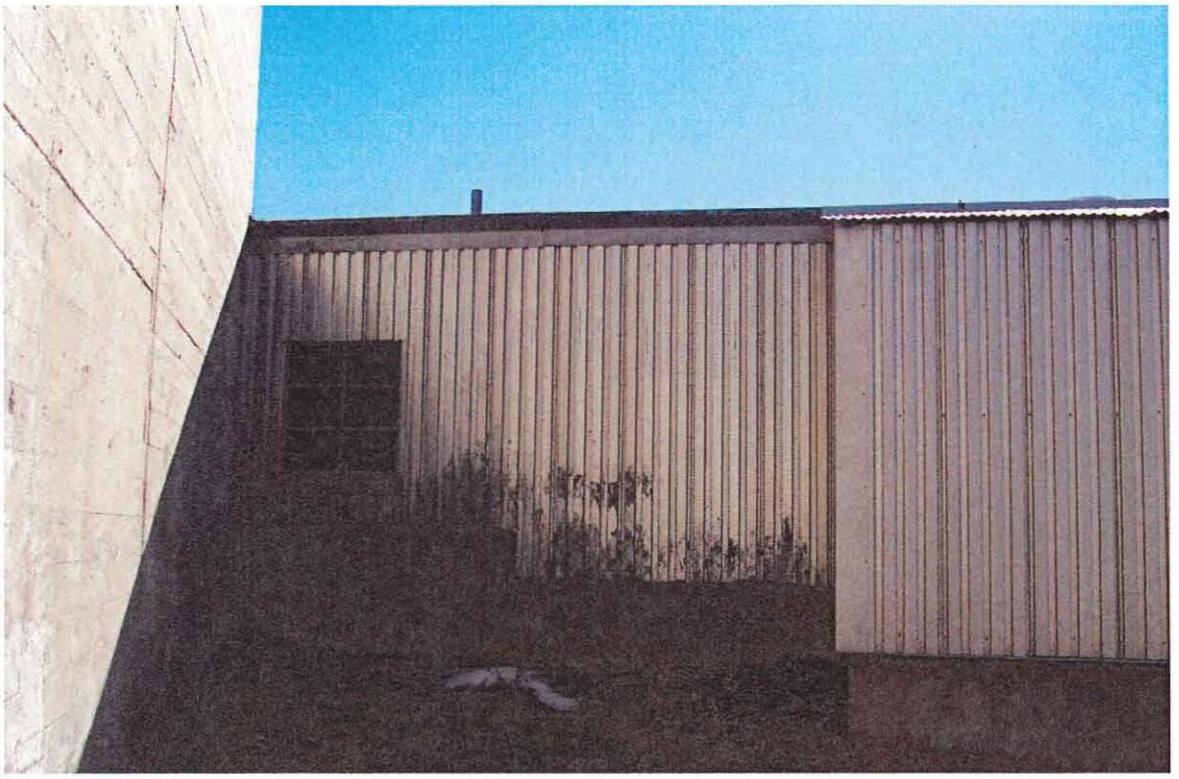
TA-3-16, West and south elevations, photo 9



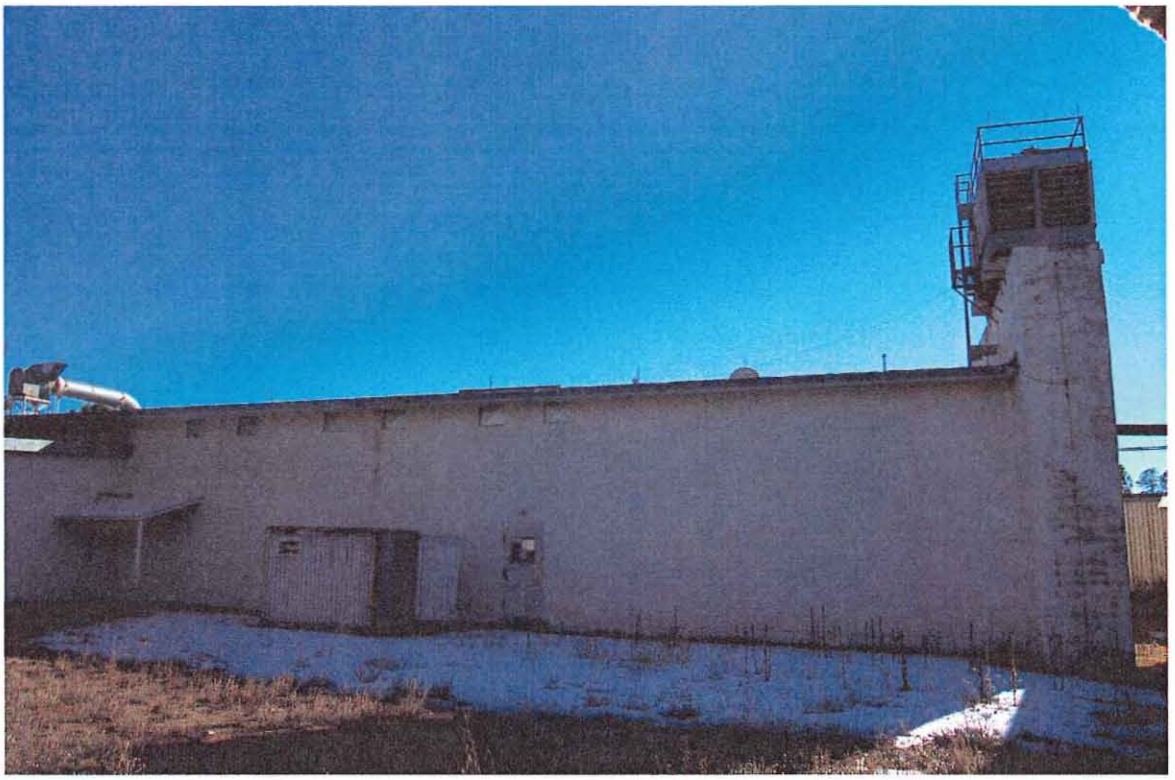
TA-3-16, North and west elevations, photo 10



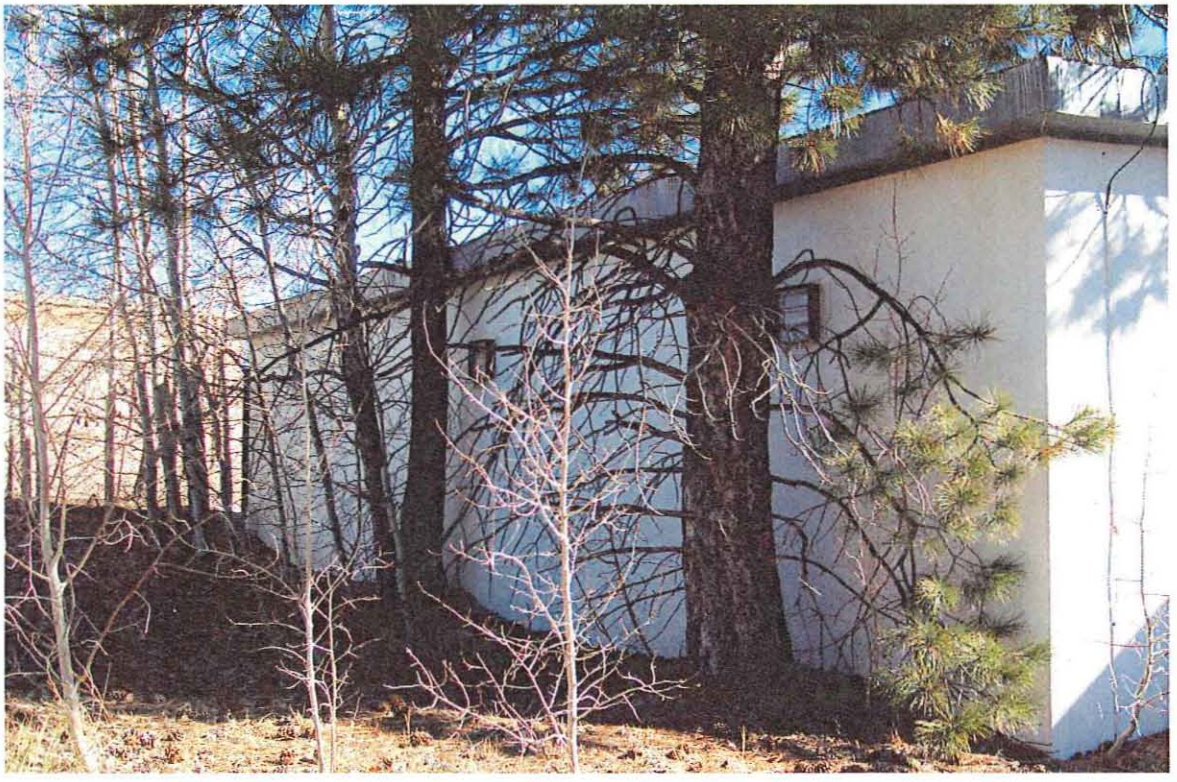
TA-3-16, North elevation, central portion, photo 11



TA-3-16, North elevation, photo 12



TA-3-16, North elevation, photo 13



TA-3-16, North elevation, eastern portion, photo 14