

PUNTA SALINAS RADAR SITE, RADOME 4
(Punta Salinas Radar Site, Building 4)
End of PR-868, approximately 0.5 miles north of Levittown
Levittown
Toa Baja Municipality
Puerto Rico

HAER No. PR-50

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, CO 20240-001

HISTORIC AMERICAN ENGINEERING RECORD

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- Location:** Radome 4 (Building 4) of the Punta Salinas Radar Site is on the northwestern portion of the main Radar Site, north of the loop road and northwest of the Radar Site's main buildings. The Punta Salinas Radar Site occupies a 30.1-acre parcel on the very northern tip of a peninsula that extends into the Atlantic Ocean between Bah a de Toa and Ensenada de Boca Vieja, west of Levittown, Toa Baja municipality, Puerto Rico. The peninsula extends north of highway Pr-165. The Radar Site is at the end of Pr-868 which runs the length of the peninsula from Pr-165. As Pr-868 reaches the end of the peninsula, it ascends a rocky hill to 25 feet above mean sea level. From this high position, the Radar Site has a commanding view of the Atlantic Ocean and San Juan to the east. The Radar Site property includes both the main station, and East Island to the east of the main peninsula. The midpoint of the Radar Site's main station is at latitude 18.47483 north and longitude -66.18242 west.¹ The midpoint of Radome 4 is at latitude 18.47542 and longitude -66.18388 west. These coordinates were obtained in March 2011 by plotting locations on the 1:20000 Bayamon, PR U.S. Geological Survey Topographic Quadrangle Map. The accuracy is +/- 12 meters and the datum is North American Datum of 1983.
- Present Owner:** The U.S. Air Force owns the land underlying Radome 4 and all of the Punta Salinas Radar Site, and leases it to the Puerto Rico Air National Guard (ANG); the Punta Salinas Radar Site is operated by the Puerto Rico ANG, 140 Air Defense Squadron, a unit under the Puerto Rico ANG's 156 Airlift Wing.
- Present Use:** Radome 4 is vacant. It ceased housing radar equipment circa 1998, and was used for a time as a training classroom and for storage.
- The Punta Salinas Radar Site is operated as an active radar site by the Puerto Rico ANG, 140 Air Defense Squadron. The Radar Site is a geographically separated unit of the Luis Mu oz Mar n International Airport Air National Guard Base (ANGB), San Juan, operated by the 156 Airlift Wing. The U.S. Customs and Border Patrol leases a portion of Building 2 at the Radar Site. The Federal Aviation Administration has radar and operations facilities on the East Island that are also managed by the ANG.
- Significance:** The exterior of Radome 4 is significant as a local landmark marking the Punta Salinas peninsula to residents of Toa Baja, and on this basis was determined eligible for inclusion in the National Register of Historic Places (NRHP) by the ANG with the concurrence of the Puerto Rico State Historic Preservation Office (SHPO). Built in 1964, it was the first radome structure at Punta Salinas Radar

¹ U.S. Geological Survey (USGS) topographic map, Bayamon Quadrangle, 7.5-minute series, photo revised 1982.

Site and originally housed a GPA-89 radar antenna. A second radome (Radome 6) was erected in 1966 to house an AN/FPS-67 radar antenna. The antennae in both radomes worked together. The Punta Salinas Radar Site was established by the Puerto Rico ANG in June 1959 as a directional search radar site in support of the ANG alert fighters at the Luis Muñoz Marín International Airport ANGB, for drug interdiction, and for other missions. The exteriors of both Radomes 4 and 6 are significant as local landmarks. The Radar Site contains five NRHP eligible resources including three coastal defenses built for World War II Fort Mascaro: Battery Buckey (coastal defense 261/Punta Salinas Radar Site Building 3), Battery Pence (coastal defense 262/ Punta Salinas Radar Site Building 9), a small pillbox (no ANG real property number), and the two Cold War-era radomes (Radomes 4 and 6).²

Historians: Marjorie Nowick, M.S. and M.Phil., and Melissa Wiedenfeld, Ph.D., of HDR EOC (formerly engineering-environmental Management, Inc. [e²M]) served as historians/architectural historians for the project under contract to the Air National Guard Readiness Center, National Guard Bureau.

Project Information: This research and documentation project was conducted by HDR EOC for the Puerto Rico ANG and the ANG, National Guard Bureau. Marjorie Nowick and Melissa Wiedenfeld were the project historians/architectural historians. The project photographer was Timothy McGrath, principal/owner, Image West Photography, Arvada, Colorado. Architectural fieldwork was conducted by Nowick and Wiedenfeld on August 2008 and January 2009. Large-format photography was completed by McGrath in August 2008. Research was conducted by Daniel Hart and Melissa Wiedenfeld at the Air Force Historical Research Agency, Maxwell Air Force Base and by Wiedenfeld in Puerto Rico at the Puerto Rico SHPO Library and Records, San Juan National Historic Site, Punta Salinas Radar Site, and Luis Muñoz Marín International Airport ANGB (San Juan, Puerto Rico). Dr. Wiedenfeld also conducted oral history interviews with personnel of Punta Salinas Radar Site including Colonel Nesemio Oliveras, first commander of the 140 Aircraft Warning and Control Squadron (later redesignated 140 Air Defense Squadron), in January 2009. Additional research also was conducted using various online sources including general historical overviews, military histories, websites concerned with the history of U.S. air defense system and radar, and U.S. Navy, U.S. Air Force, and other military cultural resources reports and historic context documents.

² NRHP eligibility of the five Punta Salinas Radar Site buildings and structure is from PEER Consultants and DuVall & Associates, *Phase I Archaeological Survey and Architectural Evaluation Puerto Rico Air National Guard Punta Salinas Station Toa Baja, Puerto Rico*, prepared for the Air National Guard under contract DAHA-90-94-D-0011 (Oak Ridge, Tennessee: PEER Consultants, P.C., 1998); SHPO and ANG correspondence regarding the cultural resources survey; and National Guard Bureau, *Final Environmental Baseline Survey, 140th Air Defense Squadron, Puerto Rico Air National Guard, Punta Salinas, Toa Baja, Puerto Rico* (Andrews Air Force Base, Maryland: National Guard Bureau, 2008). Although the exteriors of Radomes 4 and 6 are eligible for the NRHP as local landmarks marking the Punta Salinas peninsula, neither their interiors nor their equipment are significant or eligible for the NRHP.

Part I. Historical Information

A. Physical History:

1. **Date of Construction:** The Puerto Rico ANG erected Radome 4 (Building 4) in 1964. This date is based on the real property records of the Puerto Rico ANG, oral history interview of Colonel Nesemio Oliveras, and a cultural resource survey of the Punta Salinas ANGB.³

While Radome 4 was the first radome at the Punta Salinas Radar Site, there were earlier radar antennae and related buildings at the site. The Punta Salinas Radar Site was established on the main Punta Salinas peninsula by the 140 Aircraft Control and Warning Squadron, Puerto Rico ANG, in June 1959. Prior to completion of construction of the first ANG buildings in 1961, the ANG occupied a World War II bunker (Building 3), a pillbox observation tower, and two Quonset huts north of the main bunker. The radar antennae were variously mobile, mounted atop the World War II bunker (Building 3), or were attached to free-standing towers. These early radar antennae were open without exterior housing. During this early period two Quonset huts housed the ANG's radar operations and maintenance functions.⁴ In 1961 the ANG completed construction of an administration building (Building 1), operations and communications building (Building 2), and water pump station (Building 5). In 1964 Radome 4 was erected to house a GPA-89 radar antenna, replacing an unsheltered radar antenna that stood atop a tall free-standing steel tower. In 1966, a second radome (Radome 6) was constructed atop of Building 3 (bunker) to house an AN/FPS-67 radar antenna. Radome 6 replaced an antenna that had been mounted atop of the bunker and was companion to the radar antenna in Radome 4. In addition, a free-standing air-to-ground communications tower was west of Building 1. Additional buildings for recreational, administrative, and other support functions were constructed at the Radar Site during the following decades.

2. **Architect/Engineer:** The 140 Aircraft Control and Warning Squadron, a subunit of the 156 Fighter Group (now 156 Airlift Wing), and the 156 Fighter Group, Puerto Rico ANG served as engineer and constructor for the ANG facilities on the main Punta Salinas Radar Site. Colonel Oliveras, squadron commander, served as head engineer. He led the effort to adapt the existing World War II facilities and to design and construct the new permanent ANG facilities at the Radar Site. The two radomes, constructed in 1964 and 1966, were assembled on-site by the 140 Aircraft Control and Warning Squadron. U.S. Air Force personnel

³ Date of construction for Radome 4 and additional facilities at Punta Salinas Radar Site are from PEER Consultants and DuVall & Associates, *Phase I Archaeological Survey and Architectural Evaluation*; National Guard Bureau, *Final Environmental Baseline Survey of Punta Salinas Radar Site*; real property records obtained from the National Guard Bureau and the 156 Airlift Wing, Puerto Rico Air National Guard; oral history interview of Colonel Nesemio Oliveras, retired Puerto Rico Air National Guard, conducted by Melissa Wiedenfeld, Ph.D., January 2009.

⁴ The ANG use of the World War II batteries and Quonset huts prior to completion of the ANG buildings in 1961 is based on oral history interview of Colonel Nesemio Oliveras, January 2009 and a drawing titled "Modification and Rehabilitation of 140th ACWRON, Fort Mascaró, Punta Salinas, P.R., PR, Site Plan." Note this is a hand-drawn site plan without any date or other attribution, stored at 156 Airlift Wing, Civil Engineering office. Quonset huts are not shown on the drawing but were mentioned by Colonel Oliveras to Dr. Wiedenfeld, January 2009.

accompanied the delivery of the Radome 4 geodesic dome roof, and assisted in its installation.⁵

3. **Builder/Contractor/Supplier:** The 140 Aircraft Control and Warning Squadron and the 156 Fighter Group, Puerto Rico ANG, served as builder of the facilities at the main Punta Salinas Radar Site including buildings, radome towers (Buildings 4 and 6), and modifications to the World War II-era bunker (Building 3). The two radomes, constructed in 1964 and 1966, were erected by the squadron. The U.S. Air Force personnel accompanied the delivery of the Radome 4 geodesic dome roof, and assisted in its installation.⁶
4. **Original Plans:** There are no extant original plans for Radome 4, and no historic photographs showing it at time of completion or during early use. Historic photographs show the radome tower under construction but none later. The earliest dated drawing is 1982 for replacement of air conditioning in the radome. Two undated drawings for reroofing and electrical modifications of the radome are thought to date to this time. Drawings were prepared for interior changes in 1998. The history of the physical structure is based on the 1982 and 1998 drawings compared to its current configuration.
5. **Modifications and Additions:** The most significant modification to Radome 4 was removal of its radar equipment circa 1998. Since removal of the equipment, Radome 4 has been used for storage and training classroom purposes. Its interior configuration is unchanged from circa 1998, and appears to have been in place in 1982. Although not purposeful modifications, the radome has had its windows and doors removed or missing, second story exit and open stairs on Bay 9 removed, and radar antenna and equipment removed circa 1998. The radome also has had mechanical upgrades including electrical, air conditioning, and repair of its exterior sheathing during the late 1990s.

B. Historical Context:

Punta Salinas Radar Site: The ANG's establishment of the Punta Salinas Radar Site on the Punta Salinas peninsula follows a long history of use of the island for military defenses. First the Spanish, and later the Americans, considered the strategic position of Puerto Rico for defensive military purposes. As the easternmost island of the Greater Antilles chain in the Caribbean Ocean, Puerto Rico is intermediate between North and South Americas, and the Atlantic and Pacific Oceans. This key defensive position prompted both the Spanish and Americans to erect military forts, bunkers, and other coastal defenses. The *castillos* and *garitas* of the San Juan harbor are legendary reflections of these protective military functions; other defensive works were built elsewhere on the island. For American interests in particular, the island has been a critical gateway to the Caribbean and Latin American nations, to important shipping lanes, and to the Panama Canal.

The Punta Salinas Radar Site occupies a dramatic promontory at the tip of the Punta Salinas peninsula, west of San Juan and extending into the Atlantic Ocean. The defensive potential of this landform did not escape the Spanish. In 1797 the Spanish built a fortification known as Fort

⁵ Oliveras to Wiedenfeld, January 2009.

⁶ Oliveras to Wiedenfeld, January 2009.

Castro on *Isla Bateria* (Battery Island) (East Island) as one of several fortifications to protect the San Juan harbor. Fort Castro reportedly occupied the northeastern portion of the island, and was a detached masonry battery consisting of “a semi-circle gun deck with barbette emplacement, tow embrassured, place of arms, guardhouse, cistern, powder magazine, kitchen, and latrine. Its landward front consisted of a straight parapet wall, with redan, dry moat, and drawbridge.”⁷ Remains of the fort were last recorded in a 1937 survey by U.S. Army Captain Henry Magnuson.

During World War II, the Americans were concerned about challenges from German U-boats, and the security of American shipping lanes and the Panama Canal.⁸ The U.S. military reinforced Puerto Rico’s coastal defenses to protect the coastlines and harbors, particularly in the vicinity of San Juan. In 1941 the U.S. Army Garrison, Fort Buchanan established Fort Mascaro, also known as the Punta Salinas Military Reservation, on the peninsula of the same name. The installation encompassed about 500 acres including the entire peninsula, some land to the west, and the small islands to the east and west offshore of the north end of the peninsula. Fort Mascaro had a radio signal facility on the inland portion, two searchlights and/or fire towers on West Island, and on the end of the main peninsula two free-standing concrete batteries with gun emplacements. One battery was on the northern tip of the peninsula and the other on East Island. Battery Buckey / 261 (Building 3) at the tip of Punta (Point) Salinas is an aboveground concrete bunker with two long-range barbette carriage type guns with shields (1940 program type). A small concrete pillbox structure (no ANG property number) was on the northernmost slope of Fort Mascaro. It sheltered forward observers and was the location for forward shelling and retaliation. On East Island, a second battery, Battery Pence / 262 (Building 9), was constructed with the same type guns.⁹ A causeway linked a bay on the west side of Fort Mascaro’s peninsula, and a second causeway provided access from the main peninsula to East Island. After the war, the Punta Salinas peninsula became a recreation area for the American military and then during the 1950s was largely abandoned.

The 140 Aircraft Control and Warning Squadron began at the main ANG installation. The Puerto Rico ANG’s main installation was established at the new Luis Muñoz Marín International Airport ANGB as of 1956 where the 156 Fighter Group was based with its fighter aircraft. During the 1950s the island’s naval communications facilities were undergoing reorganization, and the air defense system similarly needed improved facilities. The ANG sought a permanent site for a radar station to support the ANG fighters. The radar site needed good visibility to the north of the island. In June 1959 Colonel Oliveras, commander of the squadron, discovered the two abandoned World War II batteries of Fort Mascaro at the end of the Punta Salinas peninsula. He was flying at an altitude of 3,500 feet from Ramey Air Force Base on the west coast to San Juan and saw the bunkers from the air. He returned the following day in a pick-up truck to investigate. He judged the unused bunkers of Fort Mascaro as having unparalleled visibility in all directions because of their locations on high hills at the tip of Punta Salinas and East Island in a forward position in the Atlantic. The batteries would give additional height to the radar antennae, and their

⁷ Héctor R. Marín and Joseph Harrison, *Inventario Histórico Arquitectónico del Sistema Defensivo Costanero Insular de Puerto Rico* (San Juan, Puerto Rico: Asociación de Amigos de los Castillos de Puerto Rico, 1989), 115.

⁸ Andrew Lefebvre, “Puerto Rico: Quiet Allies,” in *Latin America During World War II*, ed. Thomas M. Leonard and John F. Bratzel (Lanham, Maryland: Rowman & Littlefield, 2007), 92–102.

⁹ Pete Payette, “Puerto Rico,” North American Forts 1526–1956, accessed December 2010, <http://www.northamericanforts.com/East/pr.html#sanjuan>.

interiors could provide shelter for the equipment and serve as immediate bases of operation. Colonel Oliveras called the National Guard Bureau for permission to use the site which was obtained quickly from the head of the ANG, General Winston Wilson.¹⁰

The earliest plans for the ANG's Radar Site are architectural drawings that date to circa 1961.¹¹ Although undated, they show the administration building (Building 1) and a radar maintenance, operations, and communications building (Building 2) both completed in 1961 and none later.¹² Two radar antennae are noted on the plans: one is indicated as a free-standing tower north of the unpaved loop road northwest of Buildings 1 and 2, and the other antenna atop of the center of the main World War II bunker (Building 3).¹³ Also built at that time was a water pump station (Building 5). These three buildings are extant today although in much altered states and lacking historic integrity. During these early years, the ANG's radar operations and maintenance functions were carried out from two Quonset huts north of the bunker.

In 1964 and 1966 the ANG enclosed the radar antennae in two geodesic dome radomes (Radomes 4 and 6, respectively). Radome 4 (Building 4) is a free-standing tower with a geodesic dome roof. It is just beyond the installation's loop road, northwest of the World War II bunker (Building 3) and main operations and administration buildings. Originally it housed a GPA-89 radar antenna. Two years later, in 1966, the radar antenna atop of the World War II bunker (Building 3) was replaced with Radome 6 (Building 6), a similar steel-framed tower with geodesic dome roof to Radome 4. Radome 6 housed an AN/FPS-67 radar antenna atop of the same bunker with its utilities and support functions housed inside the bunker. Additional facilities for recreational, administrative, vehicular maintenance, and utility (sewer and electrical) upgrades were made at the Radar Site during the successive decades.¹⁴ Circa 1998 the station modernized its radar equipment, and installed an integrated radar antenna in Radome 6. The radar antenna and related equipment were removed from Radome 4. From that point on, Radome 4 was used for storage and classroom training functions.

On East Island in 1960, a U.S. Air Force missile testing facility was established as an adjunct of Patrick Air Force Base. Architects and engineers under contract to the Jacksonville District,

¹⁰ Account of discovery of Fort Mascaro for future site of Punta Salinas Radar Site is from Colonel Oliveras interview with Dr. Wiedenfeld, January 2009.

¹¹ Drawings mentioned in this section are at the 156 Airlift Wing, Civil Engineering office, Luis Muñoz Marín International Airport Air National Guard Base.

¹² Building completion date is based on PEER Consultants and DuVall & Associates, *Phase I Archaeological Survey and Architectural Evaluation*, and ANG real property records provided by the National Guard Bureau and the 156 Airlift Wing, Puerto Rico Air National Guard.

¹³ The early buildings are shown on drawing titled "Modification and Rehabilitation of 140th ACWRON, Fort Mascaro, Punta Salinas, P.R., PR, Site Plan." Note this is a hand-drawn site plan without any date or other attribution, stored at 156 Airlift Wing, Civil Engineering. Quonset huts are not shown on the drawing but are mentioned by Colonel Oliveras to Dr. Wiedenfeld, January 2009.

¹⁴ Drawings that establish the radar equipment in Radome 4, planned radar equipment in Radome 6, and air-to-ground communications tower are a set of three sheets titled "Construction of Piers for Radome Tower Bldg at 140 AC&W Sq. Punta Salinas, Puerto Rico" stored in the 156 Airlift Wing, Civil Engineering. The sheets have no dates or series or project numbers. The drawings show details of the construction of Radome 6, completed in 1966.

Army Corps of Engineers drew up plans to modify the World War II bunker (Building 9) to accommodate an observation tower atop the southwest corner of its burster slab and to remove its southeast corner for a concrete vehicle operations building (Building 11). Also built north of the bunker was a concrete administration building (Building 10).¹⁵ By 1963 the station was referred to as the San Juan Tracking Station on U.S. Geological Survey maps. It is not known if the station's function changed, or if this was its public moniker for the testing facility. Little is known about the missile testing facility. Today the ANG uses Building 9 for storage and has retained Buildings 10 and 11, although their condition is lacking due to water intrusion and other maintenance problems.

In 1964 the Puerto Rico ANG established a secondary radar site at Ramey Air Force Base, the former World War II Borinquen Air Field. Served by the 140 Air Control and Warning Squadron Detachment 1, the Punta Borinquen Radar Site worked in tandem with the Punta Salinas Radar Site to extend radar coverage to the west side of the island.¹⁶ More recently the squadron has been redesignated the 141st Air Defense Squadron.

Military History of Puerto Rico, 1893–1989:

Early Years Through World War II: With the signing of the Treaty of Paris in 1898, the island of Puerto Rico came under U.S. control as an unincorporated U.S. territory and the United States became responsible for the island's military security. The U.S. military established a post around the former Spanish-colonial military complex. Named the San Juan Military Reservation, it became the U.S. military's main garrison. In 1943 the San Juan Military Reservation was renamed Fort Brooke, and additional facilities including a hospital, fire towers, and other facilities were built as needed for World War II. The island's first permanent communications facilities were constructed by the U.S. military only five years after the end of the Spanish-American War. Established in 1905, the Naval Radio Station, Puerto Rico supported the communications requirements of the ships policing the waters of the Caribbean as well as other functions. During World War II, the radio station was redesignated the Naval Communications Station San Juan and its receiver station was moved to Carolina, San Juan. South of San Juan Bay, Camp Buchanan, originally on a 300-acre installation known as Camp Miles, was expanded with permanent facilities in 1940. Throughout World War II Fort Buchanan served as a major facility with pier-side facilities connected by rail for incoming personnel and supplies. At the fort, personnel were processed for service in World War II and later the Korean conflict.

In the late 1930s naval strategists assessed the American naval capacity to protect the Panama Canal and wage a two-ocean defense as woefully inadequate. Plans were enacted to build new facilities in Puerto Rico, Guantanamo, and Trinidad corresponding to the three sectors of the

¹⁵ Information about the U.S. Air Force missile test center on East Island, including the reuse of the World War II battery (Building 9), is from a series of drawings, titled "Missile Radar Station (FPS-16), East Island, Punta Salina, Puerto Rico, Missile Test Center Patrick Air Force Base" 1962, stamped "as built," from the U.S. Army Corps of Engineers, Jacksonville district and stored at the 156 Airlift Wing, Civil Engineering.

¹⁶ PEER Consultants and Duvall & Associates, *Phase I Archaeological and Architectural Evaluation of the Punta Borinquen Air National Guard Station, Punta Borinquen, Aguadilla Municipio, Puerto Rico, May 2000*, prepared for the National Guard Bureau and the Puerto Rico Air National Guard (Oak Ridge, Tennessee: PEER Consultants, P.C., 2000).

Caribbean. In 1939 plans were organized for a major air station in the mudflats of Isla Grande between the San Juan Harbor and the San Antonio Channel in San Juan, Puerto Rico. It was also judged that a major forward naval installation in the Caribbean the equivalent of Pearl Harbor with a shipyard with dry dock facilities was needed. President Franklin Delano Roosevelt ordered the construction of a naval base in the Atlantic to serve like Pearl Harbor and recalled the town of Ceiba as a suitable location. He had visited there as Assistant Secretary for the Navy in 1919. Work began on the Roosevelt Roads Naval Operating Base in 1943, but construction was suspended in 1944 as the U.S. military gave greater attention to the ongoing war. The base opened, closed, and reopened several times. Nevertheless, gunnery and bombing ranges were established on nearby Vieques and Culebras Islands. However, it was not until the 1950s that the Roosevelt Roads base was reestablished and grew in importance.¹⁷

During the years leading up to World War II, the Germans had invested in commercial airlines and airfields in Mexico and Latin America, causing concern to the U.S. military and foreign policy strategists. To ensure the protection of American interests in Latin America, particularly the Panama Canal, the U.S. military sought a major air base on Puerto Rico and developed additional airfields on the island and throughout Latin America. In 1939, a survey of possible air base sites on the island concluded that Punta Borinquen on the west coast would be the best site for a major air base. In addition to the Navy's establishment of the San Juan Naval Air Station at Isla Grande, the Army established Borinquen Army Air Field which was later renamed Ramey Air Force Base. The first squadron, the 27th Bombardment Squadron, consisted of nine B-18A Bolo medium bombers. In 1940, the 25th Bombardment Group (fourteen B-18A aircraft and two A-17 aircraft) arrived at the base from Langley Field. As discussed below, during the Cold War years, Ramey Air Force Base saw a second ANG radar site, Punta Borinquen, be established.

The island's air defense radar sites and airfield capacity were expanded during this period. Early warning anti-aircraft radar sets (SCR-270 [mobile] or SCR-271 [fixed]) were operated by the Signal Corps' 559th Air Warning Battalion at various locations around the island. Small airstrips, often little more than a single dirt runway with a few buildings, were constructed including at Salinas, at Santa Isabel, and at Dorado west of San Juan. Both Santa Isabel and Dorado served as auxiliary airfields for fighters and bombers from Losey Field (later renamed Fort Allen).

During World War II the island was afforded additional protection with the construction of a series of coastal fortifications. In 1939 an ammunition depot was established at Sabana Seca, a former pineapple plantation. To the east, the U.S. Army Garrison, Fort Buchanan established batteries and bunkers, barracks, observation and fire towers, and other facilities on Punta Salinas peninsula, Battery Island, and the small island to the west of the peninsula. Others like Fort Mascaro were erected elsewhere on the island's coastline and near its harbors. In the area of San Juan, fortifications were established at the Punta Escambrón Military Reservation, Punta Congrejos Military Reservation near Luis Muñoz Marín International Airport, and Fort Amezquita on Cabras Island. Coastal batteries and barracks also were constructed to defend the harbors of Aguadilla and Mayaguez and in the vicinity of Roosevelt Roads Naval Operating

¹⁷ Department of Navy Bureau of Yards and Docks, "Bases in South America and the Caribbean Area, Including Bermuda," chapter 18 in *Building the Navy's Bases: History of the Bureau of Yards and Docks and the Civil Engineer Corps, 1940-1946* (Washington, DC: Government Printing Office, 1947), www.ibiblio.org/hyperwar/USN/Building_Bases/bases-18.html.

Base. Additional fortifications were planned or constructed at Vieques, Culebras, and Punta Puerca.¹⁸

Cold War Years: After an initial ramp-down following World War II, Puerto Rico saw an expanded presence of the U.S. military during the Cold War years. The many smaller airstrips and defensive forts from World War II were closed, but Roosevelt Roads naval base and Borinquen Army Air Field were reactivated and expanded. U.S. military and foreign policy strategists sought to prevent Communists or Socialists in Cuba and elsewhere in Latin American from gaining a foothold in the western hemisphere. They saw Puerto Rican soil both as an important anchor for the developing air defense and intelligence communications systems and as a needed American base of operations against Communist expansion. Thus, a few military facilities in Puerto Rico were greatly expanded to support communications, interceptors and bombers, special forces, and reconnaissance missions.

Puerto Rico's intelligence and air defense communications functions grew in importance as the United States entered into new worldwide alliances, its intelligence institutions were established, and communications technology improved. In 1949 the ammunition depot at Sabana Seca was transferred to the U.S. Navy, and two years later the Naval Communications Station San Juan receivers were moved there. In 1954 the Sabana Seca naval installation became one of fifteen secondary fleet communications and general broadcast stations established worldwide. In 1962 it grew again with the addition of the Naval Security Group Activity (NSGA). Companion facilities to the NSGA at Sabana Seca were in Turkey, Scotland, and Spain and served cryptologic and communications support for the entire Atlantic fleet. To support the NSGA, a new Circularly Disposed Antenna Array was constructed at Sabana Seca. It was about the same time, in 1963, that the U.S. Naval Radio Station was moved to Fort Allen (former Camp Losey) on the southern coast of the island, and the Arecibo Observatory opened as the world's largest radio telescope.¹⁹

The Puerto Rico ANG moved to Luis Muñoz Marín International Airport in 1956. Its fighters participated in the runway alert program supported by the 140 Aircraft Control and Warning Squadron. As discussed above, the squadron established a directional search radar site on the Punta Salinas peninsula east of Sabana Seca to monitor air traffic from its mobile and fixed radar antennae. Initially the squadron worked out of two Quonset huts and a World War II bunker left from Fort Mascaró until its new ANG facilities were completed in 1961. In 1964 and 1966, as previously discussed, it erected two radomes to shelter its antennae, one free-standing north of the main buildings and the other mounted atop the World War II Battery Buckey. The reach of the ANG's air defense system also was extended in 1964 with the establishment of the 140 Aircraft Control and Warning Squadron, Detachment 1 which was assigned to a new radar site on Ramey Air Force Base. Located at Punta Borinquen on the island's west coast, this second radar site was equipped with a GPS-3 directional search radar that extended the ANG's western air defenses.

¹⁸ Payette, "Puerto Rico."

¹⁹ R. Christopher Goodwin and Associates, Inc., *Navy Cold War Communication Context: Resources Associated with the Navy's Communication Program, 1946–1989*, prepared for the Naval Facilities Engineering Command, Atlantic Division, Contract No. N62470-92-D-8965, Delivery Order No. 48 (Frederick, Maryland: R. Christopher Goodwin and Associates, 1997); also ConservAccion, *Update of the Architectural Inventory Naval Security Group Activity, Sabana Seca, Puerto Rico*, prepared for Naval Facilities Engineering Command, Atlantic Division (Richmond, Virginia: Sadler and Whitehead Architects, 2003).

Although at Ramey Air Force Base, the Punta Borinquen ANG Radar Site was a subordinate geographically separated unit to the Punta Salinas Radar Site and the Luis Muñoz Marín International Airport ANGB.²⁰

In 1950, the newly reestablished Ramey Air Force Base was transferred from the Caribbean Air Command to the Strategic Air Command (SAC). This gave the installation increased importance as an operational base supporting aerial and other reconnaissance functions for SAC. In the mid-1950s a medium bombardment unit was added at the base, and additional facilities were constructed. The base's new runways ranked as the longest of the Caribbean area. Likewise the Roosevelt Roads naval base expanded as the Atlantic Fleet Guided Missile Training Center during this time, and was redesignated as a full-fledged naval station in 1957. An increased land base at Roosevelt Roads enabled development of an airfield, operations center, and an industrial complex. Roosevelt Road's gunnery and bombing ranges established on Vieques and Culebras Islands during World War II saw greater use to train the Atlantic fleet. Certainly the proximity of a based fleet in Puerto Rico was given greater credence after the blockade of Cuba during the 1962 Cuban Missile Crisis. With numerous expansions including harbor facilities and Fort Bundy, Roosevelt Roads became the largest U.S. naval base by land mass in the world. Fort Buchanan, too, gained in importance and became the headquarters of the main command of the U.S. Army in the Antilles Command until 1966, when it became part of the U.S. Navy until 1977, when it was returned to the U.S. Army.

Part II. Structural/Design Information

A. General Description:

1. **Character:** Radome 4 is a typical two-and-a-half story, steel-framed tower with a fiberglass geodesic dome roof above. It stands at the northwestern portion of the Punta Salinas Radar Site. The radome originally enclosed a GPA-89 radar antenna that was mounted at the center of the dome level floor. All radar equipment has been removed from the radome. In plan view, the tower is a twelve-bay structure with an overall diameter of 48'-10". It has a height of 26'-0" from the top of the footing to the top of the tower. The exterior of the tower is sheathed in corrugated sheet metal over urethane foam insulation supported by a steel tower frame. Entrance into the first floor of the radome is at south-facing Bay 1, up a set of six concrete stairs set into a concrete platform. Additional doors are on Bays 4 and 5 (counting counterclockwise from Bay 1 on the south). Anchored to the top beam of the tower is a geodesic dome roof of fiberglass triangular units set into hexagons. Interior access to the upper floors is via open metal straight stairs leading from the first to second floors, and second to third (dome-level) floors. Entry into the second and third floors is through metal hatch-covered openings. The radar antenna was mounted at the center of the dome-level floor supported by a framework of three steel beams.

²⁰ Puerto Rico Air National Guard, *Puerto Rico Air National Guard, Forty Five Years of History 1947-1992*, (San Juan, Puerto Rico: Puerto Rico Air National Guard, 1992); also PEER Consultants, *Phase I Archaeological and Architectural Evaluation of the Punta Borinquen Air National Guard Station*.

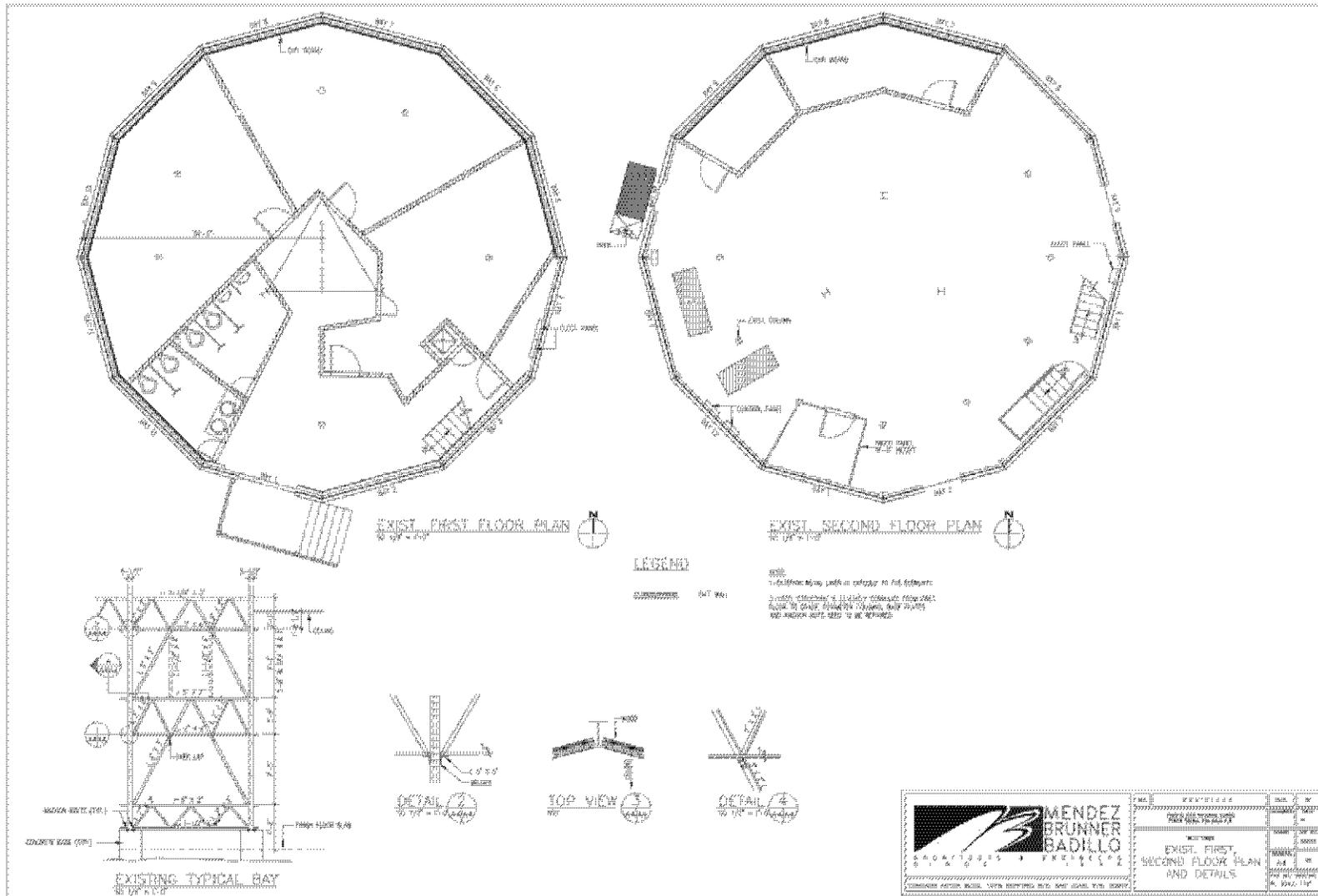


Figure 2. Plan of First and Second Floors, 1998.
(Floor plan was created for the Department of Defense and is on file at the 156 Airlift Wing, Civil Engineering office.)

2. **Condition of Fabric:** Radome 4 is in very poor condition. It has incurred hurricane and water damage and suffers from advanced deterioration. The tower's metal supports and floors are corroded and weak, and bolts and anchors that attach footings to the supporting columns are rusted and failing. Exterior sheathing is substantially missing and damaged, and urethane foam has been added to consolidate missing or damaged sheathing panels. Doors and windows are not present, leaving openings or boarded up with plywood. All radar-related equipment including antenna and consoles has been removed from the radome.

B. Construction:

Radome 4 is composed of two major components: the tower and the geodesic dome roof. The tower has two full stories elevated above the footings. It encloses a third half-story under the fiberglass geodesic dome roof above.

The radome tower is a twelve-bay, steel-framed structure with an overall diameter of 48'-10". It has a height of 26'-0" from the top of the footing to the top of the tower. The exterior of the tower is sheathed in corrugated sheet metal over urethane foam insulation supported by a steel frame. Bay 1 is the south-facing bay, and the successive bays are numbered counter-clockwise to Bay 12. Entrance into the first floor of the radome is on Bay 1 on the south-facing facade, up a set of six concrete stairs set into a solid concrete platform. Additional doors are on Bays 4 and 5 (counting counterclockwise from Bay 1 on the south). Anchored to the uppermost beam of the tower is a geodesic dome roof of fiberglass triangular units into hexagons that encloses the uppermost story. Interior access between floors is via open metal straight stairs leading from the first to second floors, and second to third floors. Entry into the second and third floors is through metal hatch-covered openings. The radar antenna was at the center of the dome-level floor. Radome 4 is in poor condition. It is missing portions of its sheathing, doors, and windows, and its frame and footing anchors are rusted and deteriorated.

The radome tower is constructed of twelve wedge-shaped bays framed in steel beams. The tower is supported by a 3'-0" wide continuous perimeter footing of reinforced concrete, twelve 2'-0" square concrete footings set inward 10"-0" from the exterior, and three 2'-0" concrete footings at the center. Each bay is composed of a steel framework with an exterior face that measures 13'-0" long and is composed of steel beams and smaller bracing members. The two 5-1/2" wide upright beams of these bay faces are anchored with bolts to the perimeter footings. These beams extend two stories high or 28'-0" above the footings. Columns with a 4" diameter connect to the square footings that are set inward by 10'-0" from the exterior. These columns support the sides of each bay. The face of each bay is framed as follows: 5-1/2" wide steel I-beams that are bolted to the perimeter base extend the full 28'-0" height of the tower. The beams are strengthened by two horizontal members at the midsection and lower and upper sections. Diagonal bracing reinforces the upper and lower sections to create modified trusses. The sides of each bay are established by I-beams bolted to the bay faces and interior. They are supported by the aforementioned round columns.

At the center of the radome tower are three I-beams that extend the full height of the tower to which horizontal beams are bolted. They support the weight of the radar antenna in the dome level above. Atop this framework was mounted the rotating radome antenna on the dome level floor with holes for data cables and electrical system.

On Bay 1, the south-facing bay, is a boarded up opening that likely held a single-leaf corrugated metal door. The concrete stairs lead to this main entrance. An emergency exit on the second story of Bay 10 was accessed via an open, steel exterior staircase. The door and open stairs are missing. Inside the radome, access between the floors is via straight flights of open, steel stairs on the east side, Bays 3 and 4, of the structure. Stairs at Bay 3 of the first floor lead up to a hatch cover at the second floor at Bay 4, and a similar straight open flight of stairs leads to a hatch cover that accesses the dome level. There are window openings, 4'-0" x 3'-0" in size, on the first floor, Bay 3 and on the second floor, Bay 2. The window frames and sashes are missing. Radome floors are flat sheet metal over wood subfloors. The geodesic dome is bolted to the top of the tower frame.

The geodesic dome serves as the uppermost story of the radome and roof. It protected the radar antenna mounted onto the upper floor. The dome is composed of triangular fiberglass units organized into hexagons framed by impregnated wood struts. There are four hinged triangular windows in the dome that correspond with the cardinal directions. They open to the exterior. The bottom struts of each triangular unit attach to a long bottom chord, which in turn is bolted to the top beam of the tower. Access to the dome level floor is via a metal hatch door on the east side of Bay 4. A flight of open metal stairs leads from the second level to the dome level. Outside the radome, a data cable in a covered trench transmitted the data from the radar antenna and consoles to the consoles in the operations room in Building 2.

The interior of the first floor is partitioned into six general-use rooms including an entry anteroom and men's and women's restrooms. Partitions are metal studs with sheetrock, and the ceiling is suspended acoustical tiles. The interior of Radome 4 is open at its second and third (dome level) stories except for two small rooms at the north side (Bays 7, 8, 9) of the second floor. The second story ceiling also is suspended acoustical tile. The interior of the third (dome level) story under the geodesic dome is open. There is a small metal cover over the central opening where the electrical and communications cabling for the radar antenna exited beneath. The third story also retains a small floor hoist. This interior configuration of Radome 4 has been in place since at least 1982. There are no drawings documenting the original interior spatial arrangement.

C. Construction:

Radome 4 stands in a dramatic setting on a high hill at the end of the Punta Salinas peninsula overlooking the Atlantic Ocean. The radome has a clear view in all directions. Within the Radar Site, Radome 4 is north of the loop road and northwest of the cluster of major buildings of the Radar Site, including Radome 6, bunker (Building 3), and Buildings 1 and 2. Paved parking is to the west of the radome.

Part III. Sources of Information

A. Primary Sources

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