MARYLAND HISTORICAL TRUST
DETERMINATION OF ELIGIBILITY FORM

NR Eligible: yes X
no ___

Property Name: Armed Forces Radiobiology Research Institute Inventory Number: M: 35-173

Address: ___ Historic district: ___ yes X no

City: Bethesda Zip Code: 20889-5603 County: Montgomery

USGS Quadrangle(s): Kensington

Property Owner: United States Navy Tax Account ID Number: ___

Tax Map Parcel Number(s): ___ Tax Map Number: ___

Project: Contract N40080-07-D-0311-0056 Agency: NAVFAC

Agency Prepared By: The Louis Berger Group

Preparer's Name: Sarah Groesbeck Date Prepared: 12/2/2011

Documentation is presented in: ___

Preparer's Eligibility Recommendation: X Eligibility recommended ___ Eligibility not recommended

Criteria: X A ___ B X C ___ D Considerations: ___ A ___ B ___ C ___ D ___ E ___ F X G

Complete if the property is a contributing or non-contributing resource to a NR district/property:

Name of the District/Property: ___

Inventory Number: ___ Eligible: ___ yes Listed: ___ yes

Site visit by MHT Staff X yes ___ no Name: Amanda Hoole Date: 5/20/10

Description of Property and Justification: *(Please attach map and photo)*

Setting

The Armed Forces Radiobiology Research Institute (AFRRI) is located at Naval Support Activity Bethesda (NSA Bethesda) in Bethesda, Maryland. The facility is located near the center of NSA Bethesda, east of the intersection of Stone Lake Road and Palmer Road South. The buildings that comprise AFRRI sit on a hillside lot that slopes downward to the northwest. AFRRI is adjacent to the National Naval Medical Center Historic District, the borders of which run along the west and south sides of the facility.

The eight buildings that comprise AFRRI, Buildings 42 to 48, are connected, and were constructed during an extended building campaign that spans from initial construction in 1962 to the last major addition in 1988 (Figure 1). A large part of the facility is located below grade; the majority of the buildings are three or four stories with two of those stories fully or partially below grade. Buildings 43, 47, and 48, which appear on the exterior to be separate from the main block of buildings, are connected below-grade.

Description

MARYLAND HISTORICAL TRUST REVIEW

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MHT Comments:

Amanda Hoole 1/20/12
Reviewer, Office of Preservation Services **Date**

Beth Savage 1/20/12
Reviewer, National Register Program **Date**

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The original AFRRI complex, completed in 1963, consisted of three buildings: Building 42, with the reactor and laboratory facilities; Building 43, used for animal research; and Building 44, the Modulator Room. Construction at AFRRI took place in several phases, at least four of which seem to have been in original plans for the facility. Phase I construction appears to have been completed in 1962-1963. Phase II included laboratory additions to the west side of Building 42, completed in 1963. Phase III of the plan was the construction of Building 45, the Positive Ion Accelerator (PIA) Building, in 1967, connected to the east side of Building 42. In 1970 Phase IV added Building 46, the four-story laboratory and technical support building south of Building 45. Building 47 was constructed eight years later, in 1978, adding to the animal research facilities in Building 43 by expanding it to the east. The last building to be constructed, Building 48, was completed in 1988, the small Radiological Liquid Storage Facility north of Building 43.

Photographs of building interiors were not permitted.

Building 42

Building 42, built in 1962-1963, is three stories. The first story is completely below grade; the second story is above grade on its west and north elevations; and the third story is completely above grade. The building is used as office and laboratory space, and houses the TRIGA Mark-F "pulsing" nuclear reactor and the Low Level Cobalt Facility. Building 42 consists of four sections: 42A, 42B, 42C, and 42D, each roughly rectangular in shape. Section 42D comprises the northwestern portion of the building and Building 42A the northeastern portion, with Section 42B to their south. Section 42C adjoins the west elevation of 42B, its south elevation projecting beyond the south elevation of 42B.

In Section 42A, the Reactor Building, the top level contains the reactor room, glass-enclosed control room, and two offices. The first sub-level contains a concrete-shielded "hot cell" for examination of irradiated specimens, a specimen preparation area, and storage space. The second sub-level, on a plane with the core of the TRIGA reactor at the bottom of the 19½-foot-deep reactor pool, houses the fast neutron exposure room, a thermal neutron exposure room, the linear accelerator area, and the accelerator exposure cell. Sections 42B and 42C contain research laboratories. Section 42D contains maintenance shops, storage, and administrative areas.

Building 42 in its entirety is reinforced poured concrete with a built-up flat roof. The lower portion of the exterior walls is clad in standing-seam metal, with corrugated metal siding above. Its original brick and concrete exterior survives under the metal cladding. The majority of the building is unfenestrated, though the south and west elevations of Section 42C have fixed single-light metal sash windows. The main entrance to the AFRRI facility is a projecting one-story one-bay enclosed vestibule located on the east side of the south elevation of Section 42B. The projecting entrance is concrete block with a corrugated-metal shed roof. Its glass south elevation has a double-leaf metal door with glazing surrounded by a transom and sidelights. A second single-leaf glazed metal door is located at the south end of the vestibule's west elevation.

A loading dock area is located on the north elevation of Section 42C and the west elevation of Section 42D. The concrete docks are covered by corrugated-metal shed roofs with metal post supports. The loading dock on Section 42D wraps around to the north elevation. A metal staircase at the end of the dock leads to a single-leaf metal door on the third floor.

Building 43

Building 43, the Animal Research Building, is a rectangular three-story poured concrete building with a built-up flat roof. The west end of the building, completed in 1962, is one story with a second-story mechanical penthouse. The east end, constructed soon after in 1963, is two stories with a 1964 third-story addition. A recently constructed fourth floor mechanical penthouse is located on the east end of the building. The original concrete exterior of the building remains intact, covered in standing-seam metal cladding, with corrugated-metal siding running along the top of the 1963 addition.

MARYLAND HISTORICAL TRUST REVIEW

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

The building, for the most part, is unfenestrated. The west elevation of the building has a single-leaf flush metal door on the second story, accessed by a metal balcony with a flight of metal stairs. The first floor of the north elevation has three door openings accessed by a concrete slab platform running the width of the building with a metal balustrade.

Building 44

Building 44, built circa 1962, originally served as the Modulator Room and is currently used for facilities support. It is a one-story above-grade concrete-block building with a built-up flat roof and is located on the third level of the facility between Buildings 45 and 43. A one-story metal mechanical penthouse has been built on the east side of the roof. A large roll-up metal door is on the west side of the south elevation. A single-leaf flush metal door provides access to the building on the north end of the west elevation.

Building 45

Building 45, built in 1967, originally served as the Positive Ion Accelerator Building and currently houses the linear accelerator (LINAC) and provides lab space. It is a three-story poured concrete building with a built-up flat roof. The west elevation of Building 45 adjoins Building 42; Building 46 adjoins it to the south. The first two stories are below grade, extending 66 feet east of the third story. The LINAC is located on the first story. The lower third of its exterior elevations has been clad with standing-seam metal siding, and the remainder is covered with corrugated-metal siding. The original cast concrete exterior survives under the metal siding. Its south and east elevations have single-leaf metal doors. The north elevation has two double-leaf flush metal doors and a single-leaf metal door on the west end of the elevation. The east end of the elevation has a stairwell leading down to a single-leaf metal door.

Building 46

Constructed in 1970, Building 46 is a three-story poured concrete laboratory and technical support building with a built-up flat roof. The first floor of the building is below grade. Standing-seam metal cladding covers the lower third of the exterior, with corrugated metal siding above. Its original concrete and brick exterior is intact beneath the metal siding. The west, south, and east elevations are broken by vertical window bays with narrow paired fixed metal-sash windows. The south side of the east elevation has a single-leaf flush metal door with one glazed light, reached by a concrete walkway with a metal railing. The north side has a two-bay poured concrete loading dock with a corrugated-metal shed roof and metal supports covering a single-leaf metal door.

The interior of the building is used as office, conference room, and laboratory space. The Cobalt Facility, part of Building 46, is a 38x48-foot projecting wing on the south side of its west elevation. The roof of the Cobalt Facility is a concrete pad used as a patio area in front of the main entrance to AFRRI and is enclosed with a metal railing. The west side of Cobalt Facility has a sloping stone retaining wall.

Building 47

Building 47, completed in 1980, is a four-story concrete-block animal research facility with a flat built-up roof. The building's north and east elevations are entirely above grade, with its first and second stories at least partially below grade on the west and south elevations. The first floor of the east and north elevations is clad in metal panels, and the remainder of the building has a brick and concrete veneer. The building is almost completely unfenestrated. An inset loading dock is located on the south side of the east elevation and is covered by a concrete canopy supported by a concrete column. A second inset opening is located on the west side of the north elevation. At the time of the site visit, a fourth-floor addition was under construction on the east end of Building 47.

Building 48

MARYLAND HISTORICAL TRUST REVIEW

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

Building 48, the Radiological Liquid Storage Facility, is a two-story gable-roof poured concrete building completed in 1988. It is connected to the north elevation of Building 43 via a one-story gable-roof hyphen. The exterior walls of the building are exposed poured concrete on the first story and clad with standing-seam metal on the second story, capped with a standing-seam metal roof. The east elevation features a roll-up metal door.

Historical Background

The official AFRRI website states that:

"The unique resources of the Armed Forces Radiobiology Research Institute (AFRRI) enable advancements in the protection of soldiers and citizens. The AFRRI mission is to preserve the health and performance of U.S. military personnel and to protect humankind through research that advances understanding of the effects of ionizing radiation. To these ends, the institute collaborates with other government facilities, academic institutions, and civilian laboratories in the United States and other countries to research the biological effects of ionizing radiation. In addition, it provides medical training and emergency response to manage incidents related to radiation exposure. . . . Located on the grounds of the National Naval Medical Center in Bethesda, Maryland, the institute is ideally situated to collaborate with the National Institutes of Health as well as the military medical and research communities. It is part of the Uniformed Services University of the Health Sciences (USUHS) under the Assistant Secretary of Defense for Health Affairs [ASD(HA)]" [NSA Bethesda 2011].

The need for a facility such as AFRRI stemmed from the threat in the late 1950s and 1960s of a Soviet invasion of Europe. If such an invasion occurred, it was believed that nuclear weapons would be used in defense (Defense Threat Reduction Agency [DTRA] 2002:206). The full effect of radiation on soldiers and civilians was not completely understood but would be crucial information in the event of a nuclear conflict with the Soviet Union. Another factor contributing to the establishment of AFRRI was the 1958 hold on nuclear weapons testing that resulted from U.S. negotiations for a comprehensive nuclear test ban at the Geneva Conference on the Discontinuance of Nuclear Weapons Tests. Concern arose that an indefinite moratorium could hinder biomedical research and training previously occurring at nuclear weapons test sites. The proposed facility, with a nuclear reactor, would be able to conduct research, independent of weapons testing, on the effects of ionizing radiation on humans.

In August 1958 the Defense Atomic Support Agency (DASA) received a proposal to establish a biomedical research facility at the National Naval Medical Center from the Chief, Bureau of Medicine and Surgery, Navy Department. The proposed facilities would house a nuclear reactor capable of simulating bursts of radiation similar to those emitted by nuclear weapons, but in safe laboratory conditions that would allow maximum control. DASA's official interest was in nuclear weapons research, development, testing, evaluation, storage, movement, and possible use, but interest in the effects of radiation on humans prompted the development of the new facility. DASA sponsored the project, coordinating with the offices of the Surgeons General of the Army, Navy, and Air Force, the Public Health Service, the Office of Civil Defense and Mobilization, and the Atomic Energy Commission's Division of Biology and Medicine (Solyan 2006:309).

TRIGA Mark-F "Pulsing" Reactor

The nuclear reactor chosen for the facility was the TRIGA (Training, Research, Isotope production, General Atomic), developed by the General Atomic Division of General Dynamics Corporation in San Diego, California. The TRIGA reactor was first conceived and designed in 1956, with the first reactor constructed by 1958. The reactor provided sufficient power and radiation intensity for research work in many fields and with numerous applications. Most importantly, the reactor was safe for operating personnel and for the public, as it was able to shut itself down before any overheating of its nuclear core could occur. By 1960 a new type of TRIGA reactor, the prototype TRIGA Mark-F "pulsing," was in operation at General Atomic's laboratories. It was different from the previous model because of its pulse mode and use of a water reflector for the core (Hall 2009:1-3). The new

MARYLAND HISTORICAL TRUST REVIEW

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MHT Comments:

_____ _____

Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

prototype could be safely and repetitively pulsed for fractions of a second to peak power levels of 2,000,000 kilowatts or more and release high-intensity neutron and gamma radiations. After pulsing it automatically restored itself to a normal operating level without the use of control rods or other mechanical shutdown devices (U.S. Department of Defense, Navy [Navy] 1962:9-10).

In 1960 the Department of Defense (DoD) entered into a contract for a Mark-F TRIGA reactor that conformed to DASA's specifications and special requirements. General Atomic was given the prime contract for AFRRI, including the TRIGA reactor and associated experimental facilities. Holmes & Narver, Inc., of Los Angeles was selected as architect-engineer and construction subcontractor. Congress approved the construction of AFRRI facilities on June 8, 1960. Groundbreaking ceremonies took place on November 29, 1960 (Navy 1962:9-10). A second TRIGA Mark-F reactor was located at the Diamond Ordnance Radiation Facility at the Forest Glen Annex, Silver Spring, Maryland. The Forest Glen reactor, used from 1961 to 1977 to test the effects of radiation on electrical and electronic components, was decommissioned in 1980. Of the Mark-F reactors built by General Atomics, the AFRRI TRIGA reactor is the only one that remains in operation (Hall 2009:4).

The AFRRI TRIGA Mark-F was the first pulsing-type reactor designed specifically for biomedical research (Navy 1962:3). The reactor was able to simulate conditions of intense neutron and gamma radiation associated with the explosion of nuclear weapons, allowing scientists to determine the extent of biological radiation in varying doses, rates, and distances of exposure and improving methods of combating radiation sickness. The controlled simulation of radiation associated with weapons explosions allowed more precise measurements of the amounts and nature of radiation delivered. The reactor could produce radiation emissions under identical conditions, and effects could be observed, both by instruments and visually, close to the released radiation (Navy 1962:15-17).

Two exposure rooms form the primary exposure facilities for AFRRI's reactor. In addition to the rooms, objects can be placed in a dry core exposure tube to be irradiated within the core. A portable beam port can be installed in the reactor pool, though it has not been used during the last 29 years, according to current reactor staff (Hall 2009:9). The reactor is located at the bottom of a 15,000-gallon tank of demineralized water that serves as coolant, as a moderator for the reactor, and as a biological shield for those working on the reactor deck. The core "is suspended from a carriage which houses the control rod drive mechanisms and which also allows the reactor core to be positioned at a position along the track between the two exposure rooms upon which the carriage is mounted. This ability to move the core gives researchers a great deal of flexibility in varying the radiation field within the two exposure rooms" (Hall 2009:10).

Establishment of AFRRI

AFRRI was formally established as a joint agency under the three military departments on May 12, 1961, under the management control of the Secretary of the Navy. The Chief of DASA, under the direction of the Secretary of Defense, was to sponsor the development and establishment of AFRRI and coordinate the research program. The mission of AFRRI, as stated in the DoD directive that established the institute, was to "conduct scientific research in the field of radiobiology and related matters that are essential to the medical support of the United States military services, to national welfare, and to the well-being of mankind" (Navy 1962:7). The directive further stated that the AFRRI "shall (1) provide facilities for research on the biological effects of ionizing radiation, (2) conduct advanced training and educational programs, (3) provide facilities for radioisotope production, and (4) perform such other functions as may be assigned" (Solyan 2006:310). Initially, AFRRI was to focus on the effects of nuclear weapons on military personnel and the civilian population in the event of a nuclear attack. It was also to extend to the treatment of diseases and the development of new theories, instruments, and techniques (Navy 1962:7).

The first occupants of AFRRI moved into the facility on January 2, 1962. On June 25, 1962, the Atomic Energy Commission issued a utilization facility license for the TRIGA reactor. Three days later, on June 28, the reactor was operational. The entire facility was not fully operational until almost a year later, by September 1963 (Solyan 2006:310).

MARYLAND HISTORICAL TRUST REVIEW

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MHT Comments:

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Reviewer, Office of Preservation Services **Date**

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Reviewer, National Register Program **Date**

The ambiguous original command and organizational arrangement of AFRRI, with sponsorship and coordination by DASA and management control provided by the Secretary of the Navy, proved to be a problem. Both the Army and the Air Force complained of problems resulting from Navy interpretation of its management control authority and, as a result, AFRRI was reassigned in 1964 to the military command and administrative control of DASA.

During its first few years the institute was seen as unproductive in terms of research tasks undertaken, accomplished, recorded, and reported. The lack of productivity was viewed as stemming from its lofty mission of research supporting the "well-being of mankind." By 1967, three years after its reorganization, AFRRI had become a productive organization as measured by work accomplished (U.S. Congress, Senate [Senate] 1971:2449).

Collaboration with National Naval Medical Center and Other Agencies

AFRRI was ideally located at NNMC to collaborate with neighboring medical facilities. It was located across the street from the National Institutes of Health, the Naval Medical Research Institute, and a short distance from Walter Reed Army Medical Center. The location of AFRRI at the NNMC was chosen as the most advantageous because if its proximity to these and other research facilities in the area (U.S. Congress, House of Representatives [House] 1960:214). It was able to draw on the expertise and talents of nearby scientists and physicians. Col. Darrell W. McIndoe, director of AFRRI in 1978, referred to the relationship among facilities as a "constant input back and forth type of intellectual expertise" that couldn't be found anywhere else in the country (House 1978:561).

Collaboration with other agencies included the Atomic Energy Commission (AEC). In 1966-1967 joint DARA-AEC research effort Operation HENRE (High Energy Neutron Reactions Experiment) was designed to improve understanding of the propagation of neutrons and gamma rays in the atmosphere near the earth's surface. Additionally, studies were made for shielding, dosimetry, instrumentation, neutron activation, and spectral studies. Information gathered was used to calculate doses of radiation in exposed people. The operation took place at a Nevada test site, with data analyzed by personnel at participating laboratories, including AFRRI, the focal point for the DoD program (United States Atomic Energy Commission 1967:291-92).

AFRRI Accomplishments

AFRRI's research program had three broad phases. From 1961 to 1971, the program focused on "the study of high-dose external radiation effects on biological systems and upon developing casualty criteria" (Solyan 2006:312). Research at AFRRI was broken into several departments: (1) the Experimental Pathology Department studied the pathological effects of ionizing radiation; (2) the Behavioral Sciences Department worked in several areas of fundamental research with special emphasis on the applied area of psychological effects of radiation and noxious agents; (3) the Physical Sciences Department contained divisions working with the TRIGA experimental reactor and linear accelerators; and (4) the Radiation Biology Department primarily emphasized providing information to the DoD about the effects of ionizing radiation. Later expansion was based on Chemistry, Radiological Physics, and Theoretical divisions. AFRRI's investigation of incapacitating doses of radiation using monkeys, rats, dogs, mice, and other animals led to an understanding of the effects of radiation on the central nervous system, the blood system, and other tissues and organs (DTRA 2002:206-7).

After DASA was disestablished in 1971, AFRRI became part of the Defense Nuclear Agency (DNA). Research expanded to include nuclear weapons' biomedical effects, trauma, toxicology, ionizing radiation effects, cancer markers, and drug toxicity. It became a center of knowledge for casualty problems such as infection, shock, and wound healing. From 1971 to 1979 AFRRI radiation experts worked to aid in the cleanup of Enewetak Atoll, a group of islands in the Pacific used for nuclear testing from 1948 to 1956, so that local islanders could return to their homes. In total, AFRRI's radiation specialists made nine trips to the islands (AFRRI 2010).

MARYLAND HISTORICAL TRUST REVIEW

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_____ _____

Reviewer, Office of Preservation Services **Date**

_____ _____

Reviewer, National Register Program **Date**

By fiscal year 1977 AFRRI had begun teaching medical personnel. Its first course, on Medical Effects of Nuclear Weapons (MENW), provided education on the pathophysiology, diagnosis, and treatment of casualties of exposure to ionizing radiation or from nuclear weapons. This early training focused on "productivity in the foxhole," the need to sustain productivity as long as possible despite exposure or injury from ionizing radiation. The title of the course was eventually changed in 1995 to Medical Effects of Ionizing Radiation (MEIR) and expanded to nuclear incidents other than the use of traditional nuclear weapons. This training has continued, especially since the terrorist attacks of September 11, 2001 (Solyan 2006:312).

The third phase of AFRRI's research program came with the end of the Cold War, when the Institute began to look at treatments for lower radiation doses and the late effects of radiation, especially to civilians such as women and children (Solyan 2006:312-13). AFRRI's budget was significantly reduced because of the perceived diminution of nuclear threats. In 1992 management of AFRRI was given to the Uniformed Services University of the Health Sciences (USUHS). As the 1990s progressed, funding plummeted and its nuclear/radiological research capability was nearly mothballed. But emerging threats late in the decade, including the detonation of nuclear weapons by India and Pakistan, suspected production of nuclear weapons by North Korea, and radiological accidents occurring every year, reshaped U.S. attitudes about preparedness. Since the September 11, 2001, attack on the World Trade Center and the Pentagon, funding has increased and AFRRI has worked to defend against threats of radiological dispersal devices, planting of radiation sources by terrorists, nuclear weapons, and sabotage of nuclear reactors in the area of *military* operations (Solyan 2006:311). AFRRI received the Department of Defense Joint Meritorious Unit Award for exceptionally meritorious achievements from Sept. 11, 2001 through June 20, 2003. This honor recognized AFRRI's response to acts of terrorism and nuclear and radiological threats at home and abroad.

Currently, research at AFRRI falls within five areas: (1) Biological Dosimetry; (2) Radiation Countermeasures; (3) Radiation Neutralization; (4) Radiation Combined Injury; and (5) Internal Contamination and Metal Toxicity.

AFRRI and Anthrax

In 2004 the Environmental Protection Agency (EPA) awarded two AFRRI microbiologists, Thomas B. Elliott, Ph.D., and Michael O. Shoemaker, Ph.D., the Gold Medal for Exceptional Service. The two served as part of a 19-member crisis-exemption team that evaluated methods to inactivate anthrax spores contaminating the Brentwood U.S. Postal Service (USPS) processing and distribution center. Two USPS employees had died at the center after inhaling anthrax spores from contaminated letters in 2001. The center was decontaminated using fumigation with chlorine dioxide gas (ClO_2). The process, which required a crisis exemption from the EPA, was complicated by the massive size of the facility and the need to maintain an exact concentration of gas, relative humidity, and temperature within the space for 12 hours, and by the proximity of neighborhood residents. The crisis management team worked to determine the extent of anthrax contamination; set parameters for temperature, relative humidity, gas concentration and contact time; monitored the inside of the building to ensure parameters were met; and sampled air and surfaces to confirm the absence of spores. The center reopened on December 22, 2003, after having been closed since October 21, 2001 (AFRRI 2004).

Prior to the event, AFRRI had studied the effects of irradiation on biological agents, establishing a "kill curve" or standard dosage of radiation necessary to eradicate anthrax spores. The official standard established by AFRRI researchers was used in two mail irradiation facilities that sorted mail formerly handled by the Brentwood Center (Henry Jackson Foundation 2003). The "kill curve" established by AFRRI continues to be used to irradiate mail sent to certain government buildings.

Nuclear Historic Landmark

In 2009 AFRRI was designated a Nuclear Historic Landmark by the American Nuclear Society for outstanding physical accomplishments that have taken place at the facility over time. The nomination states that:

MARYLAND HISTORICAL TRUST REVIEW

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_____ _____

Reviewer, Office of Preservation Services **Date**

_____ _____

Reviewer, National Register Program **Date**

"For nearly five decades, the Armed Forces Radio Biology Research Institute (AFRRI) has served as the United States' primary source of medical nuclear/radiological research, preparedness, and training.... Over the lifetime of the Institute, research interests and focus have adapted with the ever-changing global climate...as an integral piece of the strategic mission of the United States. Through contributions to the scientific community in the form of peer journal publications in the field of radiobiology, advisory support provided by the Medical Radiobiology Advisory Team (MRAT), training expertise administered in the Medical Effects of Ionizing Radiation (MEIR) Course, state-of-the-art radiation research facilities (TRIGA Mark-F nuclear reactor, cobalt-60 gamma irradiation, low-level radiation facility, and linear accelerator), AFRRI has served as an extremely valuable resource to the nuclear community [Solyan and Gifford 2009:1]."

Site History

AFRRI facilities originally consisted of three buildings (Figures 2 and 3). The Reactor Building (42A) was the largest of the three buildings and had a reinforced concrete structure. The Reactor Building had a flat composition roof with gravel on lightweight concrete and a scored concrete exterior. The Laboratory Building (42B) was built soon after the Reactor Building, adjoining it to the south; it contained research laboratories, student demonstration areas, a library, conference room, and housing for small animals. Building 42B was constructed of concrete and brick with a flat built-up roof, a concrete and brick veneer, and fixed glass windows. The entrance to the facility was on the projecting wing of the south elevation of 42B, a single-leaf door with a transom and large fixed glass sidelight. Building 42C was added next, the plans completed and approved in July 1963. The new building, attached to the west elevation of 42B, provided additional laboratory space, a library, and a conference room.

The Animal Clinical Research Facility (Building 43) was north of, but not connected to, the Reactor Building and was one story. Referred to as the Animal House, Building 43 appears to have been built concurrent with the Reactor Building, but Building 43 soon received a 45x90-foot addition to the east, more than doubling the footprint of the building. Plans for the two-story addition were completed at the same time as the Building 42C addition. The 1963 addition provided rooms labeled as wards: infectious wards, receiving and quarantine wards, animal surgery rooms, offices, and storage areas. The building had a built-up roof and concrete exterior that was unfenestrated on the south elevation and had a single door on both the east and west elevations. The first floor of the north elevation had three door openings accessed by a concrete slab platform running the width of the building with a steel rail and wire mesh balustrade. In 1964 plans were approved for a third floor for the 1963 addition. The concrete-block addition provided more laboratory and office space for the research facility. Building 44, the Modulator Room, was constructed at the same time as Buildings 42 and 43.

In 1967 the PIA Building (Building 45) was constructed on the east side of Building 42 (Figure 4). The PIA Building was shown as a planned addition to the facility in 1962 and 1963 site plans. The new concrete building was three levels, one above grade and two below. The third-floor (above-grade) level measured 82x77 feet with cast concrete exterior walls with scoring and a built-up flat roof. The east elevation had fixed aluminum-sash windows. The first floor, which contained the PIA exposure room and variable energy accelerator room, extended 66 feet to the east. Passageways were created to connect the first floor to adjacent areas of Building 42, and a new tunnel was created from Building 43 to Building 42.

Building 46 was completed in 1970 (Figure 5). The four-story laboratory and technical support building was built with two floors above grade and two floors below. Building 46 was constructed of concrete with a built-up roof. Exterior concrete around the top of the building was sandblasted. The majority of the exterior elevations were covered with brick veneer, broken by narrow two-story windows. The third and fourth floors contained offices, laboratories, a technical library, and conference room. The first and second (below-grade) floors contained offices and laboratories. A 38x48-foot gamma source exposure room on the south side of the west elevation created an exposed aggregate concrete plaza in front of the main entrance to the facility (Naval Support Activity Bethesda [NSA Bethesda] var.).

MARYLAND HISTORICAL TRUST REVIEW

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_____ _____

Reviewer, National Register Program **Date**

DNA requested $6.3 million for construction of a new animal research facility for fiscal year 1979. The existing facilities at AFRRI were inadequate both in size and quality to meet the current needs of its research program. Around 1975 research at AFRRI had changed from emphasis on experimentation with large doses of radiation that might be experienced in the detonation of nuclear weapons to studying biological response to much lower levels of radiation that might be experienced in civilian areas at a distance from nuclear detonation or received from tactical nuclear weapons. Animals subjected to large doses of radiation survived for only days or weeks, but those exposed to sub-lethal levels of radiation recovered from the immediate effects of radiation. Observation and experimentation would continue over months or years, requiring a controlled, isolated, sanitary environment that would prevent the introduction of diseases to irradiated animals susceptible to infection and disease (House 1978:525-26). Previous facilities did not meet statutory requirements for care and use of laboratory animals, despite renovation and upgrading efforts. DNA requested funding for facilities during fiscal year 1977, but funding was reduced and later eliminated completely by Congressional authorizing committees because a detailed design of proposed facilities had not been started. The increasingly stringent laws on animal care negatively impacted the stature of AFRRI's research. In addition, AFRRI had not been able to gain accreditation in the laboratory and animal welfare community as it fell behind changes in the law and in national standards (House 1978:526).

The three-level animal research facility, Building 47, was completed in 1980 and subsequently became fully-accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (Figure 6). The first floor had animal rooms and storage facilities, the second consisted mainly of animal rooms, and the third floor had animal rooms and operating rooms. The new facilities would adjoin the east side of Building 43 (House 1978:556-59). The concrete building had a built-up roof with a mechanical penthouse. Exterior walls had brick veneer panels on all four elevations. Where the first floor was above grade on the north and east elevations, there were brick and metal panel veneers.

Between 1980 and 1984, the exteriors of Buildings 42, 43, 45, and 46 were clad with insulated metal siding (Figures 7 and 8). The new siding was seam metal on the lower portion of the buildings and corrugated metal siding above that. Window openings on Building 46 were preserved, but window openings on Building 42C were covered at that time.

In 1984 the electrical and mechanical systems of the entire facility were upgraded. At the same time several buildings received additions. Second stories were added to Buildings 42B and 42D, a third floor and a mechanical penthouse fourth-floor addition were built on Building 42B, and a second-floor penthouse was built on the original, west block of Building 43.

Building 48, the Radiological Liquid Storage Facility, was completed in 1988 (Figure 9). This two-story concrete building had insulated metal siding on the second story and a standing-seam metal roof.

The interiors of the buildings have undergone numerous alterations, repairs, and renovations during the lifetime of the facility, upgrading mechanical equipment, laboratory spaces, and HVAC equipment. Renovations within the last five years have reconfigured laboratory spaces from smaller labs to larger, open labs with multiple work stations. The exterior of the building was updated ca. 2008, when the insulated metal siding was replaced with the current exterior cladding. The new insulated metal siding is similar to the previous covering, with standing-seam metal cladding on the lower portion and corrugated-metal cladding above. Window openings on the south and west elevations of Building 42C were reopened in 2008 (NSA Bethesda var.).

Evaluation

AFRRI is recommended as individually eligible for the National Register of Historic Places under Criterion A for its significant national contribution to advancing research on and an understanding of the effects of ionizing radiation. Additionally, AFRRI is

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

_____ _____

Reviewer, Office of Preservation Services **Date**

_____ _____

Reviewer, National Register Program **Date**

eligible under Criterion C for its TRIGA Mark-F "pulsing" reactor, the only remaining Mark-F reactor in operation. The facility qualifies under Criteria Consideration G for its exceptional importance for its body of work during the Cold War era and in connection with the anthrax attacks of 2001, having establishing a kill curve for irradiating mail and its contribution to establishing methods to inactivate anthrax spores.

Under Criterion A, AFRRI is individually eligible for its contribution to science, specifically its contribution to the field of radiobiology. It has been described as "a national asset, the only one of its kind, and the mission performed there is absolutely essential—trying to ascertain the effects of nuclear weapons on man, the effects of radiation, both lethal and sub-lethal doses…" (House 1978:562). Throughout the Cold War and up through the present, AFRRI's accomplishments have been numerous. Its research led to an understanding of the effects of radiation on the central nervous system, blood system, tissues, and organs. It become a center of knowledge for casualty problems such as shock, infection, and wound healing. AFRRI's MEIR course has educated medical professionals on the effects of ionizing radiation.

AFRRI has retained sufficient integrity to convey its significance. Under Criterion A, a building is eligible if it retains "essential physical features" (National Park Service 1997:46). The majority of additions and changes to the facility took place through the 1980s, before major funding cuts during the 1990s. These changes were all directly related to AFRRI's mission and associated with its areas of significance under Criterion A. The exterior was re-clad ca. 2008, but it was replaced in-kind. AFRRI has retained integrity of setting, location, feeling, and association. Changes made to the building, such as a recent addition of a roof-top penthouse, have negatively affected integrity of materials, workmanship, and design, but not sufficient to remove all features of those aspects of integrity. The buildings retain their overall configuration and proportions.

The TRIGA Mark-F "pulsing" reactor is eligible under Criterion C as an example of a type, period or method of construction. The reactor is one of a few Mark-F reactors developed by General Atomic, differentiated from other TRIGA reactors by its pulsing mode. Of the two TRIGA Mark-F reactors built by General Atomics, the AFRRI reactor has been the only reactor of its kind in operation since the Forest Glenn reactor was decommissioned in 1980. Changes made to the reactor have not been substantial and it retains integrity of design, feeling, association, setting, and location. Buildings 42-48 are not eligible under Criterion C, as they lack individual distinction for design or construction.

As a facility that continues to achieve significance into a period less than 50 years from the date of this evaluation, AFRRI meets Criteria Consideration G for its exceptional importance. From the early 1960s, when the first buildings were constructed, and throughout the Cold War Era, AFRRI provided an exceptional body of work contributing to the field of medical radiobiology. It is the only facility of its kind, operating the sole reactor dedicated to radiobiology in the United States. More recently, AFRRI played a significant role in establishing a "kill curve" for anthrax spores that allowed for the irradiation of mail after the anthrax attacks of 2001. Research conducted at AFRRI also contributed to decontaminating USPS facilities contaminated with anthrax. AFRRI's contributions were recognized through the receipt of the Department of Defense Joint Meritorious Unit Award for its exceptional achievements during this time.

The buildings were not evaluated under Criterion D.

The National Naval Medical Center Historic District has been found eligible under Criteria A, B, and C. Under Criterion A, the district draws significance as a "temple of medical science" with an "outstanding number of contributions made to medical science through the research and educational divisions of NNMC" (Robinson et al. 1998:8-1). The district derives from its associations with President Franklin D. Roosevelt, who envisioned the hospital as a place of healing for naval personnel (Criterion B). Under Criterion C, the historic district is an example of the work of master architect Paul Philippe Cret, who was appointed as consulting architect and carried out Roosevelt's initial plan as well as planning the larger medical complex. It is also significant under

MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

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Reviewer, Office of Preservation Services **Date**

_____ _____

Reviewer, National Register Program **Date**

Criterion C as an example of Art Deco architecture. The district has a period of significance of 1940-1945.

At the time the national register nomination was written, AFRRI was not evaluated "because these buildings are all less than 50 years old (constructed from the mid-1960s through the early 1980s), and occupy an area outside the proposed historic district" (Robinson et al. 1998:8-15). A reevaluation of the buildings finds that the AFRRI complex is not eligible for inclusion in the historic district, since AFRRI does not date to the current period of significance of the historic district, which focuses on the original design of the Medical Center by architect Paul Cret and excludes later buildings that were not part of his original plan.

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MARYLAND HISTORICAL TRUST REVIEW

Eligibility recommended ____ **Eligibility not recommended** ____

Criteria: A B C D **Considerations:** A B C D E F G

MHT Comments:

Reviewer, Office of Preservation Services **Date**

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Eligibility recommended _____ **Eligibility not recommended** _____

Criteria: ___A ___B ___C ___D **Considerations:** ___A ___B ___C ___D ___E ___F ___G

MHT Comments:

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Reviewer, Office of Preservation Services **Date**

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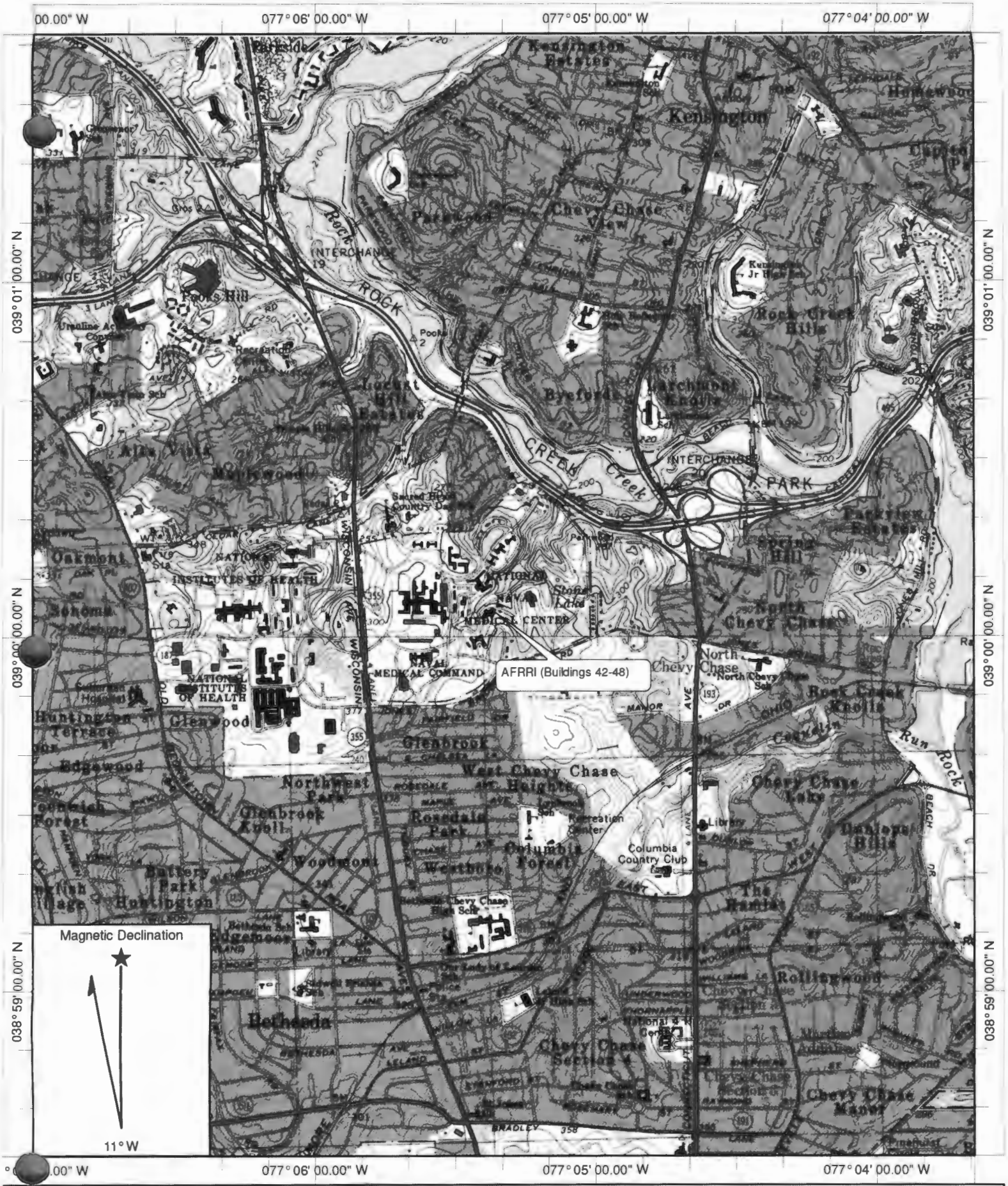
Reviewer, National Register Program **Date**



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Date: 11/21/2011
Scale: 1 inch equals 2000 feet

Location: 039° 00' 06.76" N 077° 05' 19.85" W NAD 27
Caption: AFRRI (Buildings 42-48)
NSA Bethesda
MIHP No. M:35-173

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FIGURE 1: AFRRI Site Plan

SOURCE: USGS 2008

M:35-173

Figure 2. 1963 Photograph of the South Elevation of Building 42

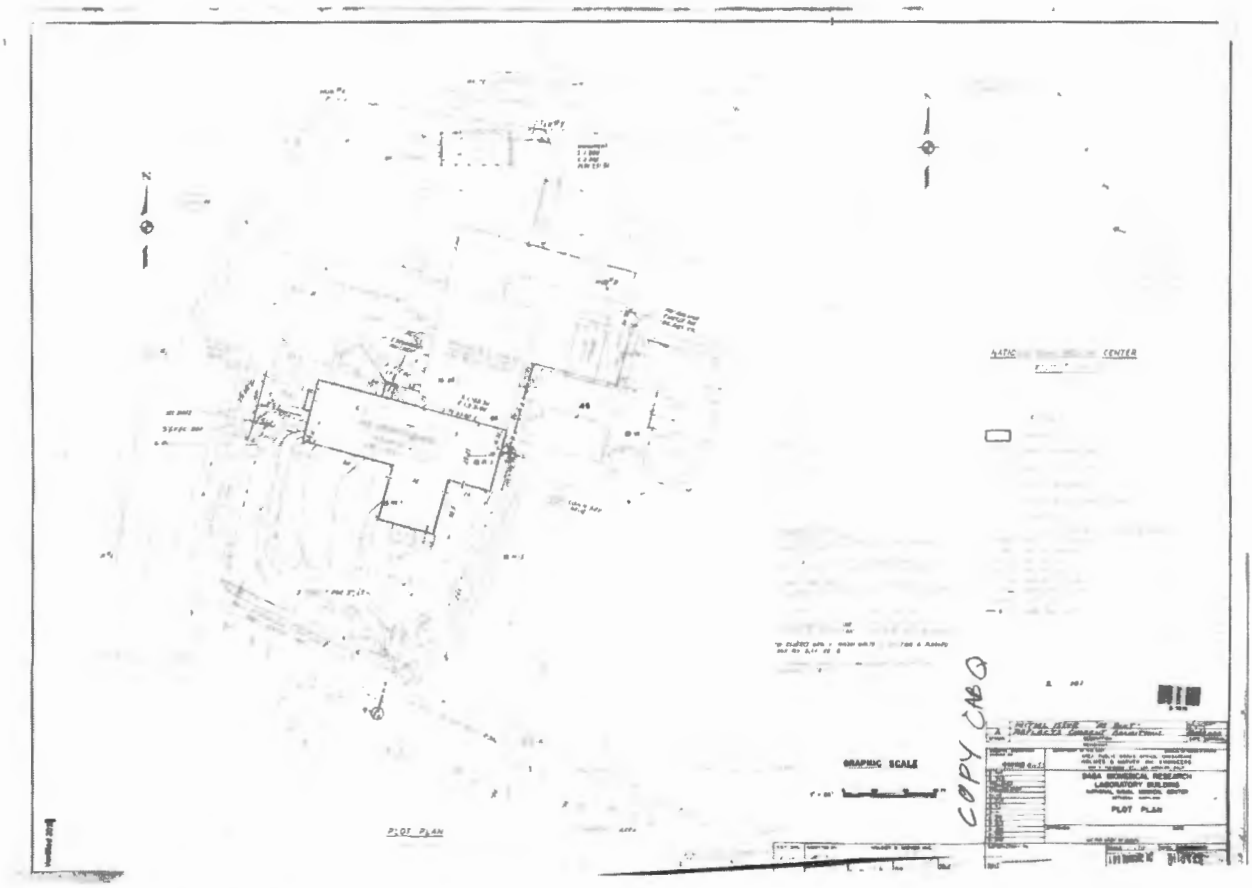

Figure 3. 1962-1963 Plot Plan Showing Building 42

Figure 4. April 1968 Photograph Showing the Addition of Building 45

Figure 5. Circa 1970-1980 photograph of AFRRI Showing Building 46 Added in 1970

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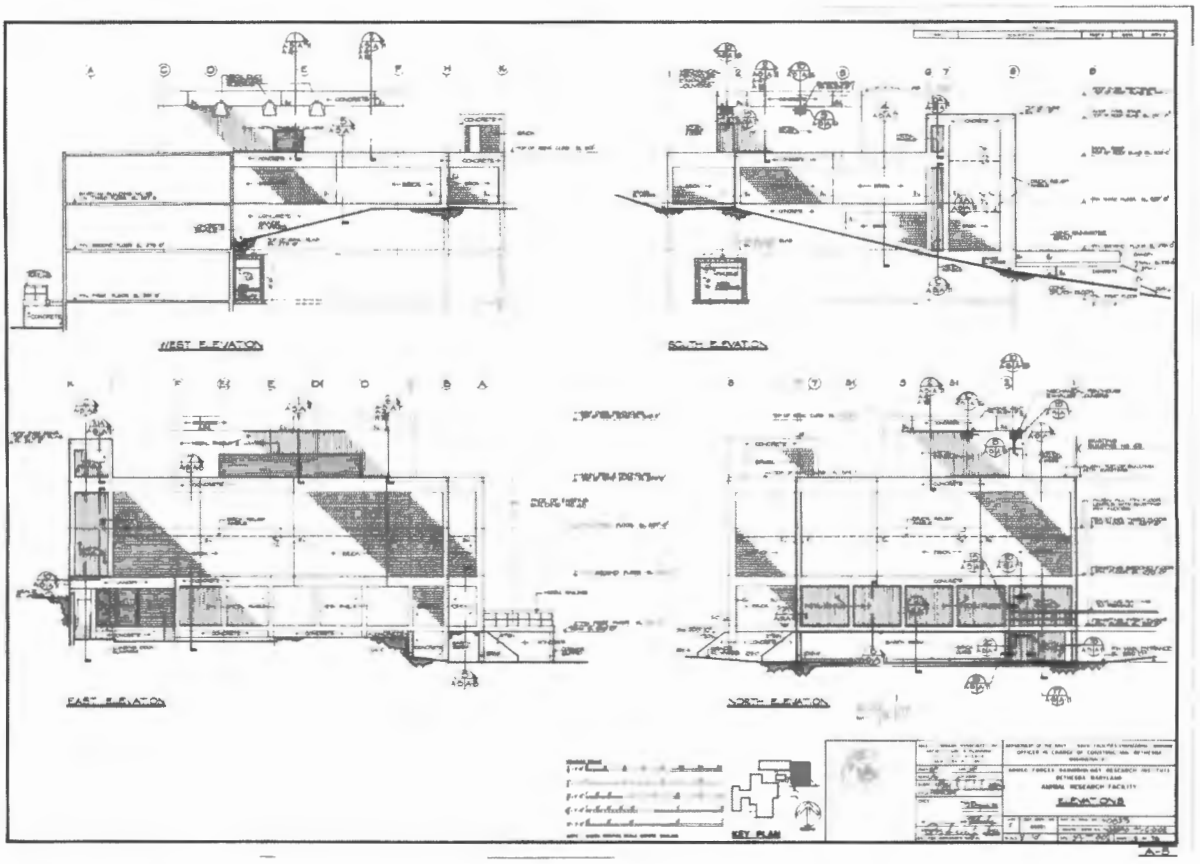

Figure 6. 1978 Elevation Plan of Building 47

Figure 7. 1980 Aerial Photograph of AFRRI

Figure 8. November 1987 Aerial Photograph Showing the Addition of Building 47, Addition to Building 42, and the Exterior Cladding added circa 1980-1984

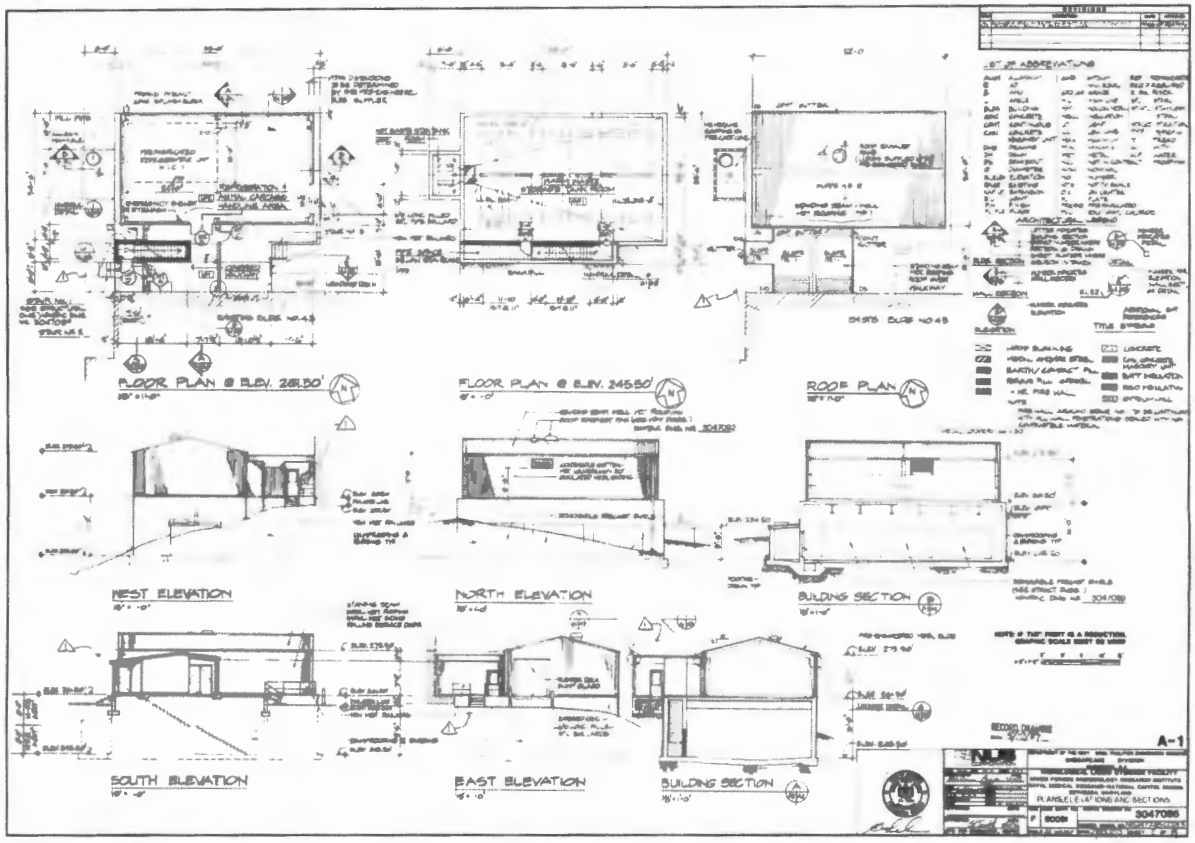

Figure 9. 1986 Plans for Building 48

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PHOTO	FILE NAME	DESCRIPTION	INK/PAPER
1	M35-173_2011-10-29_01.TIF	Building 42, South Elevation, and Building 46, West Elevation, Looking Northeast	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
2	M35-173_2011-10-29_02.TIF	Building 42, East and North Elevations, Looking Southwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
3	M35-173_2011-10-29_03.TIF	Building 42, North Elevation, Looking South	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
4	M35-173_2011-10-29_04.TIF	Building 42, West and South Elevations, Looking Northeast	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
5	M35-173_2011-10-29_05.TIF	Building 43, South Elevation, Looking Northwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
6	M35-173_2011-10-29_06.TIF	Buildings 48 and 43, West Elevation, Looking East	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
7	M35-173_2011-10-29_07.TIF	Building 43, North Elevation, Looking West, and East Elevation of Building 48	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
8	M35-173_2011-10-29_08.TIF	Building 44, North and West Elevations, Looking East	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
9	M35-173_2011-10-29_09.TIF	Building 45, South and East Elevations, Looking North	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
10	M35-173_2011-10-29_10.TIF	Building 45, North Elevation, Looking South	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte

11	M35-173_2011-10-29_11.TIF	Building 46, West and South Elevations, Looking Northeast	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
12	M35-173_2011-10-29_12.TIF	Building 46, Patio and Roof of Gamma Source Exposure Room, Looking Northwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
13	M35-173_2011-10-29_13.TIF	Building 46, South and East Elevations, Looking Northwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
14	M35-173_2011-10-29_14.TIF	Building 47, South Elevation, Looking Northeast	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
15	M35-173_2011-10-29_15.TIF	Building 47, East and North Elevations, Looking Southwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
16	M35-173_2011-10-29_16.TIF	Building 48, North and West Elevations, Looking Southeast	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte
17	M35-173_2011-10-29_17.TIF	Building 48, North and East Elevations, and North Elevation of Building 43, Looking Southwest	Epson UltraChrome Pigmented Ink/Epson Premium Enhanced Matte

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7 OF 17

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12 OF 17

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14 OF 17

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17 OF 17