

WHITE SANDS SPACE HARBOR
(Space Shuttle Landing Facility)

HAER No. NM-27

White Sands Missile Range

Approximately 6.8 miles northeast of intersection of Range Road 7 and
Range Road 10 and approximately 2.5 miles west of Doña Ana-Otero
County line

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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U.S.G.S. 7.5. Minute Las Cruces, New Mexico,
quadrangle, Universal Transverse Mercator Coordinates:
E 32.93817 N 106.41016 Zone 13S, NAD 1983

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The White Sands Space Harbor (WSSH) has a direct
association with the U.S. Space Shuttle Program (SSP),
as the site of the landing of Space Transportation
System (STS)-3 *Columbia* in March 1982; this is the
only STS landing to take place outside Edwards Air
Force Base in California and Kennedy Space Center in
Florida.

The WSSH district is considered to have national
significance and is eligible for listing in the
National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA SSP with
a period of significance of 1976-2011. Because it
achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

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118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. INTRODUCTION

The National Aeronautics and Space Administration (NASA) operated and managed the WSSH for astronaut training operations and as an alternate landing facility for the U.S. Space Shuttle Program (SSP) from 1976-2011. It has a direct association with the SSP as the site of the landing of Space Transportation System (STS)-3 *Columbia* in March 1982. The WSSH is located on the WSMR northeast of the NASA-operated White Sands Testing Facility (WSTF). The WSSH facility included the runways and support facilities (Area 1); the orbiter deservice area (Area 2); operations control center (Area 3); and original operations control center/deservice area/Delta Clipper site (Area 4). NASA formally ended the SSP on August 31, 2011, and in the summer of 2012 disposed of the WSSH and released use of the property to WSMR.

The WSSH Space Shuttle Landing Facility lies at the north end of the WSSH and contains approximately 4,900 acres. Area 1 is comprised of twenty-eight resources, including three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The runways were constructed between 1976 and 1988. The HUB maintenance facility and support buildings are prefabricated and were located together between 1984 and 1992 to house training and landing needs. The Control Tower was purpose-built in 1979 and Weather Tower No. 4 was assembled in phases from 1982-2005. The WSSH Space Shuttle Landing Facility was vacated in 2011 and all electronic equipment, machinery, and furnishings were removed. In the summer of 2012, the U.S. Army initiated occupation and reuse of the facility and the Control Tower was relocated from WSSH to the WSMR Museum for storage and future exhibition.

Located at the south end of the WSSH, Area 2 contains the Deservice Pad, Heavy Equipment Maintenance Building, Latrine, Environmental Office, Field Engineer Office, Security Guard Shacks, Workshops, and several storage buildings. A natural surface tow way connects the Deservice Pad to Range Road 10 and the Runways in Area 1. A gravel road connects Area 2 to Range Road 10 and the Operations

Control Center at Area 3, which is located at the southwest corner of WSSH. Area 3 contains the Operations Control Center, Dispensary, Communications Building, Weather Trailer, Loading Dock, Helicopter Landing Pad, and mobile trailers. Area 4 is comprised of the ruins of two concrete pads and a loading dock as well as a small survey marker commemorating the STS-3 Columbia landing in March 1982. A natural surface access road connects Area 4 to Range Road 10. The land area and dunes within the Alkali Flat outside the footprint of Areas 2, 3, and 4 is controlled by the U.S. Army and U.S. Air Force.

B. HISTORICAL CONTEXT

1. CHARACTER/ENVIRONMENT

The White Sands Space Harbor (WSSH) is located on the U.S. Army White Sands Missile Range (WSMR) near Las Cruces in Doña Ana County, New Mexico. This military post lies in the Tularosa basin along the upper edge of the Chihuahuan Desert, a vast eco-region straddling the U.S.-Mexico border in the central and northern portions of the Mexican Plateau. The Tularosa basin is an arid high-desert region covering approximately 6,000 square miles between the Rio Grande and Pecos River in south-central New Mexico with elevations ranging from approximately 3,800-4,200' feet above sea level. This stark desert is composed of the world's largest surface deposit of gypsum, a very soft sulfate mineral made of sulfur and calcium. Gypsum is derived from the Greek word *gypsos*, which means "chalk" or "plaster." Located between two towering mountain ranges, the gypsum sand dune is commonly known as "White Sands."¹

The landlocked, bowl-shaped Tularosa basin is 150 miles long and 50-60 miles in width. It is located between the San Andres Range to the west and the Sacramento Mountains to the east. The unique sand dunes originated many millions of years ago when a shallow, glacial lake called Lake Otero covered south-central New Mexico. When the lake eventually evaporated, it left behind gypsum bearing marine deposits nearly 1,600' thick. The exposed northern region of the lakebed is a 1,600-square mile area called the Alkali Flat. The southern region contains an ephemeral lake, or playa, called Lake Lucero with a very high mineral content. Although summer temperatures can easily exceed 100 degrees, the unique white sand reflects the sun's rays and the grains are so fine they are cool and silky to the touch. Gypsum is commonly

¹ Andreloi 1998: Section 3.1.2.2; Bennett, Jeffrey, and Douglas Wilder. "Physical Resources Foundation Report: White Sands National Monument. Natural Resources Report NPS/NRPC/NRR-2009/166." National Park Service, Fort Collins, Colorado, 2009: 9.

used to make plaster of Paris, fertilizers, drywall and Portland cement.²

The near ceaseless desert winds, clocked at more than fifty miles per hour, push the fine gypsum grains to form crests as high as sixty feet on the upwind side, and under the pressure of gravity, the sand slides down steep slipfaces, giving the sands dynamic movement. Each year, the most active dunes advance to the northeast more than thirty feet, covering almost everything in their path; the more stable dunes move very little. The gypsum dunes are a harsh and dry environment with fierce sandstorms, flash floods, and temperatures ranging from below zero in winter to more than 110 degrees in summer. Only a few plants and animals have adapted to survive.³

2. CHARACTER

Isolated, spacious, and built on the Northrup Strip within a federal installation, the location of 100-square mile WSSH at the WSMR offered some definite advantages for the expansive runways needed for the SSP. Area 1 of the Space Shuttle Landing Facility is comprised of three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The immense "X" shaped intersecting runways are its dominating feature. The few support buildings and structures are organized around the runways. The control tower and the HUB buildings are clustered together on the east side of the intersection. The navigation aids and support facilities are located along the runways. The Space Shuttle Landing Facility is surrounded by open desert and ringed by mountain ranges.

² Andreoli 1998: Section 3.1.4; Welsh, Michael. "Dunes and Dreams: A History of White Sands National Monument. Administrative History: White Sands National Monument." National Park Service, Division of History, Intermountain Cultural Resources Center, Santa Fe, New Mexico, Professional Paper No. 55, 1995: Chapter 1; Bennett and Wilder 2009: 9.

³ Andreoli, 1998: Section 3.1.2.2; Andreoli, 1998: Section 3.2.3; Welsh, 1995: Chapter 1; Bennett & Wilder, 2009: 7-18.

3. EARLY SETTLEMENT

For a period of nearly 10,000 years, American Indians occupied the Tularosa Basin, until a major drought around A.D. 1350 forced outmigration. For the next 250 years, the basin was occupied only by small groups of hunters and gatherers on a limited basis. By the time of Spanish colonization in the mid-seventeenth century, nomadic groups of Athabascan tribes were established in the nearby mountains. By the eighteenth century, the Mescalero Apache were the only Indian tribe living in the Tularosa Basin. European colonization in the basin was delayed by Apache resistance until the mid-nineteenth century.⁴

In the late eighteenth and early nineteenth centuries, settlers made occasional salt expeditions from El Paso to the Alkali Flats. The area was part of Mexico until 1848, when it was turned over to the U.S. as part of the Treaty of Guadalupe Hidalgo. In 1849, the U.S. Army initiated exploration of the region and in 1855 established Fort Stanton, a military outpost on the Chisholm Trail in the Sacramento Mountains, and Camp Comfort in 1858 at White Sands. The military also constructed a service wagon road through the San Augustin Pass that separates the San Andres Mountains from the Organ Mountains.⁵

4. RANCHING THE TULAROSA BASIN

Under U.S. military protection, in the early 1860s, Hispanic families from the Rio Grande Valley moved to the area and established permanent agricultural communities, the first being Tularosa. These ranchers applied gypsum to the exterior of their adobe homes giving them a distinctive white appearance from a distance. After the Mescalero Apache Reservation was established in 1873 in the Sacramento Mountains and the Desert Land Act passed in 1877, this region of the New Mexico territory was colonized by European settlers from the eastern United States and western Texas.

⁴ Eidenbach, 2010: n.p.

⁵ Welsh, 1995: Chapters 1-2.

Ranchers replowed long abandoned agricultural lands and established free-range livestock ranches with sheep, Angora goats, horses, and cattle. Homesteads were built near permanent water sources flanking the "old salt lake." Miners searched the mountains for gold, silver, copper, lead, zinc, and other minerals. Boston investors established a copper mining town called Estey City, which operated from 1901-1910, before it was abandoned. Among the legendary inhabitants of White Sands was Pat Garrett who killed Billy the Kid in 1881 and was later shot to death in 1908 near the San Augustin Pass.⁶

Once Congress granted New Mexico statehood in 1912, new public land laws were soon implemented that resulted in the end of the open range ranches and a shift to a cash-based economy centered on mining, timber harvesting, stock raising, agriculture, and construction of railroads. A period of severe drought in the 1890s and overgrazing led to soil erosion and desertification of the once rich native grasslands, which caused the open range cattle ranches to go bankrupt. In addition, the hopes of a new gypsum-based construction industry never materialized. In the 1930s, the Great Depression and droughts brought the frontier era to an end with the federal government setting aside large tracts of land in the central and western sections of the White Sands basin.⁷

5. CONSERVATION

Local residents first envisioned conservation of the White Sands in 1898 when a group of businessmen from nearby El Paso, Texas, proposed the Mescalero National Park as a game hunting preserve. Around that same time, geologists intensified their studies of the White Sands, realizing its significance as a unique natural occurrence. Railroads reached the area in 1901 with stations in Alamogordo in Otero County to the east and Las Cruces in Doña Ana County to the west. In addition, newly established public universities, such as the University of New Mexico in Santa Fe

⁶ Welsh, 1995: Chapters 1-2; Eidenbach, 2010: n.p.

⁷ Welsh, 1995: Chapter 2; NPS, 2005: 19.

and New Mexico State University in nearby Las Cruces, initiated academic studies of the dunes.⁸

Federal designation of U.S. Highway 80 in the late 1920s from Savannah, Georgia, to San Diego, California, across southern New Mexico boosted the regional economy with automobile tourism. Roadside businesses, such as service stations and motels, opened along the 2,726-mile route called the "Dixie Overland Highway," which had originated in the South in 1914 with the motto: "The Shortest and Only Year Round Ocean-to-Ocean Highway." U.S. 80 also carried sections of the transcontinental Lee Highway and Jefferson Davis National Highway, both connecting Washington, D.C., with San Diego, as well as the Bankhead Highway, connecting El Paso with San Diego.⁹

As one of the principal transcontinental highways, towns along U.S. 80 in New Mexico included Roswell, Alamogordo, Las Cruces, Deming, Lordsburg, and Mescalero within the Mescalero Apache Reservation. Until the mid-twentieth century, travelers along U.S. 80 were diverted around White Sands to El Paso, Texas, although an unimproved road, State Route 3, opened through the sand dunes in the late 1920s. Nevertheless, U.S. 80 provided much improved access to the remote White Sands region.¹⁰

6. WHITE SANDS NATIONAL MONUMENT

Feasibility studies were initiated in the 1920s for commercial mining of the vast White Sands gypsum field. Passionate local opposition led to the resurrection of the idea of an all-year national park and ultimately to the creation of the White Sands National Monument in January 1933 by President Herbert Hoover. Straddling Doña Ana and Otero counties, the 115-square mile national park was dedicated on April 29, 1934. From 1936-1940, the National Park Service (NPS) constructed several support facilities designed by NPS architects, and constructed by the Works Progress Administration (WPA). These facilities included

⁸ Welsh, 1995: Chapter 2.

⁹ Weingroff, 2011: n.p.

¹⁰ Weingroff, 2011: n.p.

staff residences, restrooms, access roads, and a Spanish pueblo-style Visitor Center; most were listed in the NRHP in 1988.¹¹

The state highway department improved State Route 3 in the late 1930s and relocated U.S. 70/U.S. 80 through the San Augustin Pass between Alamogordo and Las Cruces, bypassing El Paso, and providing direct access to the new national monument (in 1991, New Mexico dropped the U.S. 80 designation). Soon, White Sands became the most popular national park in the southwestern U.S., averaging around 450,000 visitors annually.¹²

7. UNITED STATES ARMY WHITE SANDS MISSILE RANGE

During World War II, the U.S. Army established a rocket testing and bombing range at White Sands, due in part to the result of rocket research at Roswell, New Mexico, located approximately 130 miles to the east. The nearly 3,200-square mile installation at White Sands is the largest in the U.S., covering a swath of the desert in five counties in south-central New Mexico. The enormous installation is contiguous with the north side of Fort Bliss, established in 1849 at El Paso, Texas, and includes the White Sands National Monument. Much of the secluded land was already under local, state, and federal government jurisdiction, primarily as part of military firing, target, and bombing ranges. The New Mexico Highway Department declared U.S. 70, which crosses the WSMR, a military road subject to periodic closures.¹³

The initial military facility was the Alamogordo Army Air Field, established by the U.S. Army Air Force (USAAF) in April 1941 six miles west of Alamogordo at the western base of the Sacramento Mountains. By the end of 1941, the federal government cancelled public land grazing leases at White Sands so the land could be used by the USAAF as the Alamogordo Bombing and Gunnery

¹¹ NPS, 2007: n.p.; Welsh, 1995: Chapter 3; Bennett & Wilder, 2009: 3.

¹² Weingroff 2011: n.p; NPS 2005: 19; Welsh 1995: Chapter 3).

¹³ Quinn, Michael E. "White Sands Missile Range: V-2 Rocket Facilities." Historic American Engineering Record. National Park Service, 1984: 9; Buchanan, David G., John P. Johnson and William A. Brenner. "White Sands Missile Range: Dona Anna, Sierra, Socorro, & Lincoln Counties, New Mexico." Historic American Engineering Record. National Park Service, Washington, DC, 1984: 66.

Range (ABGR), renamed the White Sands Proving Grounds (WSPG) in 1945. The WSPG was a 1,243,000-acre land area incorporating the ABGR, the nearby ORDCIT (a joint venture between the U.S. Army Ordnance Department and California Institute of Technology at Fort Bliss), and additional portions of the Fort Bliss Artillery Range. Following the air attack on Pearl Harbor in December 1941, construction of the 5,900-acre air base began in February 1942 with full status achieved by June 1942.¹⁴

In 1944, the War Department chose White Sands as a missile research and nuclear bomb test site, due to its geography, isolation, and proximity to the Los Alamos Laboratory outside Santa Fe, New Mexico, approximately 200 miles to the north. On July 16, 1945, the first atomic bomb was detonated at the Trinity Test Site, an 18 by 24-mile area located on the Jornada del Muerto, Spanish for "journey of the dead man," in the northern end of the WSPG in Socorro County. Trinity was a test of a 16-kiloton nuclear fission, plutonium device developed as part of the Manhattan Project in coordination with research laboratories and facilities at Los Alamos, New Mexico; Oak Ridge, Tennessee; and Hanford, Washington, along with assistance from scientists at the University of Chicago and University of California at Berkeley.¹⁵

The Trinity test led to the creation of the "Fat Man" bomb detonated over Nagasaki, Japan, on August 9, 1945, ending the war five days later and ushering in the Atomic Age. The 36,480-acre

¹⁴ United States Air Force. "Holloman Air Force Base History." Holloman Air Force Base, New Mexico, Public Affairs Office. Website <http://www.holloman.af.mil/library/factsheets/factsheet.asp?id=4361>, accessed November 17, 2011; Buchanan, 1984: 18; Eidenbach, Peter L. "A Brief History of the White Sands Proving Ground, 1941-1965." Las Cruces, New Mexico: Human Systems Research, Inc., 1997: 1; Deming, Joan, and Patricia Slovinac. "Survey and Evaluation of NASA-owned Historic Facilities and Properties in the Context of the U.S. Space Shuttle Program: White Sands Test Facility, Las Cruces, New Mexico." Archaeological Consultants, Inc., Sarasota, Florida, 2007: Section 4.2. Unpublished report prepared for NASA Johnson Space Center, Houston, Texas.

¹⁵ Greenwood, Richard. "Trinity Site." National Register of Historic Places Nomination, National Park Service, Washington, DC, 1975; Andreoli, 1998: Section 3.6.

Trinity Test Site was designated a National Historic Landmark in 1965, when a stone monument was erected to commemorate the site, which includes the base camp, Ground Zero (detonation site), control bunkers, the Schmidt-McDonald Ranch House, where the bomb was assembled, and "Jumbo," a huge steel vessel designed to enclose the plutonium in the event of an unsuccessful test.¹⁶

The U.S. Army Corp of Engineers initiated construction of the Main Post Headquarters in early 1945. This post was located in the southwest corner of WSMR along the eastern base of the Organ Mountains in Doña Ana County and contained the W.W. Cox San Augustin Ranch as well as abandoned mines. The main post was designed with four quadrants containing the administrative and troop area, technical area, industrial and warehouse area, and the quarters and parade ground area. Temporary CCC buildings and an aircraft hangar were relocated from the Sandia Base in Albuquerque. A large Quonset hut was constructed for the V-2 program, as well as many temporary buildings, nearly all of which have since been replaced.¹⁷

The assembly and testing of captured German V-2 rockets was initiated in June 1945 from an army blockhouse at Launch Complex 33 (LC-33); a 75-foot tall gantry crane on a launch pad with rolling tracks was added in 1946. The testing of liquid-filled V-2 rockets capable of reaching outer space launched the American rocket program and led to U.S. exploration of space. Testing at LC-33 continued until 1952 when the U.S. Army transferred the rocket program to Redstone Arsenal in Huntsville, Alabama. The White Sands LC-33 Blockhouse and Gantry was designated a National Historic Landmark in 1985.¹⁸

The U.S. Navy constructed its own rocket firing facilities in 1946 at Launch Complex 35 with a launch pad and two steel launch towers. Other launch and testing sites were constructed at

¹⁶ Greenwood, 1975: n.p.; Buchanan, 1984: 49; Andreoli, R.J. "White Sands Missile Range, Range-Wide Environmental Impact Statement." WSMR, New Mexico, 1998: Section 3.6. Unpublished report on file at WSMR.

¹⁷ Buchanan, 1984: 66.

¹⁸ Quinn, 1986: n.p.; Buchanan, 1984: 68; Butowsky, Harry A. "White Sands Blockhouse and Gantry Crane." National Register of Historic Places Nomination, National Park Service, 1984; Andreoli, 1998: Section 3.6.

various locations from the late 1940s through the 1950s. From 1946-1961, the main post was expanded with semi-permanent buildings, including multi-story barracks and Quonset huts, as well as permanent facilities such as the headquarters, administration building, laboratory, missile assembly buildings, commissary, fire station, elementary school, cafeteria, chapel, recreational facilities, clinic, museum, mess hall, and family housing. In addition, several, small support outposts were built across the base.¹⁹

After World War II ended, the nearly 60,000-acre Alamogordo Army Airfield was deactivated. In 1947, it became home to the 49th Wing of the U.S. Air Force Air Command and in 1948 was renamed Holloman Air Force Base (HAFB) in honor of Col. George V. Holloman, a pioneer in guided missile research. In the 1950s and 1960s, the base became a renowned site for testing and development of pilotless aircraft and guided missiles. The base is home to the world's longest and fastest high-speed test track, nearly 10 miles long, which hosted a world land speed record for a railed vehicle with a recent run of 6,543 miles per hour, or Mach 8.5. Currently, the mission of the HAFB is research and development of advanced self-protection systems for combat aircraft, aerial reconnaissance improvements, and new weapons delivery systems. Nearly 2,100 people live on the HAFB, which supports about 21,000 active-duty, Guard Reserve, retirees, Department of Defense civilians, and their family members.²⁰

On April 29, 1958, the WSPG was officially renamed White Sands Missile Range (WSMR), which is pronounced "Whiz-Mer" by local residents. President John F. Kennedy visited WSMR to witness rocket launches in June 1963. The WSMR Historic District, containing approximately 50 buildings, was determined eligible for listing in the NRHP in the 1990s for its Cold War significance (1946-1991). The American Institute of Aeronautics and Astronautics (AIAA), the professional society for the field

¹⁹ Buchanan, 1984: 68-89.

²⁰ USAF, 2008: n.p.

of aerospace engineering, designated WSMR a Historic Aerospace Site in 2004.²¹

8. NORTHRUP STRIP

Northrop Aircraft, Inc. (Northrop) selected White Sands in 1948 for construction of a natural surface gypsum airfield. Founded in 1939 by John Knudson "Jack" Northrop (1895-1981) in the Los Angeles suburb of Hawthorne, Northrop designed and manufactured specialized military aircraft, including tailless, fixed-wing jet fighters - predecessor of the B-2 Stealth Bomber - intercontinental ballistic missiles, and target drones. Northrop used the White Sands airfield, located on the Alkali Flat approximately 6.5 miles east of the base of the San Andres Mountains, as a target drone firing range during anti-aircraft gunnery training exercises by military personnel from the U.S. Army and U.S. Air Force. The airfield flanked the north side of the White Sands National Monument and west side of the HAFB.²²

A former chief engineer at Lockheed, Jack Northrop was well known and respected in the field of aviation, receiving numerous honors and awards, including a Presidential Certificate of Merit in 1974. When he retired in 1952, the WSMR acquired control of the Northrop airfield, which became known as the "Northrup Strip" due to a longstanding typographical error. Jack Northrop's association with Northrup Strip appears to have been short-lived, from 1948-1952, and the exact nature of his involvement is undocumented. In 1952, Northrop purchased the Radioplane Company, which Reginald Denny established in 1939 for manufacturing target drones for the U.S. Army and U.S. Navy. By the late 1940s, the Radioplane drones were small, all-metal, piston-powered drones that became known as Basic Training Targets or BTTs. By the late 1950s, the BTTs evolved into experimental,

²¹ Buchanan, 1984: 18.

²² Freeman, Paul. "Abandoned & Little-Known Airfields: Northrup Strip/White Sands Space Harbor, White Sands, New Mexico." Website http://www.airfields-freeman.com/NM/Airfields_NM_Alamagordo.html, accessed September 23, 2011; Offutt, Frank. "WSSH Background." Unpublished response to questionnaire submitted by Victoria Bradley, 1994: n.p., on file at WSTF; Andreoli, 1998: Section 3.7.1.5; Deming and Slovinac, 2007: Section 4.4.

jet-powered anti-radar missiles and turbojet-powered drones that could reach supersonic speeds of Mach 2. A Northrop marketing image from 1955 was most likely set at White Sands.²³

Unmanned drones in the form of scale miniature fighter planes and helicopters took off at nearby HAFB and were fired upon over the Alkali Flat. Surviving and damaged drones landed or parachuted at Northrup Strip before being returned to HAFB for repairs and additional testing. The unmanned drones were controlled remotely by Northrop and military personnel from the WSMR Post Headquarters, HAFB, or via a mobile truck. At that time, there was no Control Tower at the airfield. During its use as a drone firing range in the 1950s and 1960s, the Northrup Strip airfield featured a drone maintenance building near Range Road 10 (Area 4) and a drone staging/tie-down area along the center of the 3,200' long, north-south runway, which was simply a graded gypsum surface with few if any navigational aids or markings. None of the Northrup Strip facilities from this period survive.²⁴

9. NASA AT WHITE SANDS

President Dwight D. Eisenhower (1890-1969) created the National Aeronautics and Space Administration (NASA) on October 1, 1958, in response to the Soviet launching of *Sputnik* on October 4, 1957. The first artificial earth satellite, *Sputnik* remained in orbit for three months before burning up on reentry on January 4, 1958. The surprise success of *Sputnik* spurred the Space Race between the United States and the Soviet Union during the Cold War (1947-1991). NASA's first series of missions were to send man into space, followed by manned orbits around the Earth, mastery of rendezvous and docking procedures, and finally,

²³ Freeman, 2008: n.p.; Guttman, John. "John Northrop's XP-79B Jet Fighter." Aviation History. Website <http://www.historynet.com/jack-northrops-xp-79b-jet-fighter-jan-96-aviation-history-feature.htm>, accessed November 19, 2011; Bergensen, Paul. "Jack (John Knudson) Northrop." Website copyright 2003 <http://www.bergen.org/AAST/Projects/Engineering Graphics/EG2000/flyingwing/history/jack.htm>, accessed November 19, 2011; Deming and Slovanic, 2007: Section 4-4; Goebel, Greg. "Unmanned Aerial Vehicles," 2010: Section 1.0-1.3. Website <http://vectorsite.net/twuav.html>, accessed November 29, 2011; Offutt, 1994: n.p.

²⁴ Offutt, Frank interview with Robbie D. Jones, WSSH, September 2011; Mitchell, Robert E. interview with Robbie D. Jones, WSSH, September 2011.

landing man on the Moon. These goals defined the three main programs of the late 1950s and 1960s: Mercury, Gemini, and Apollo. This effort culminated in the first moon landing on July 20, 1969. Moon landings continued until 1972 when the Apollo program ceased. By that time, it was clear that the next major program would be based on a reusable space shuttle, designed to serve orbiting space stations and related missions.

Initially, NASA had agencies located at Hampton, Virginia; Cleveland, Ohio; Washington, DC; Los Angeles and San Jose, California; and Huntsville, Alabama. In 1960, NASA astronauts began training on the WSMR, with the first manned flight into space taking place in May 1961.

NASA established the Lyndon B. Johnson Space Center White Sands Test Facility (WSTF) in July 1962 as the Apollo Spacecraft Propulsion Development Facility to perform testing of vital flight systems for the Apollo mission to land men on the Moon. Located at the U.S. Army WSMR on the west side of the San Andres Mountain Range, the first engine tests at the 87-square mile WSTF took place in September 1964. Two years later, NASA completed the Little Joe II test program for Apollo.²⁵

NASA entered into an agreement with the U.S. Army in 1976 for establishing an orbiter landing strip on a separate 100-square mile outparcel at the Northrup Strip, located approximately 55 miles northeast on the east side of the San Andres Mountains. In February 1969, President Richard Nixon (1913-1994) established the Space Task Group, which conducted a study to recommend a future course for the U.S. Space Program. In May 1970, NASA initiated a series of drop tests at the Northrup Strip using a one-tenth scale model of the experimental Space Shuttle, a reusable space flight vehicle providing routine access to space which the U.S. Department of Defense (DoD) had been exploring since the mid-1950s. A helicopter hovering at an altitude of

²⁵ NASA WSTF. "White Sands Space Harbor: 25th Anniversary Celebration, August 11, 2001": n.p. Unpublished brochure, on file at NASA WSTF; Deming and Slovinac, 2007: Section 4.3.

8,000' dropped the model, which then glided to the ground, controlled remotely from a mobile NASA van.²⁶

The NASA Space Shuttle Program (SSP) was formally launched by President Richard Nixon on January 5, 1972. With the mission of developing a reusable space shuttle system, the program was officially known as the Space Transportation System (STS). In the spring of 1976, NASA selected Northrup Strip as a Space Shuttle operations and astronaut training facility. That May, the airfield was upgraded, lengthened to 15,000', widened to 100' with additional 50' shoulders, and renamed "Runway 17/35." Initial test flights began in May 1976 with shuttle pilots from Houston flying into El Paso then to White Sands for two missions per day and nineteen approaches on each mission. NASA leased a privately owned commercial hangar at El Paso for storing Shuttle Test Aircraft (STA), which were Gulfstream II aircraft that had been highly modified to simulate the flight characteristics and instrumentation of the Space Shuttle from about 35,000' to touchdown. Over the course of the NASA SSP, pilots and commanders completed roughly 70 to 80 percent of their training at WSSH, flying 500 to 1,000 approaches, respectively. Training sessions occurred some 200-250 days out of the year in the 1980s and 1990s, tapering to 160-180 days in recent years as the program came to a close in 2011.²⁷

Due to a limited budget, NASA staff acquired surplus military equipment and a handful of temporary, prefabricated and portable buildings, including a Fire Station at the center of the runways. A mobile Air Traffic Control Tower used at the Apollo Lunar Landing Test operation at NASA's Ellington Field in Houston was relocated to Northrup Strip via a flatbed trailer. Ultrahigh

²⁶ Buchanan, 1984: 24; U.S. Army. "WSMR: Fact Sheet," 4. Undated, unpublished brochure, on file at WSMR; Andreoli, 1998: Section 3.7.1.5. Unpublished report on file, WSMR; Deming and Slovinac, 2007: Section 3.1.

²⁷ Offutt, 1994: n.p.; Paczynski, Alex S. "NASA Johnson Space Center Facilities Oral History Project: Alex S. Paczynski, interviewed by Jennifer Ross-Nazzal." Las Cruces, New Mexico, August 10, 2009; Mitchell, 2011; Offutt, 2011; Deming and Slovinac, 2007: Section 4.4.

Frequency (UHF) radios and other communication equipment were borrowed from the U.S. Army.²⁸

In October 1978, NASA designated Northrup Strip as a back-up shuttle-landing site and the primary abort-once-around landing site, requiring substantial improvements. Northrup Strip was chosen because it remains dry throughout most of the year and was under the flight path of the first Earth orbit following launch. In 1979, NASA added a second 15,000' long runway, named "Runway 23/05," which ran east-west and intersected Runway 17/35 near its center - forming an "X" shaped footprint. NASA engineers modified the mobile Control Tower into a stationary structure by attaching the cab to a former Apollo Propulsion Test Stand from the WSTF. The stationary Control Tower was located southeast of the runways' intersection. NASA also constructed an Operations Control Center (OCC) and "Deservice" area along Range Road 10 at the site of the preexisting target drone maintenance building (no longer extant). Connected to the runways via a natural surface graded towway, the Deservice area featured a concrete pad supporting a stationary 75-ton derrick crane for mating and demating the shuttle to a modified Boeing 747 jet for transportation to Kennedy Space Center (KSC) in Florida. The crane (no longer extant) was transported from the NASA Marshall Space Flight Center at Huntsville, Alabama, where it had served as the mate-demate device from 1976-1979 for the Orbiter *Enterprise* when it arrived and departed for testing.²⁹

Runway 17/35 replicated the runway at KSC and Runway 23/05 replicated the runway at Edwards Air Force Base (EAFB) in California so that shuttle pilots could practice landings at one location simultaneously. The runways were made of graded gypsum that had been compacted with water from a manmade waterhole at the southern end of Runway 17/35. NASA continued its practice of acquiring surplus military prefabricated portable buildings and equipment. A Microwave Scanning Beam Landing System was brought in from EAFB. The lone purpose-built facility was the Control Tower, which NASA engineers created by attaching the cab unit of

²⁸ Paczynski, 2009: 13; Mitchell, 2011; Offutt, 2011; Deming and Slovinac, 2007: Section 4.4; Dennis G. Perrin. Telephone interview with Robbie D. Jones, June 13, 2013.

²⁹ Paczynski, 2009: 4, 11; NASA, 2001: n.p.

a Mobile Air Traffic Control Tower to a repurposed Apollo Propulsion Test Stand relocated from the WSTF on the opposite side of the San Andres Mountain Range.³⁰

The first flight (STS-1) of Space Shuttle *Columbia* into the Earth's orbit occurred in April 1981; the second flight (STS-2) occurred in November 1981. After three decades of operations and 135 flights into orbit, NASA formally ended the SSP on August 31, 2011. Over this span, NASA used a total of five space shuttles: *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour* (the prototype, *Enterprise*, never went into space).

The SSP achieved a number of significant goals. In addition to supporting diverse space facilities such as Spacelab, the Hubble Space Telescope, the *Mir* Space Station, and the International Space Station, the shuttles contributed to many other space programs. Among these were various satellite systems (from COMSAT to the Advanced Communications Technology Satellite, or ACTS), and the unmanned probes that were sent to Jupiter (*Galileo*), Venus (*Magellan*), and the Sun (*Ulysses*). Additionally, the shuttle has deployed a number of Department of Defense (DoD) payloads that remain classified.³¹

On March 30, 1982, at the conclusion of an 8-day flight, the *Columbia* landed at Northrup Strip due to flooding at EAFB in California and harsh weather at KSC in Florida. The landing was delayed by a day, due to a dust storm on the Alkali Flat. This was the shuttle's third orbital flight test mission, known as "STS-3." The two-man crew for STS-3 consisted of Jack R. Lousma (b.1936), commander, and Col. Charles Gordon Fullerton (1936-2013), pilot. Two trains packed with NASA convoy equipment were shipped from EAFB to White Sands and portable buildings such as hangars, barracks, and latrines, were borrowed from the nearby HAFB. Approximately 2,000 civil servants from KSC and EAFB, who

³⁰ Pacznski, 2009: 3, 8, 11; NASA, 2001: n.p.; Mitchell, 2011; Deming and Slovinac, 2007: Section 4.4; Dennis G. Perrin. Telephone interview with Robbie D. Jones, June 13, 2013.

³¹ Deming, Joan, and Patricia Slovinac. "NASA-Wide Survey and Evaluation of Historic Facilities in the Context of the U.S. Space Shuttle Program: Roll-Up Report." Archaeological Consultants, Inc., Sarasota, Florida, 2008: 2.22-24. Unpublished report on file at the NASA Kennedy Space Center, Florida.

were trained to service the orbiter, were deployed to the Northrup Strip. *Columbia* was stationed at Northrup Strip for several days for flight preparations before being mated to a specially modified Boeing 747 and flown back to KSC on April 6, 1982. The process was delayed due to sandstorms that penetrated the orbiter.³²

Major General Alan A. Nord (1928-1993), WSMR Ranger Commander from 1980-1982, placed a small, engraved concrete monument in the sand at the location where the STS-3 astronauts met their families and named it the "*Columbia* site." On May 11, 1982, President Ronald Reagan (1911-2004) formally designated the Northrup Strip as the "White Sands Space Harbor," as a result of a petition to Congress by New Mexico Senator and former Apollo astronaut Harrison "Jack" Schmitt (b.1935). The Act stated, "[t]hat the landing strip known as Northrup Strip, located at White Sands Missile Range in the State of New Mexico, shall hereafter be known as 'White Sands Space Harbor'."³³

Once NASA began using the Shuttle Landing Facility at KSC in Florida in 1984, the WSSH became a back-up to the primary alternate landing site at EAFB in California. This resulted in a diminished role at WSSH within the NASA SSP in regards to orbiter landings. WSSH continued as the primary astronaut training facility for the SSP.

The NASA SSP underwent a thirty-two month hiatus following the loss of the Space Shuttle *Challenger* and the crew of seven astronauts on January 28, 1986. As a consequence, between 1986 and 1989, NASA implemented major changes at all NASA facilities and designated WSSH an official contingency landing site. Management of the NASA SSP was relocated from Johnson Space Center in Texas to NASA Headquarters at KSC in Florida. The NASA SSP at Vandenberg Launch and Landing Site in California was shut down. Changes at WSSH included upgrading and lengthening Runways 23/05 and 17/35 to 35,000' in length, by adding 10,000' long approaches on each end and 300' sidelines. All gypsum runway

³² NASA, 2001: n.p.; Paczynski, 2009: 6-8; Deming and Slovinac, 2007: Section 4.4.

³³ Deming and Slovinac, 2007: Section 4.4; U.S. Congress, S.2373 (97th), 1982.

surfaces were also laser leveled and constantly maintained by WSSH personnel. Both of the 35,000' long by 900' wide runways had the capability of handling the weight of the Space Shuttle.³⁴

In addition, both the OCC and Deservice Area (Area 4) were relocated approximately three miles west along Range Road 10 where new facilities were constructed on a rise overlooking the runways (Areas 2-3) and off the gypsum lakebed where blowing sand would be less of a hazard to the orbiters. Only the original OCC Building, now the Communications Building, was relocated from the original OCC and Deservice area. During this period, new prefabricated and portable facilities were erected at the Control Tower (Area 1), which became the HUB Maintenance Facility and included a maintenance building, office, navigational aids storage, fire station, and tool storage. Several of these buildings were relocated from WSMR; a prefabricated trailer that had been used for NASA's Apollo program was relocated from JSC at Houston.³⁵

In 1989, a third runway was constructed at WSSH to allow pilots to practice Transoceanic Abort Landings (TAL). Called Runway 20/02, this runway is 19,800' long and 200' wide and replicates runways at the Istres Air Base in France, Zaragoza Air Base in Spain, and Morón Air Base in Spain. From 1988-2002, other TAL sites included the Banjul International Airport in the Republic of Gambia, West Africa, and the Ben Guerir Air Base in Morocco. Each TAL was covered by separate international agreements. Additional support structures such as convoy staging and helicopter landing areas were created alongside the runways.³⁶

After NASA resumed the Space Shuttle flights in 1988, the WSSH was used primarily for shuttle flight training by astronauts and the third alternate landing site for Shuttle missions. NASA implemented a temporary two-year hiatus after the loss of Space Shuttle *Columbia* and the crew of seven astronauts during reentry

³⁴ Mitchell, 2009: 3-4; Deming and Slovinac, 2007: Section 3.5.

³⁵ Mitchell, 2009: 3-4; Offutt, 2011; Mitchell, 2011.

³⁶ NASA HPWG. "Space Shuttle Transoceanic Abort Landing (TAL) Sites." Information booklet, 2006: 2-4, published online at http://www.nasa.gov/centers/kennedy/pdf/167472main_TALsites_06.pdf, accessed November 19, 2011.

over Texas on January 16, 2003. In 2004, President George H.W. Bush announced that the NASA SSP would be retired by 2010, although NASA extended the SSP until 2011 due to delays with cargo delivery to the International Space Station. The Space Shuttle *Atlantis* (STS-135) landed safely at KSC in Florida on July 21, 2011, the final landing of almost 30 years of NASA space shuttle flights. President Barack H. Obama formally ended the NASA SSP on August 31, 2011, and gave NASA a new directive of deep space exploration, ultimately sending Americans to Mars.

Other government agencies or private corporations that have used the WSSH runways for training or experiments include the Department of Defense, U.S. Army, U.S. Air Force, Special Operations, General Motors (ABS brake testing), and Lockheed Missile and Space Company. The runways also have been used for emergency landings for both commercial and military aircraft, as well as high-speed automobile testing. Typically, WSSH hosted twenty-five regular personnel, including one NASA employee and twenty-four private contractors. Due to winds, the runways were continuously graded and compacted, a process that took six months for all three runways. Otherwise, the runways would not be usable. With every shuttle launch, a KSC crew of 114 personnel, known as the Rapid Activation Force, was placed on stand-by status in case they were needed as WSSH.³⁷

10. DELTA CLIPPER

Between 1993-1997, NASA and McDonnell Douglas (MD) - a private defense contractor based in St. Louis, Missouri - used the abandoned WSSH Deservice Area for experimental test launches and landings of the "Delta Clipper, Experimental (DC-X)," a 1/3 scale prototype for an unmanned, reusable, orbiter spacecraft that was inexpensive, low maintenance, and mobile/transportable for quick turn-around. In order to complete the tests, NASA and MD modified the "Single Stage Rocket Technology" (SSRT) site by constructing a new concrete vertical landing pad adjacent to the original 1979 orbiter deservice pad, which was repurposed for use as a vertical launch pad. The DC-X could be prepared and

³⁷ NASA, 2001: n.p.; Mitchell, 2011; Offutt, 2011; Deming and Slovinac, 2007: Sections 3.5.3 and 4.4.

launched by a crew of fifteen people and would be flown almost like a typical commercial airliner from spaceports around the U.S.³⁸

Twelve DC-X test launches were held at the SSRT site between August 1993 and July 1996 with Apollo astronaut Charles "Pete" Conrad, Jr. (1930-1999) as the ground-based pilot. On July 31, 1996, the DC-X was destroyed by fire on its twelfth flight upon landing when one of the landing legs failed to deploy. At that point, NASA discontinued the DC-X program and all mobile support equipment and portable structures, including a launch test stand and hangar, were removed. Only concrete foundations were left in place.³⁹

11. OTHER CHANGES

In the early 1990s, the central operations of WSSH, which included many of the portable support buildings at the HUB, were relocated to the new Orbiter Deservice Area. Since then, NASA acquired additional, prefabricated support buildings by NASA procurements from the Federal Emergency Management Agency (FEMA), HAFB, and other federal property reutilization processes. The agency has also borrowed mobile storage buildings for use at WSSH from the WSMR through an informal loan agreement.⁴⁰

³⁸ Hanson, Chris "Xenon." "Delta Clipper DC-X Test Launch, Whites Sands Missile Range." Website <http://xenon.arcticus.com/delta-clipper-dc-x-test-launch-white-sands-missile-range-september-1993>, accessed November 19, 2011; McDonnell Douglas. "Delta Clipper Test Program Off to Flying Start." Press Release issued June 20, 1994; Lerner, Preston. "Black Day at White Sands." *Air & Space Smithsonian Magazine*, August 2010.

³⁹ Mitchell, 2011; Offutt, 2011; Lerner, 2010: n.p.

⁴⁰ Offutt, 2011; Mitchell, 2011.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

NASA engineers prepared four sheets of Control Tower drawings, including a site plan, base foundation plan, plan view, elevations, and construction details in the spring of 1979. There are no original engineering plans or drawings for the HUB Maintenance Facility, Runways, or the majority of the Navigational Aids and Support Facilities. Plans were created around 1988 for construction of new asphalt navigational markings for the Runways. NASA staff created an as-built, not-to-scale site plan of the HUB Maintenance Facility, which was used as a base map for this report.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A 2010 aerial view of the WSSH can be found on page 38. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011
and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at the Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remained at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.⁴¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contained a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

⁴¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army White Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 2012. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR
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APPENDIX - LOCATION MAPS

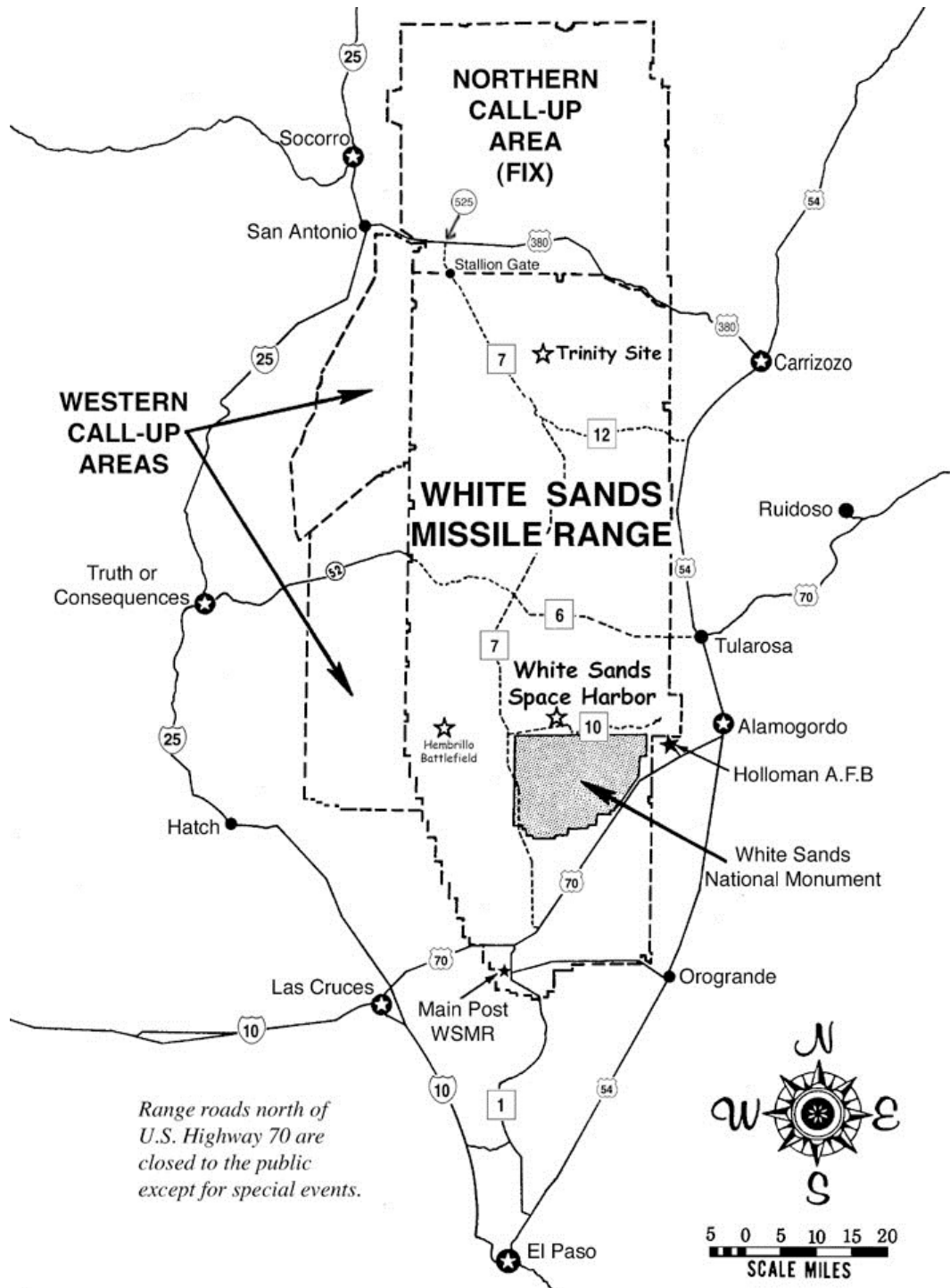


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).



Figure 3. Plan map of the HUB complex in Area 1, including the Control Tower (4), HUB Maintenance Building (6), Fire Station No. 4 (7), NAVAIDS Storage Building (8), NAVAIDS Control Building (9), and HUB Tool Storage (10) (Drawn from not-to-scale site plan courtesy NASA WSTF).

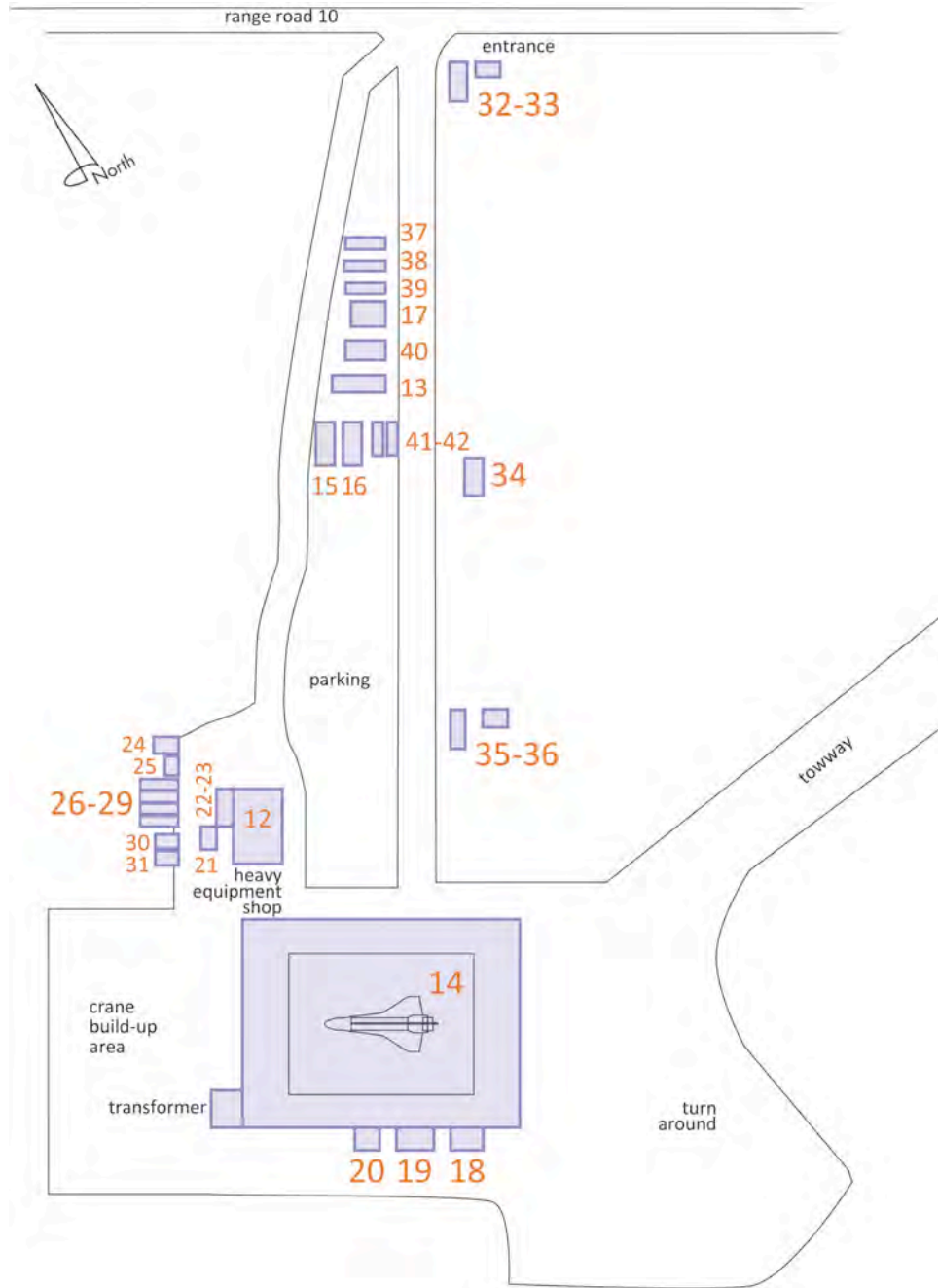


Figure 4. Plan of Area 2, Orbital Deservice Area. Environmental Office (13), Deservice Pad (14), Storage (15-17, 20, 22-30, 33, 36-39, 41, 42), Payload Shop (18), Workshop (19), Steam Pad (21), Polaris Shed (31), Security Guard Shack (32, 35), Field Engineer Office (34), Latrine (40).

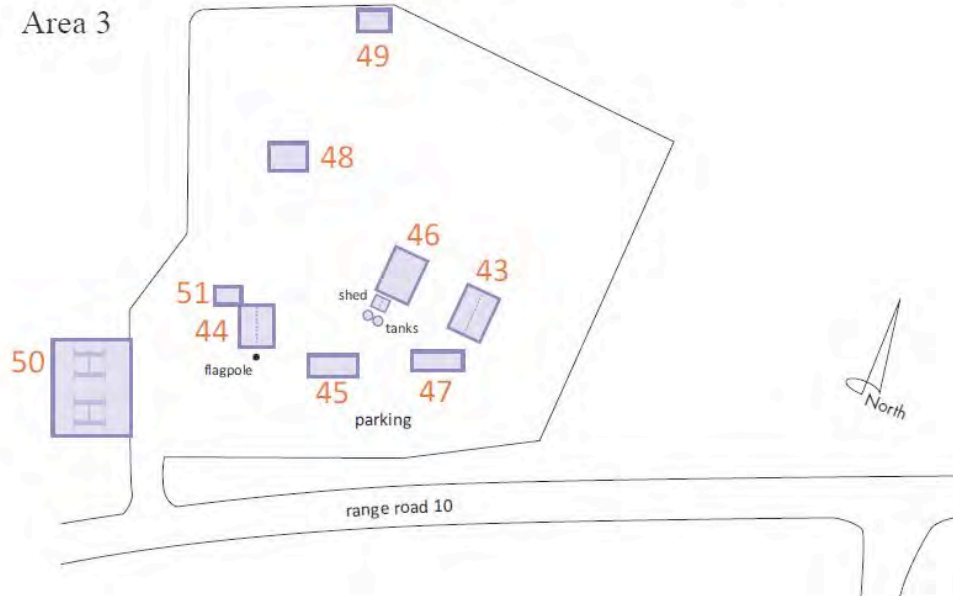


Figure 5A. Plan of Area 3, Operations Control Center (43), Communications Building (44), SCAPE Building (45), Dispensary (46), VITT Trailer (47), Loading Dock (48), Weather Trailer (49), Helicopter Landing Pad (50), SCAPE (51).

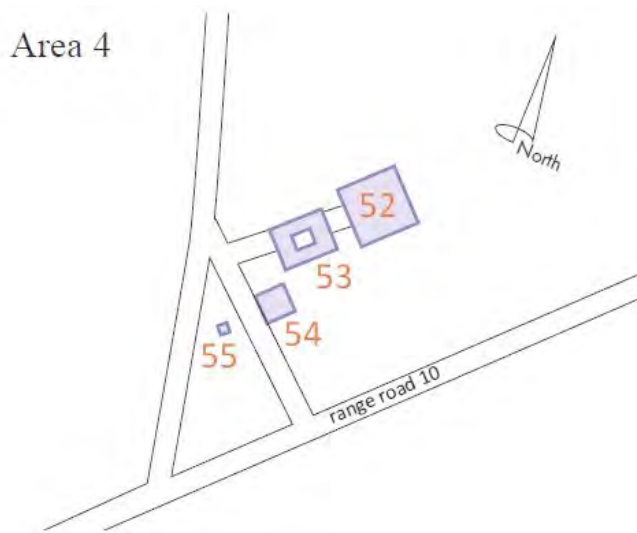


Figure 5B. Plan of Area 4, Original Operations Control Center/Deservice Area/Delta Clipper Site. STS-3 Deservice Pad/Delta Clipper Launchpad (52), Delta Clipper Landing Pad (53), Loading Dock (54), Columbia Site Survey Marker (55).

WHITE SANDS SPACE HARBOR
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Figure 6. Aerial image of Whites Sands Space Harbor, 2010.

WHITE SANDS SPACE HARBOR AREA 1

HAER No. NM-28

(Space Shuttle Landing Facility Area 1)

White Sands Missile Range

Range Road 10, approximately 4.2 miles northeast of intersection with

Range Road 7

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1
(Space Shuttle Landing Facility Area 1)

HAER NO. NM-28

Location: White Sands Missile Range
Range Road 10, approximately 4.2 miles northeast of
intersection with Range Road 7
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S 7.5. Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates:
E 32.93817 N 106.41016 Zone 13S, NAD 1983

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: Space Shuttle Landing Facility Area 1 was an essential
component of the White Sands Space Harbor (WSSH) from
1976-2011. It has a direct association with the U.S.
Space Shuttle Program (SSP) as the site of the landing
of Space Transportation System (STS)-3 *Columbia* in
March 1982; this is the only STS landing to take place
outside Edwards Air Force Base in California and
Kennedy Space Center in Florida. The Space Shuttle
Landing Facility Area 1 is comprised of three runways,
a control tower, a weather tower, a helicopter staging
area, navigational aids and support facilities, a HUB
maintenance building, a fire station, portable storage
buildings, and a generator building.

Area 1 is considered to have national significance and
is eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA SSP with a period of
significance of 1976-2011. Because it achieved
significance within the past fifty years, Criterion
Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. INTRODUCTION

The Space Shuttle Landing Facility, located on the U.S. Army White Sands Missile Range (WSMR) near Las Cruces in Doña Ana County, New Mexico, was an essential component of the White Sands Space Harbor (WSSH). The National Aeronautics and Space Administration (NASA) operated and managed the WSSH for astronaut training operations and as an alternate landing facility for the U.S. Space Shuttle Program (SSP) from 1976-2011. It has a direct association with the SSP as the site of the landing of Space Transportation System (STS)-3 *Columbia* in March 1982. The WSSH is located on the WSMR northeast of the NASA-operated White Sands Testing Facility (WSTF). The WSSH facility included the runways and support facilities (Area 1); the orbiter deservice area (Area 2); operations control center (Area 3); and original operations control center/deservice area/Delta Clipper site (Area 4). NASA formally ended the SSP on August 31, 2011, and in the summer of 2012 disposed of the WSSH and released use of the property to WSMR.

The WSSH Space Shuttle Landing Facility lies at the north end of the WSSH and contains approximately 4,900 acres. Area 1 is comprised of twenty-eight resources, including three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The runways were constructed between 1976 and 1988. The HUB maintenance facility and support buildings are prefabricated and were located together between 1984 and 1992 to house training and landing needs. The Control Tower was purpose-built in 1979 and Weather Tower No. 4 was assembled in phases from 1982-2005. The WSSH Space Shuttle Landing Facility was vacated in 2011 and all electronic equipment, machinery, and furnishings were removed. In the summer of 2012, the U.S. Army initiated occupation and reuse of the facility and the Control Tower was relocated from WSSH to the WSMR Museum for storage and future exhibition.

B. PHYSICAL HISTORY OF WSSH AREA 1

1. DATE OF CONSTRUCTION

The first component of WSSH Area 1 to be constructed was Runway 17/35, completed in 1976. Runway 23/05 followed in 1977-78; it intersects Runway 17/35 near its center creating an "X" shaped footprint. The Control Tower was purpose built in 1979. The Weather Tower structures were assembled from 1982-2005. The Harbor Utility Building (HUB) complex is comprised of six prefabricated buildings created between 1984 and 1992. Runway 20/02, a Waterhole, and a Helicopter Staging Area were constructed in 1988. Navigational aids and support facilities were added from 1988-1995.

2. ARCHITECT/ENGINEER

Dennis G. Perrin, NASA WSTF engineer, is the engineer-of-record for the Control Tower. No other architects or engineers were identified.

3. BUILDER/CONTRACTOR/SUPPLIER

None identified.

4. ORIGINAL PLANS AND CONSTRUCTION

NASA WSTF Facility Manager and engineer Dennis G. Perrin drafted a set of engineering drawings with the assistance of Lockheed Martin contract employee J.A. "Andy" Dorris. Robert Maveety served as engineering supervisor and Ken Blair as drafting supervisor. There are four sheets of drawings, including a site plan, base foundation plan, plan view, elevations, and construction details. Plans were created around 1988 for construction of new asphalt directional markings for the runways. No other plans were identified.

5. ALTERATIONS AND ADDITIONS

Runway 17/35 was built in 1976 on the footprint of the earlier Northrup Strip. The original strip was upgraded, lengthened to 15,000', and widened to 100' with 50' shoulders. Around 1982, a cantilevered walkway was added to the Control Tower. Both Runways 17/35 and 23/05 were upgraded and lengthened between 1986 and 1989 to 35,000' in length and widened to allow 300' sidelines. Between 1988 and 1995, the runways were upgraded with modern navigational aids such as lighting and asphalt directional markings as well as prefabricated metal support buildings, portable synthetic sheds, and repurposed metal trailers. Around 2005, the covered vehicle bay attached to the Fire Station was enclosed and some navigational aids were upgraded. Many of the exteriors of the HUB buildings have been covered with spray foam insulation. The Weather Towers were upgraded as new technology became available. Once the WSSH Space Shuttle Landing Facility was vacated in 2011, all electronic equipment, machinery, and furnishings were removed. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012. As a condition of a Memorandum of Agreement executed between NASA, the U.S. Army and the NM-SHPO in August 2012, the Control Tower was relocated from WSSH to the WSMR Museum in the summer of 2012 where it was placed in storage for future exhibition and public interpretation.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. ENVIRONMENT

The White Sands Space Harbor (WSSH) is located on the U.S. Army White Sands Missile Range (WSMR) near Las Cruces in Doña Ana County, New Mexico. This military post lies in the Tularosa basin along the upper edge of the Chihuahuan Desert, a vast eco-region straddling the U.S.-Mexico border in the central and northern portions of the Mexican Plateau. The Tularosa basin is an arid high-desert region covering approximately 6,000 square miles between the Rio Grande and Pecos River in south-central New Mexico with elevations ranging from approximately 3,800-4,200' feet above sea level. This stark desert is composed of the world's largest surface deposit of gypsum, a very soft sulfate mineral made of sulfur and calcium. Gypsum is derived from the Greek word gypsos, which means "chalk" or "plaster." Located between two towering mountain ranges, the gypsum sand dune is commonly known as "White Sands."¹

The landlocked, bowl-shaped Tularosa basin is 150 miles long and 50-60 miles in width. It is located between the San Andres Range to the west and the Sacramento Mountains to the east. The unique sand dunes originated many millions of years ago when a shallow, glacial lake called Lake Otero covered south-central New Mexico. When the lake eventually evaporated, it left behind gypsum bearing marine deposits nearly 1,600' thick. The exposed northern region of the lakebed is a 1,600-square mile area called the Alkali Flat. The southern region contains an ephemeral lake, or playa, called Lake Lucero with a very high mineral content. Although summer temperatures can easily exceed 100 degrees, the unique white sand reflects the sun's rays and the grains are so fine they are cool and silky to the touch. Gypsum is commonly

¹ Andreloi 1998: Section 3.1.2.2; Bennett, Jeffrey, and Douglas Wilder. "Physical Resources Foundation Report: White Sands National Monument. Natural Resources Report NPS/NRPC/NRR-2009/166." National Park Service, Fort Collins, Colorado, 2009: 9.

used to make plaster of Paris, fertilizers, drywall and Portland cement.²

The near ceaseless desert winds, clocked at more than fifty miles per hour, push the fine gypsum grains to form crests as high as sixty feet on the upwind side, and under the pressure of gravity, the sand slides down steep slipfaces, giving the sands dynamic movement. Each year, the most active dunes advance to the northeast more than thirty feet, covering almost everything in their path; the more stable dunes move very little. The gypsum dunes are a harsh and dry environment with fierce sandstorms, flash floods, and temperatures ranging from below zero in winter to more than 110 degrees in summer. Only a few plants and animals have adapted to survive.³

2. CHARACTER

Isolated, spacious, and built on the Northrup Strip within a federal installation, the location of 100-square mile WSSH at the WSMR offered some definite advantages for the expansive runways needed for the SSP. Area 1 of the Space Shuttle Landing Facility is comprised of three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The immense "X" shaped intersecting runways are its dominating feature. The few support buildings and structures are organized around the runways. The control tower and the HUB buildings are clustered together on the east side of the intersection. The navigation aids and support facilities are located along the runways. The Space Shuttle Landing Facility is surrounded by open desert and ringed by mountain ranges.

3. CONDITION OF FABRIC

² Andreoli 1998: Section 3.1.4; Welsh, Michael. "Dunes and Dreams: A History of White Sands National Monument. Administrative History: White Sands National Monument." National Park Service, Division of History, Intermountain Cultural Resources Center, Santa Fe, New Mexico, Professional Paper No. 55, 1995: Chapter 1; Bennett and Wilder 2009: 9.

³ Andreoli, 1998: Section 3.1.2.2; Andreoli, 1998: Section 3.2.3; Welsh, 1995: Chapter 1; Bennett & Wilder, 2009: 7-18.

When documented in March 2012, the Space Shuttle Landing Facility had been abandoned and vacated, but was in overall fair to good condition. The exterior of some of the facility's buildings exhibited some minor rust and deferred maintenance. The portable interior equipment within the HUB Maintenance Facility had been removed, but the attached furnishings were in place. Due to the harsh desert environment and lack of maintenance, the runways had quickly deteriorated due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Space Shuttle Landing Facility is composed of a variety of buildings and structures. Documentation of each component follows in HAER Nos. NM-28-A through NM-28-T.

C. MECHANICAL/OPERATION

Several buildings featured electricity to power interior lights, electronic navigational equipment, radios, and wall-mounted air conditioning units. Non potable water was supplied by a freestanding water tank at the HUB Maintenance Facility. A manmade Waterhole provided water for maintaining the runways. Generators provided back-up power at the HUB complex. The Weather Towers are monitored and maintained by the U.S. Army. The Fire Station was maintained by the U.S. Air Force. The Navigational Aids and Support Facilities were powered by portable generators or underground electrical cables connecting to the HUB Maintenance Facility.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

NASA engineers prepared four sheets of Control Tower drawings, including a site plan, base foundation plan, plan view, elevations, and construction details in the spring of 1979. There are no original engineering plans or drawings for the HUB Maintenance Facility, Runways, or the majority of the Navigational Aids and Support Facilities. Plans were created around 1988 for construction of new asphalt navigational markings for the Runways. NASA staff created an as-built, not-to-scale site plan of the HUB Maintenance Facility, which was used as a base map for this report.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography. Those photographs are located on pages 21 through 31 of this document. The other historical data comes from a variety of sources cited in the Bibliography below.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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Paczynski." Published online, 2000. Website
[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and
secondary sources. Sources that were not investigated that may
contain secondary information are archived at the Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remained at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.⁴

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contained a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking

⁴ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army White Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 2012. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

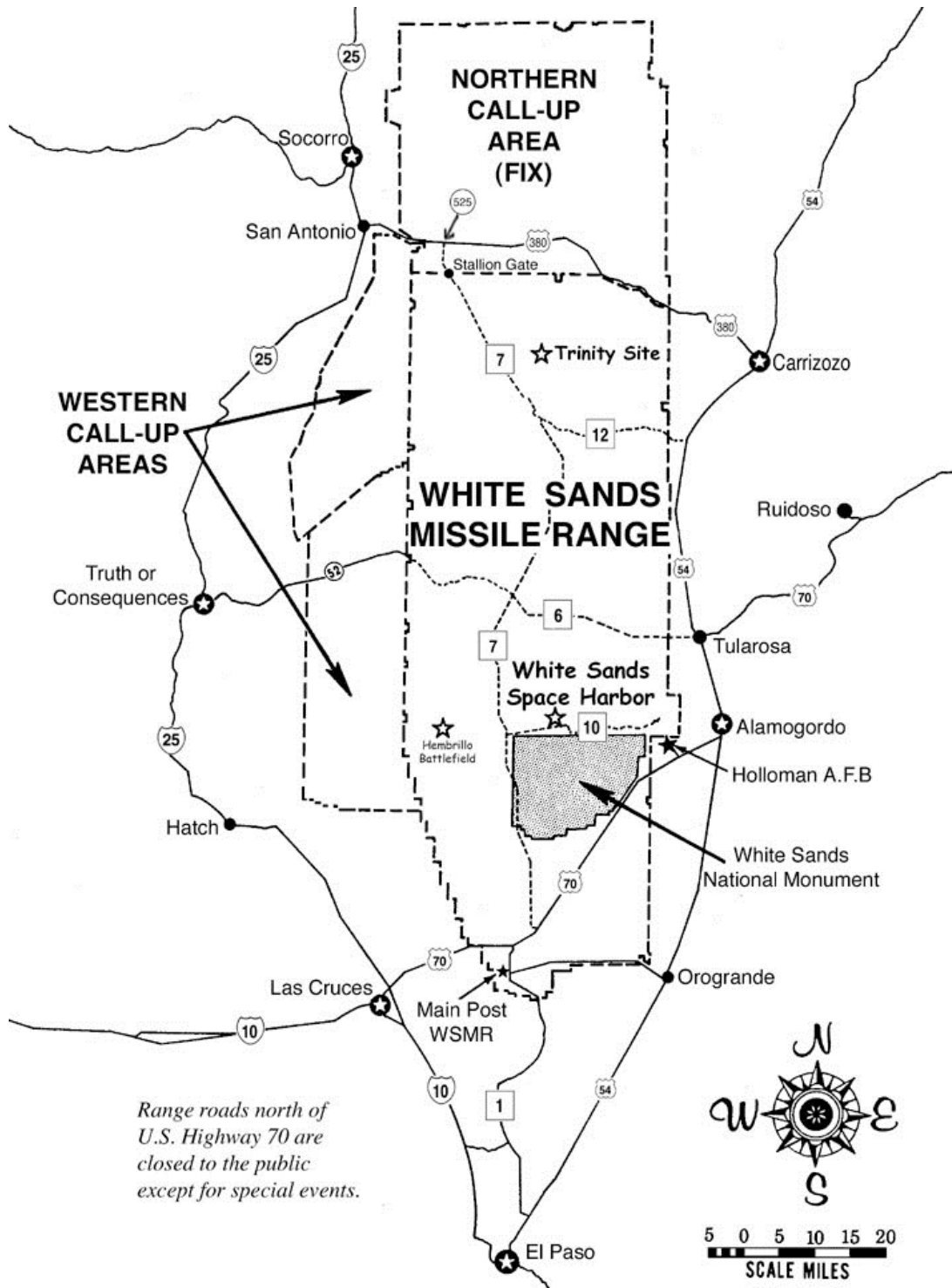


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

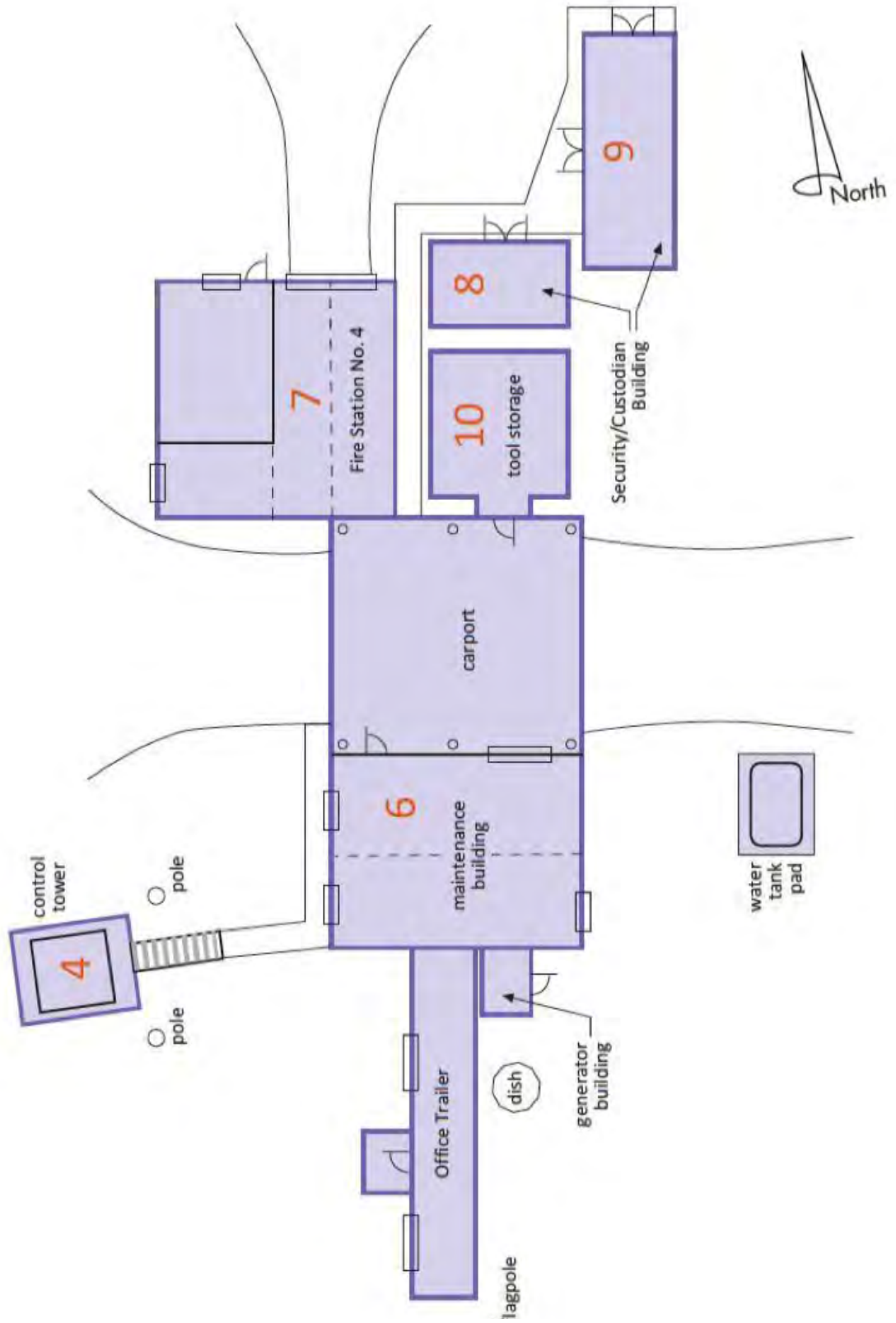


Figure 3. Plan view detail of the HUB Complex, Area 1.



Figure 4. Aerial View of Runway 17/35 and Waterhole (left) looking northwest towards San Andres Mountains, 2007. Source: NASA White Sands Test Facility, New Mexico.



Figure 5. Aerial View of Runway 23/05 looking southwest towards San Andres Mountains, 2007.
Source: NASA White Sands Test Facility, New Mexico.



Figure 6. Aerial View of Runway 23/05 (foreground) and Runway 20/02 (left background) looking northwest northeast, 2007. Source: NASA White Sands Test Facility, New Mexico.



Figure 7. Aerial View of Runway 20/02 looking northeast towards runway 17/35 and San Andres Mountains, 2006. Source: NASA White Sands Test Facility, New Mexico.



Figure 8. Aerial View of Runway 17/35 (foreground) and Runway 20/02 (background) looking southwest towards the San Andres Mountains, 2006. Source: NASA White Sands Test Facility, New Mexico.



Figure 9. Aerial View of Runway 17/35 (foreground) and Runway 20/02 (background), showing detailed view of runway landing aid markings, looking southwest towards the San Andres Mountains, 2007. Source: NASA White Sands Test Facility, New Mexico.

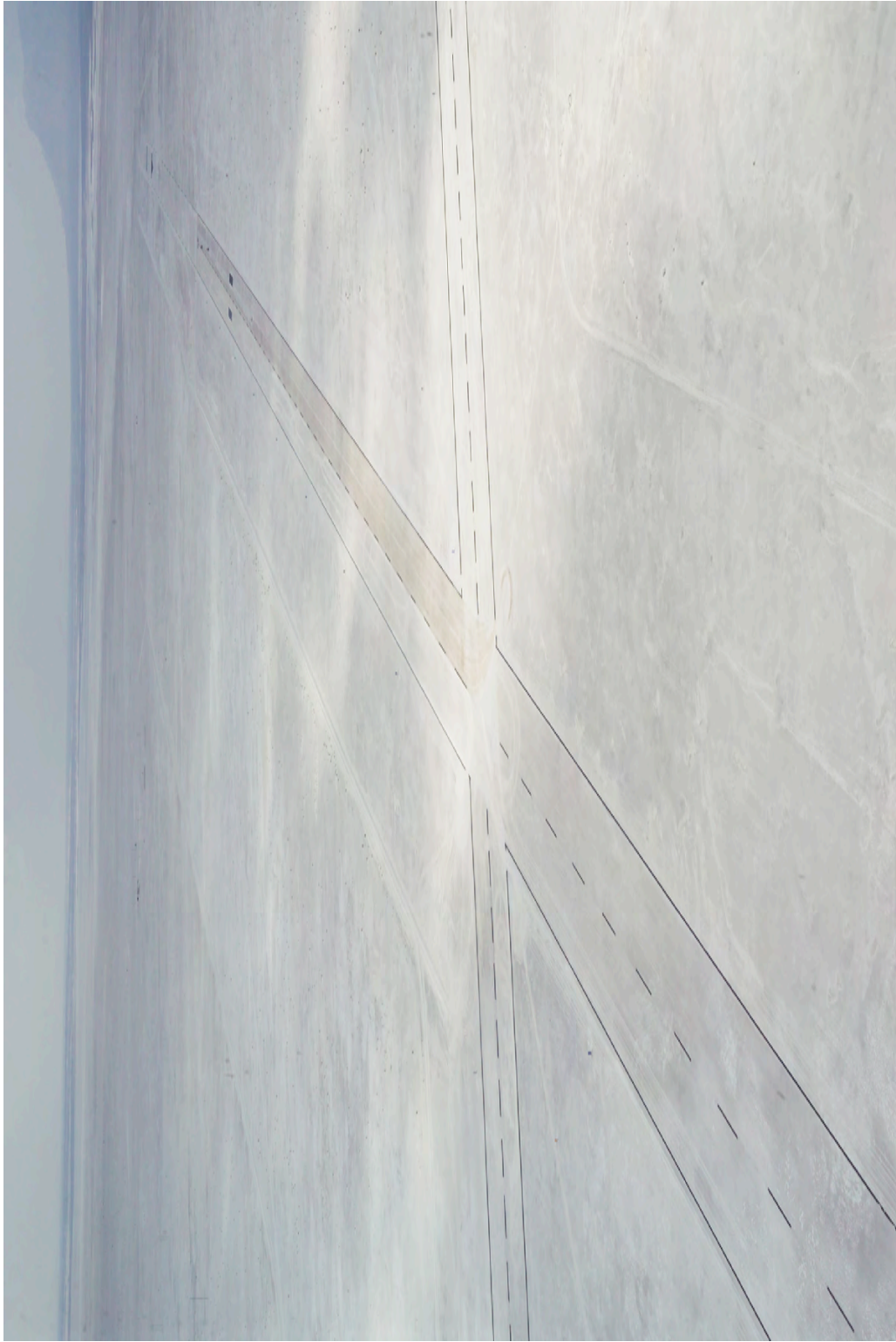


Figure 10. Aerial View of the intersection of Runway 17/35 (top to bottom) and Runway 23/05 (left to right), looking southeast, 2007. Source: NASA White Sands Test Facility, New Mexico.



Figure 11. Aerial View of the intersection of Runway 17/35 (left) and Runway 23/05 (right), looking southeast towards the San Andres Mountains, 2006. Source: NASA White Sands Test Facility, New Mexico.



Figure 12. Aerial View of the Helicopter Staging Area looking north towards the San Andres Mountains, 2006. Source: NASA White Sands Test Facility, New Mexico.



Figure 13. Aerial View of the HUB Maintenance Facility (foreground) and Runway 23/05 (background) looking northwest towards San Andres Mountains, 2007. Source: NASA White Sands Test Facility, New Mexico.



Figure 14. Aerial View of Control Tower, HUB Maintenance Facility, Fire Station (left), and Weather Tower (foreground) looking southeast, 2006. Source: NASA White Sands Test Facility, New Mexico.

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1
(Space Shuttle Landing Facility Area 1)
White Sands Missile Range
Range Road 10, approximately 4.2 miles northeast of intersection with
Range Road 7
White Sands vicinity
Doña Ana County
New Mexico

NASA, Photographer
Various Dates

NM-28-1 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 17/35 AND WATERHOLE
(LEFT) LOOKING NORTHWEST TOWARDS SAN ANDRES MOUNTAINS,
2007. SOURCE: NASA WHITE SANDS TEST FACILITY, NEW
MEXICO.

NM-28-2 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 23/05 LOOKING
SOUTHWEST TOWARDS SAN ANDRES MOUNTAINS, 2007. SOURCE:
NASA WHITE SANDS TEST FACILITY, NEW MEXICO.

NM-28-3 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 23/05 (FOREGROUND)
AND RUNWAY 20/02 (LEFT BACKGROUND) LOOKING NORTHEAST,
2007. SOURCE: NASA WHITE SANDS TEST FACILITY, NEW
MEXICO.

NM-28-4 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 20/02 LOOKING
NORTHEAST TOWARDS RUNWAY 17/35 AND SAN ANDRES
MOUNTAINS, 2006. SOURCE: NASA WHITE SANDS TEST
FACILITY, NEW MEXICO.

NM-28-5 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 17/35 (FOREGROUND)
AND RUNWAY 20/02 (BACKGROUND) LOOKING SOUTHWEST
TOWARDS SAN ANDRES MOUNTAINS, 2006. SOURCE: NASA
WHITE SANDS TEST FACILITY, NEW MEXICO.

NM-28-6 PHOTOCOPY OF AERIAL VIEW OF RUNWAY 17/35 (FOREGROUND)
AND RUNWAY 20/02 (BACKGROUND) SHOWING DETAILED VIEW OF
RUNWAY LANDING AID MARKINGS, LOOKING SOUTHWEST TOWARDS
SAN ANDRES MOUNTAINS, 2007. SOURCE: NASA WHITE SANDS
TEST FACILITY, NEW MEXICO.

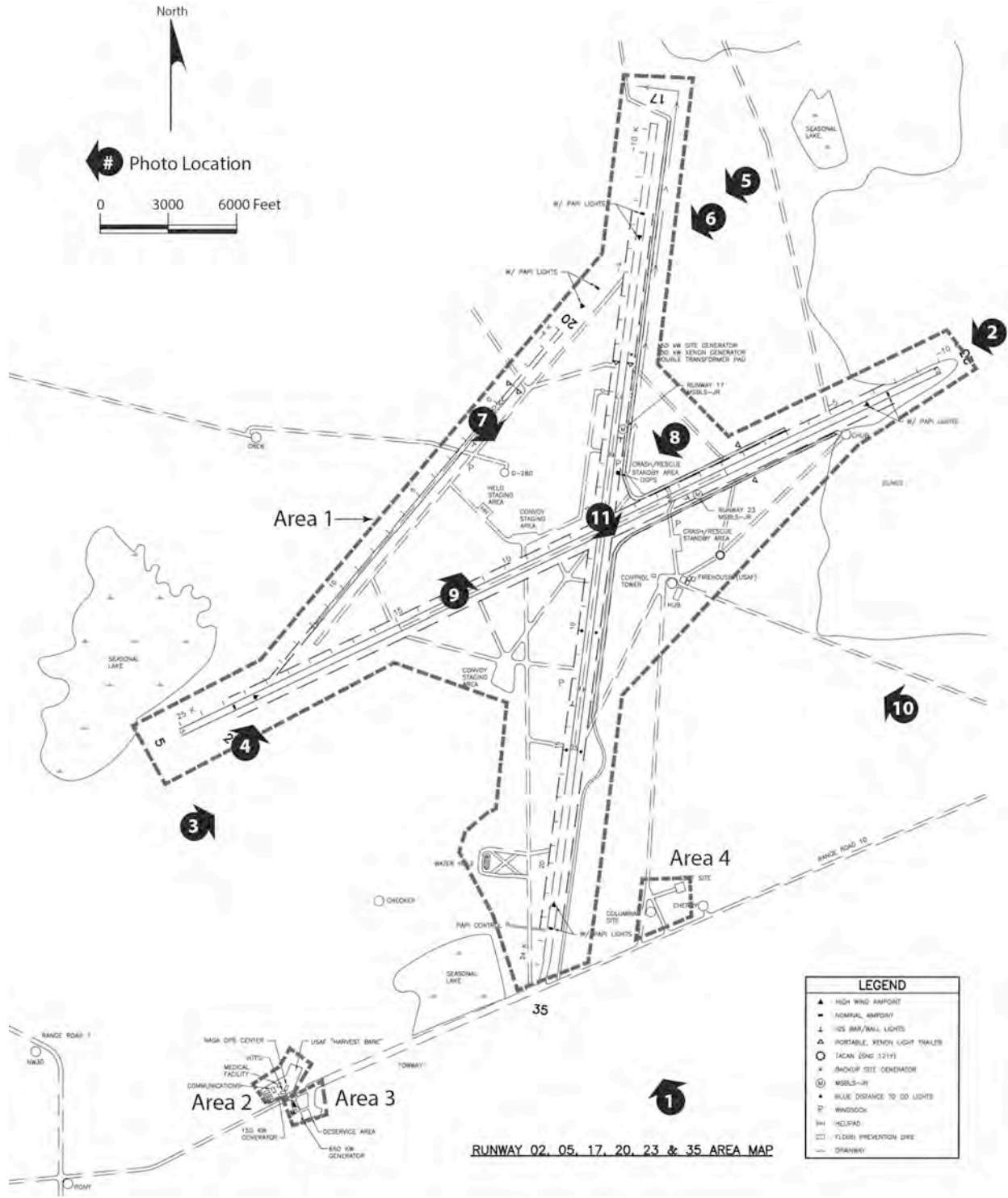
NM-28-7 PHOTOCOPY OF AERIAL VIEW OF INTERSECTION OF RUNWAY
17/35 (TOP TO BOTTOM) AND RUNWAY 23/05 (LEFT TO RIGHT)

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LOOKING SOUTHEAST, 2007. SOURCE: NASA WHITE SANDS
TEST FACILITY, NEW MEXICO

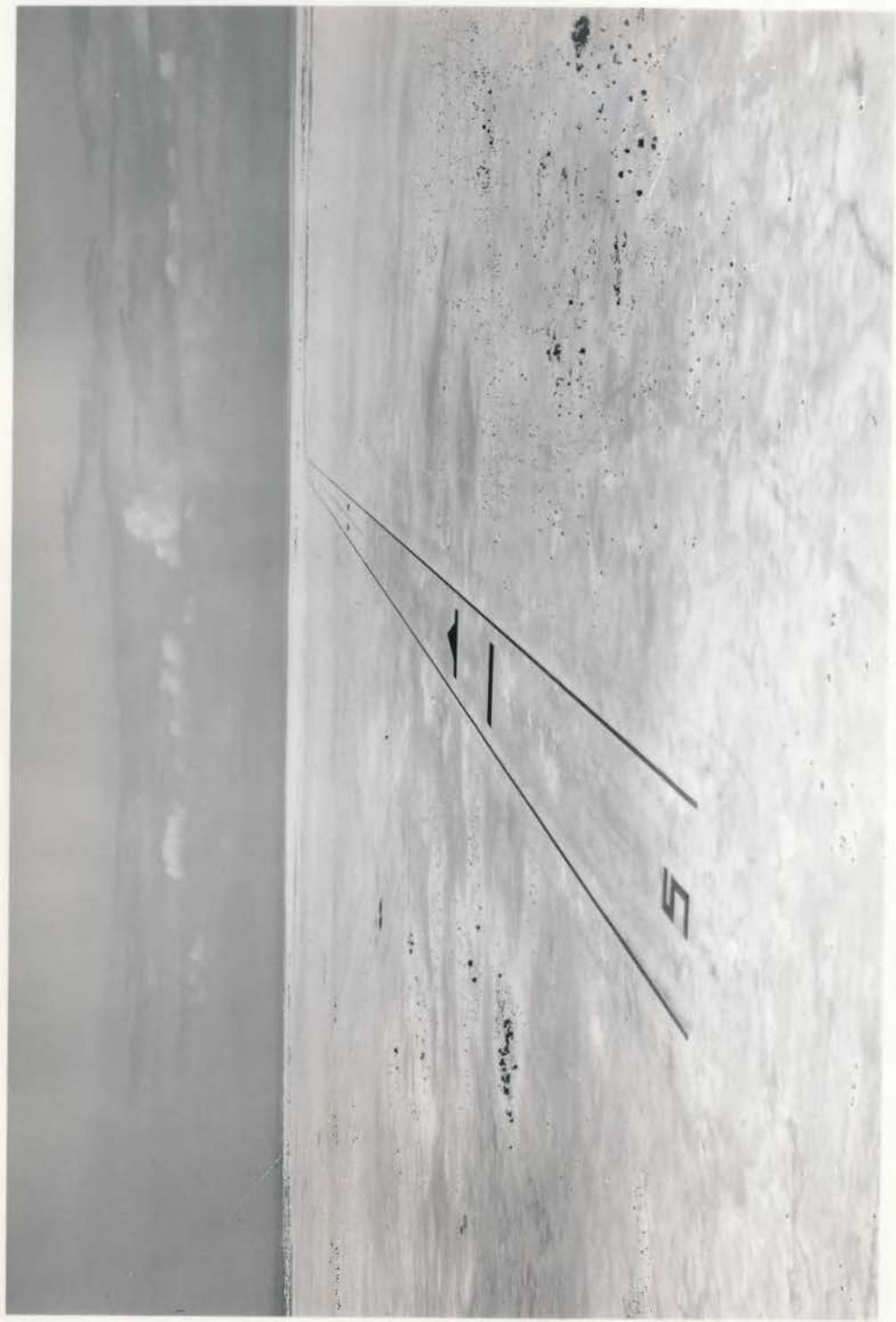
- NM-28-8 PHOTOCOPY OF AERIAL VIEW OF INTERSECTION OF RUNWAY
17/35 (LEFT) AND RUNWAY 23/05 (RIGHT) LOOKING
SOUTHWEST TOWARDS SAN ANDRES MOUNTAINS, 2006. SOURCE:
NASA WHITE SANDS TEST FACILITY, NEW MEXICO
- NM-28-9 PHOTOCOPY OF AERIAL VIEW OF HELICOPTER STAGING AREA
LOOKING NORTH TOWARDS SAN ANDRES MOUNTAINS, 2006.
SOURCE: NASA WHITE SANDS TEST FACILITY, NEW MEXICO.
- NM-28-10 PHOTOCOPY OF AERIAL VIEW OF HUB MAINTENANCE FACILITY
(FOREGROUND) AND RUNWAY 23/05 (BACKGROUND) LOOKING
NORTHWEST TOWARDS SAN ANDRES MOUNTAINS, 2007. SOURCE:
NASA WHITE SANDS TEST FACILITY, NEW MEXICO.
- NM-28-11 PHOTOCOPY OF AERIAL VIEW OF CONTROL TOWER, HUB
MAINTENANCE FACILITY, FIRE STATION (LEFT), AND WEATHER
TOWER (FOREGROUND) LOOKING SOUTHEAST, 2006. SOURCE:
NASA WHITE SANDS TEST FACILITY, NEW MEXICO.

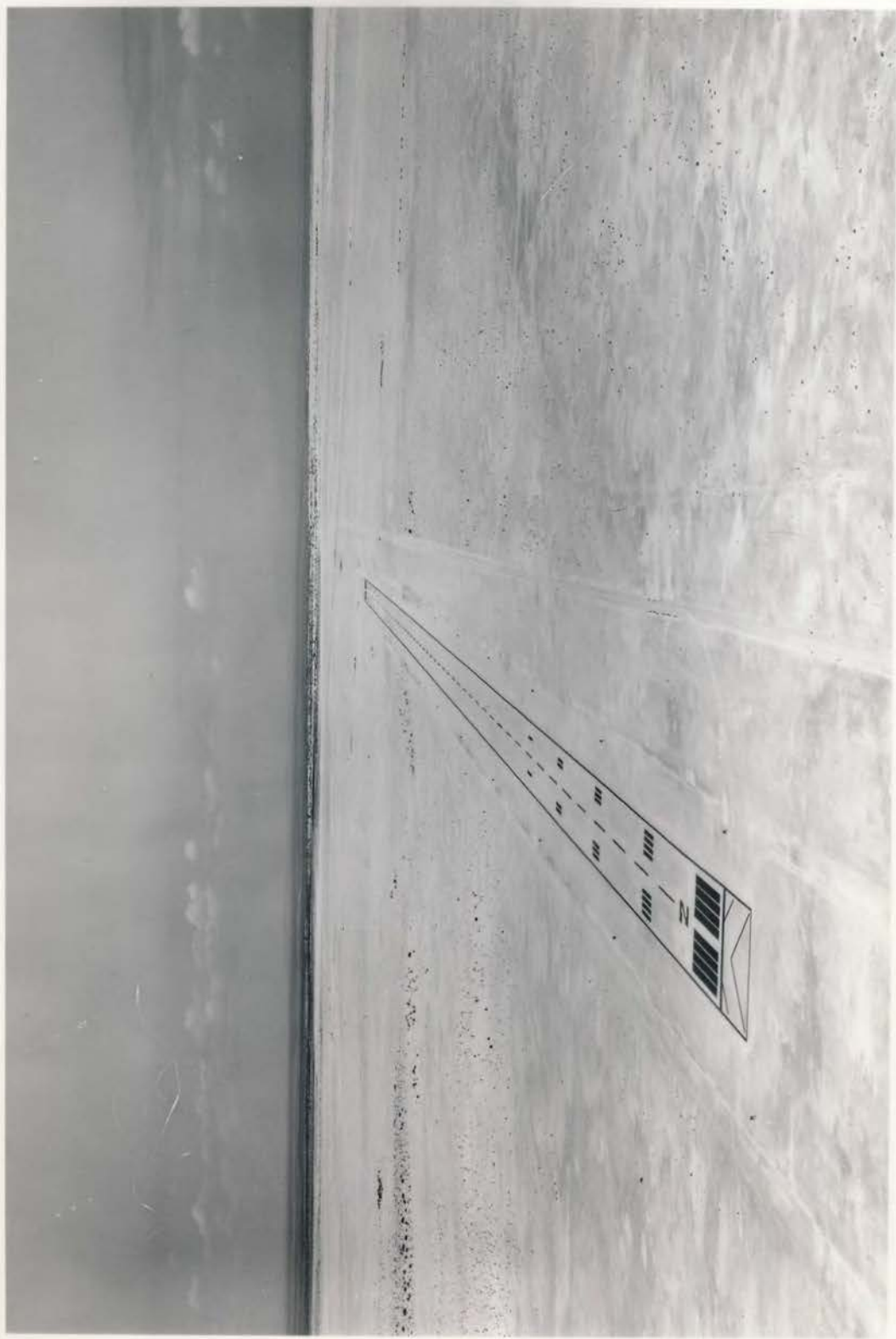
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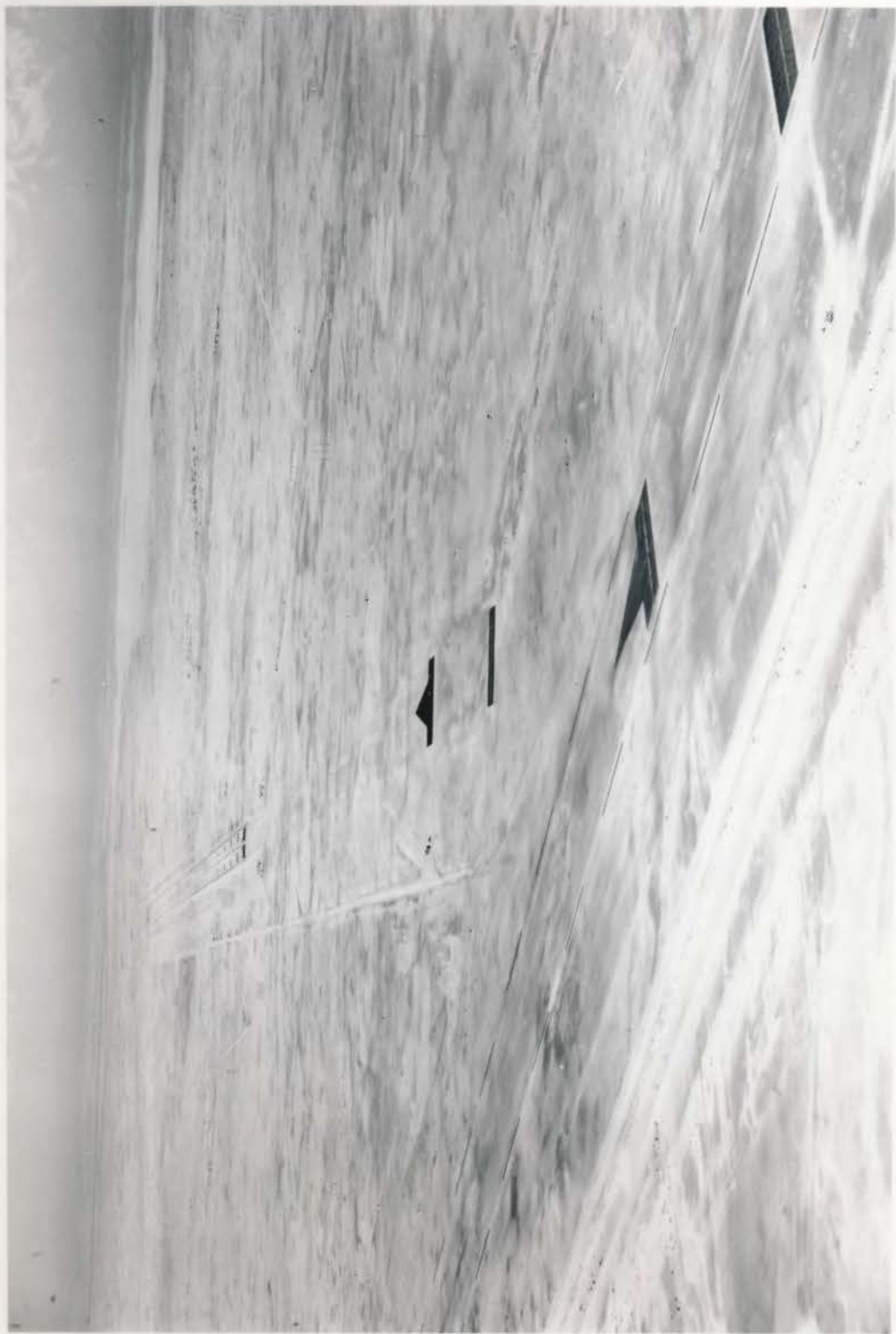




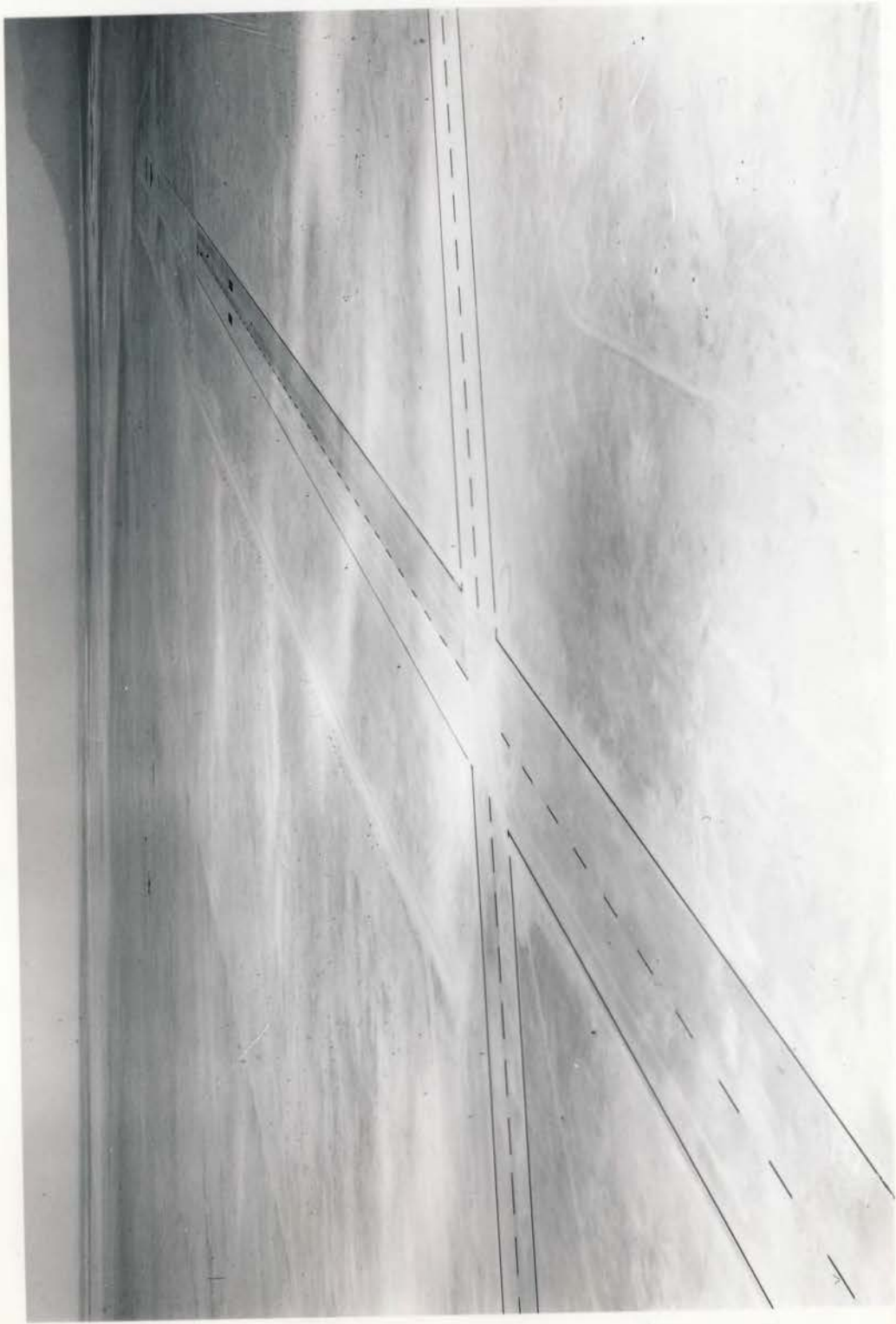






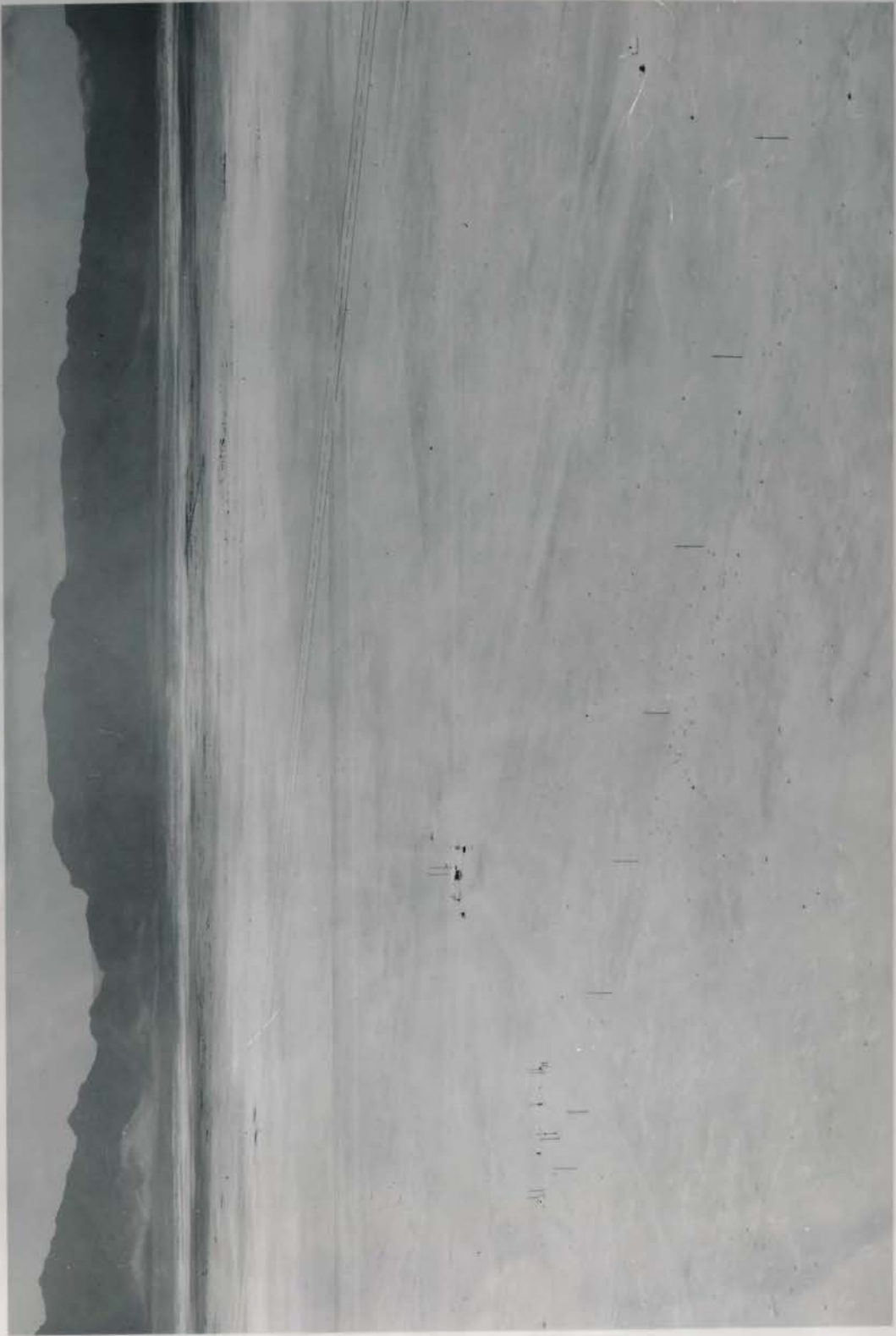


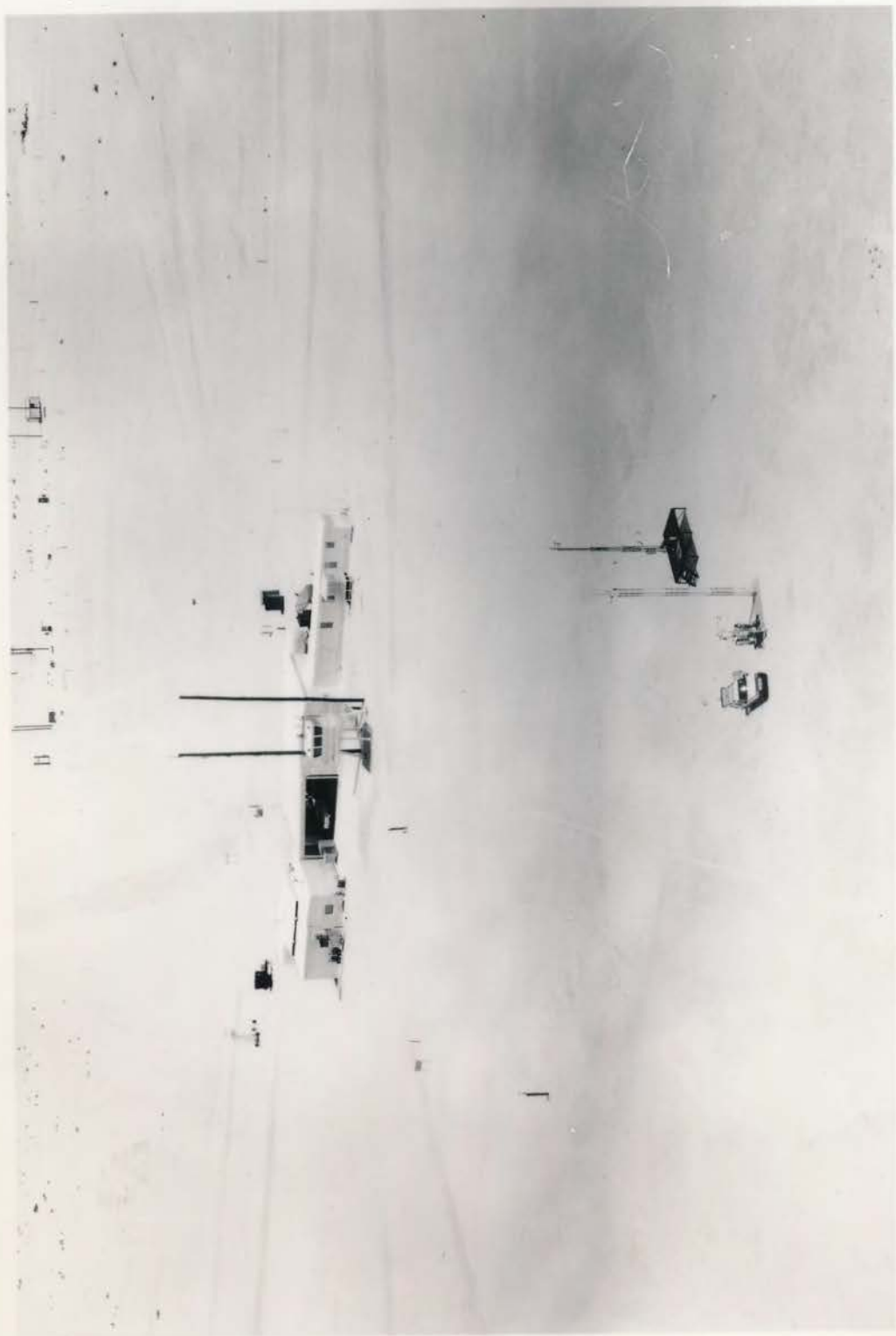












WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 17/35
(Space Shuttle Landing Facility Area 1, Runway 17/35)
White Sands Missile Range
Extending 35,000 feet north from Range Road 10, beginning
approximately 4.2 miles northeast of intersection with Range Road 7
White Sands vicinity
Doña Ana County
New Mexico

HAER NM-28-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 17/35
(Space Shuttle Landing Facility Area 1, Runway 17/35)

HAER NO. NM-28-A

Location: White Sands Missile Range
Extending 35,000 feet north from Range Road 10,
beginning approximately 4.2 miles northeast of
intersection with Range Road 7
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: 1976-1988

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: Runway 17/35 was an essential component of the White
Sands Space Harbor (WSSH) from 1976-2011. It has a
direct association with the U.S. Space Shuttle Program
(SSP) as the site of the landing of Space
Transportation System (STS)-3 *Columbia* in March 1982;
this is the only STS landing to take place outside
Edwards Air Force Base in California and Kennedy Space
Center in Florida. Runway 17/35 is considered to have
national significance and is eligible for listing in
the National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA SSP with
a period of significance of 1976-2011. Because it

achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids

NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

Runway 17/35 was constructed in 1976 at the former site of the original 10,000' long Northrup Strip (1948-1963).

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

The Runway is constructed of a compacted, natural gypsum surface and has been upgraded with modern navigational aids such as lighting and asphalt directional markings.

Once the runway was abandoned in 2011, routine maintenance ceased. Due to the harsh desert environment, the runway began to deteriorate quickly. The U.S. Army initiated occupation of WSSH in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Located in Area 1, the three natural surface gypsum runways, including Runway 17/35, are located within a 10-square mile area at WSSH. The runways are constructed of compacted gypsum sand with a 1-2" thick soft top layer and a hard-paved under layer. Due to the harsh desert environment, the runways required constant grading, repairs, and maintenance.

Each of the three runways duplicates a shuttle landing runway: 17/35 replicates the runway at Kennedy Space Center in Florida; 23/05 replicates the runway at Edwards Air Force Base in California; and 20/02 replicates the Transoceanic Abort Landing (TAL) runways in other countries.

Runways 17/35 and 23/05 cross each other at their approximate center lines, creating an X shaped site plan. Runway 17/35 is oriented along the north-south axis and 23/05 along the east-west axis. Both runways are 15,000' in length with 10,000' overruns at either end. Both runways are 300' wide with 300' wide shoulders flanking both sides. Navigational aids such as lighting and markings made of asphalt are located along the entire length of both runways.

At 1,000' into the overruns at runways 17 and 23 are two portable xenon light trailers, one on each side of the runway. At 7,500' into each overrun are the Nominal Aimpoints; at 6,500' into the overruns are the High-Wind Aimpoints. Both High-Wind Aimpoints in Runway 17/35 and the east Aimpoint of Runway 23/05 contain PAPI lights. At 2,000' into the actual runways, at each end, are Inner Glide Slope (IGS) Indicator Bar/Ball lights, except on Runway 05.

Runway 20/02 is located in the northwest quadrant created by the intersection of Runways 17/35 and 23/05. Runway 20/02 is oriented along a northeast-southwest axis and measures 19,800' in length and 200' in width. This runway does not feature overruns.

Navigational aids such as lighting and markings made of asphalt are located along its entire length. This runway does not have maintained overruns.

At 6,500' from the northeast end of runway 20 is the Nominal Aimpoint and at 5,500' is the High-Wind Aimpoint with PAPI lights. At 2,000' into the runway at the northeast end are the IGS Bar/Ball lights.

Within the northwest quadrant of the intersection of Runway 17/35 and 23/05 is a Helicopter Staging Area, consisting of a natural surface landing pad for eight helicopters. The pad features a row of H-shaped markings made of asphalt.

A shuttle tow-way, approximately 400' wide and constructed of compacted natural surface gypsum, begins at the southern terminus of Runway 17/35 and continues southwest along Range Road 10 where it terminates at the Deservice Pad in Area 2.

2. DESCRIPTION

The following is a more detailed description of Runway 17/35, also known as "Northrup-Kennedy."

Runway 17/35 is 35,000' long and 900' wide runway with runway markings and navigational aids, including: two sets of Precision Approach Path Indicator (PAPI) lights, IGS Ball/Bar lights, touchdown markers, distance-to-go markers, xenon lights, nominal night strobes, and runway side lights.

This runway is the site of the original 10,000' long Northrup Strip (1948-1963), which is no longer extant. Runway 17/35 was constructed in 1976 to replicate the runway located at the Kennedy Space Center near Orlando, Florida. On March 31, 1982, the Space Shuttle *Columbia* landed on this runway. The runway was improved in 1988 with upgraded navigational aids such as lighting.

This runway served originally as the Orbiter backup landing site and the primary abort-once-around landing site, while Edwards AFB was the primarily landing facility. Once the decision was made

in 1984 for the Orbiter to land regularly at KSC, Edwards AFB became the primary backup and WSSH would be used only in the event that the shuttle could not land at KSC or Edwards AFB. After 1984, the primary use of the runways at WSSH was astronaut training. As it replicated the Orbiter's primary landing site at KSC, Shuttle pilots would train on Runway 17/35 for their eventual landing of the actual Orbiter at KSC.

3. CONDITION OF FABRIC

When documented in March 2012, the Runway had been abandoned for over six months and was in fair condition. Due to the harsh desert environment and lack of maintenance, the runway had quickly deteriorated due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Runway is constructed of compacted natural surface gypsum with landing aid markings made of asphalt.

C. MECHANICAL/OPERATION

The Runway does not feature any mechanical equipment, with the exception of navigational aids, which are documented separately.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Runway, however, plans were created around 1988 for construction of the asphalt navigational markings.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH, including the Runways, are very limited. Historical views can be found on pages 21-22, 25-30 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

D. BIBLIOGRAPHY

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Paczynski." Published online, 2000. Website
[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and
secondary sources. Sources that were not investigated that may
contain secondary information are archived at NASA's Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army White Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 2012. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

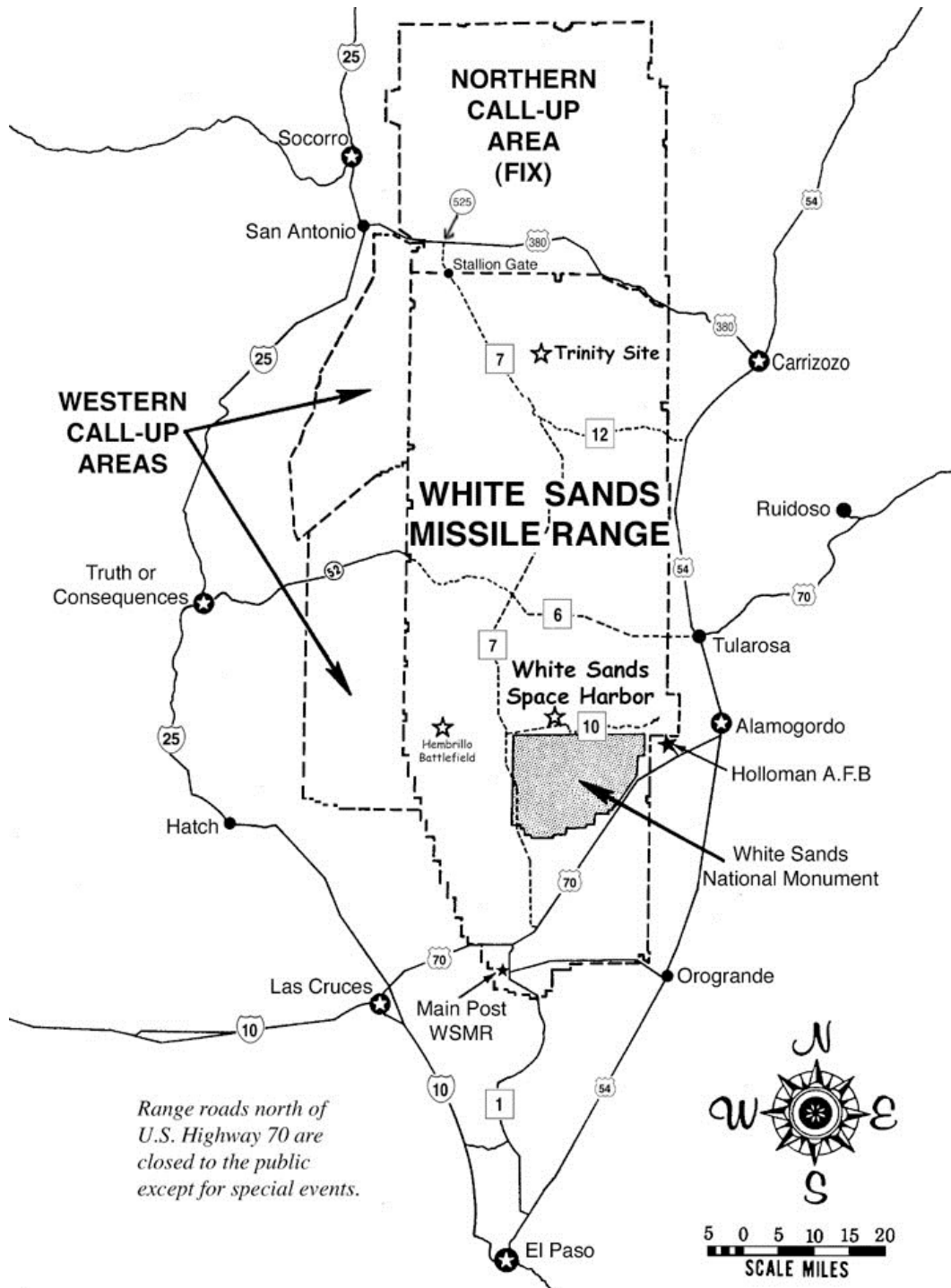


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

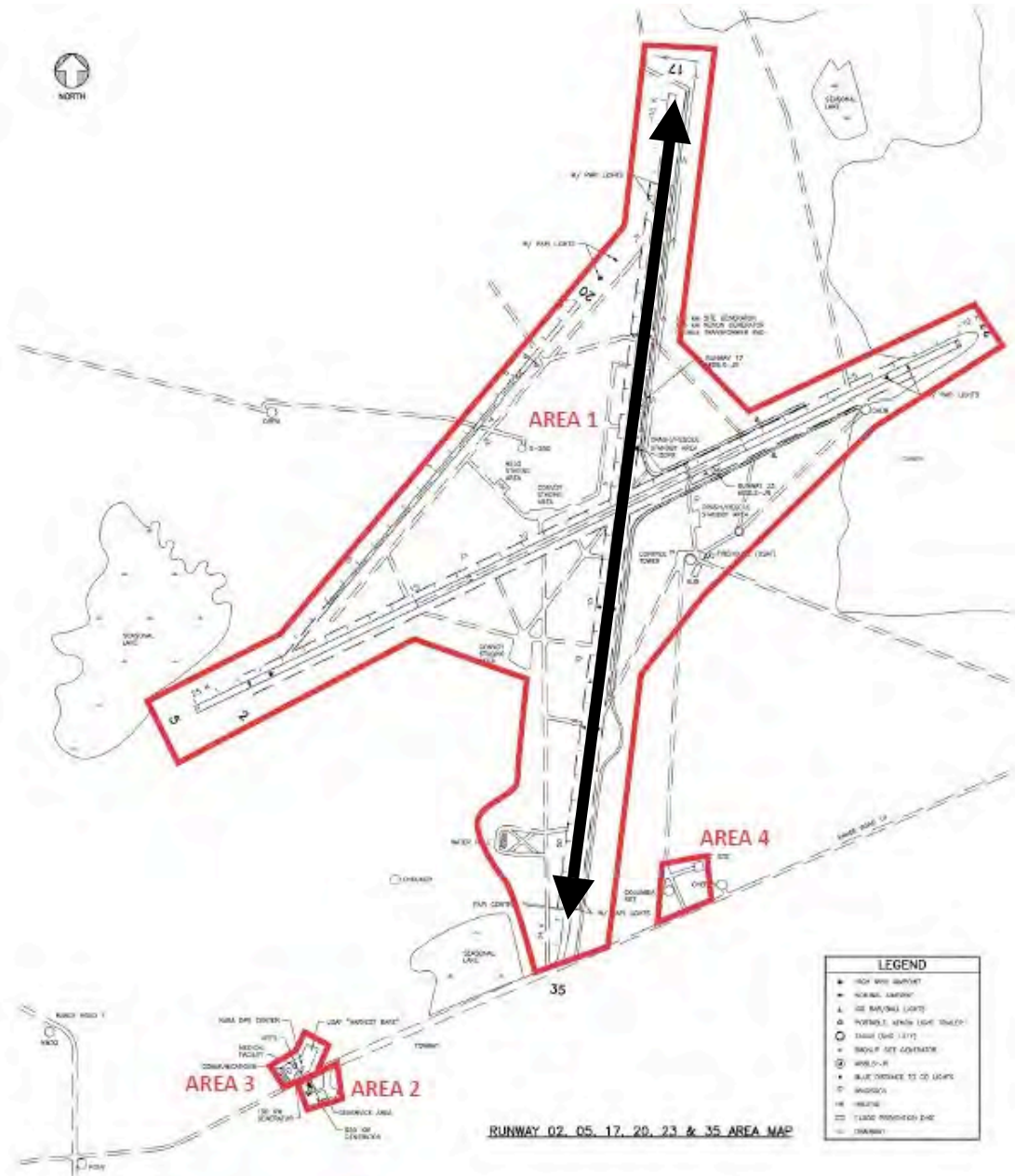


Figure 1. Map of WSSH showing location of Runway 17/35 in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

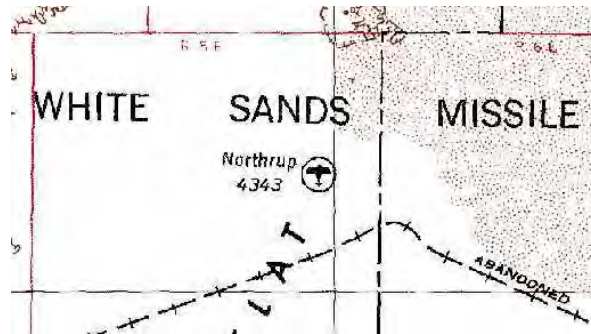


Figure 4A. Map of Northrup Strip, USGS Topographic Map, 1971.

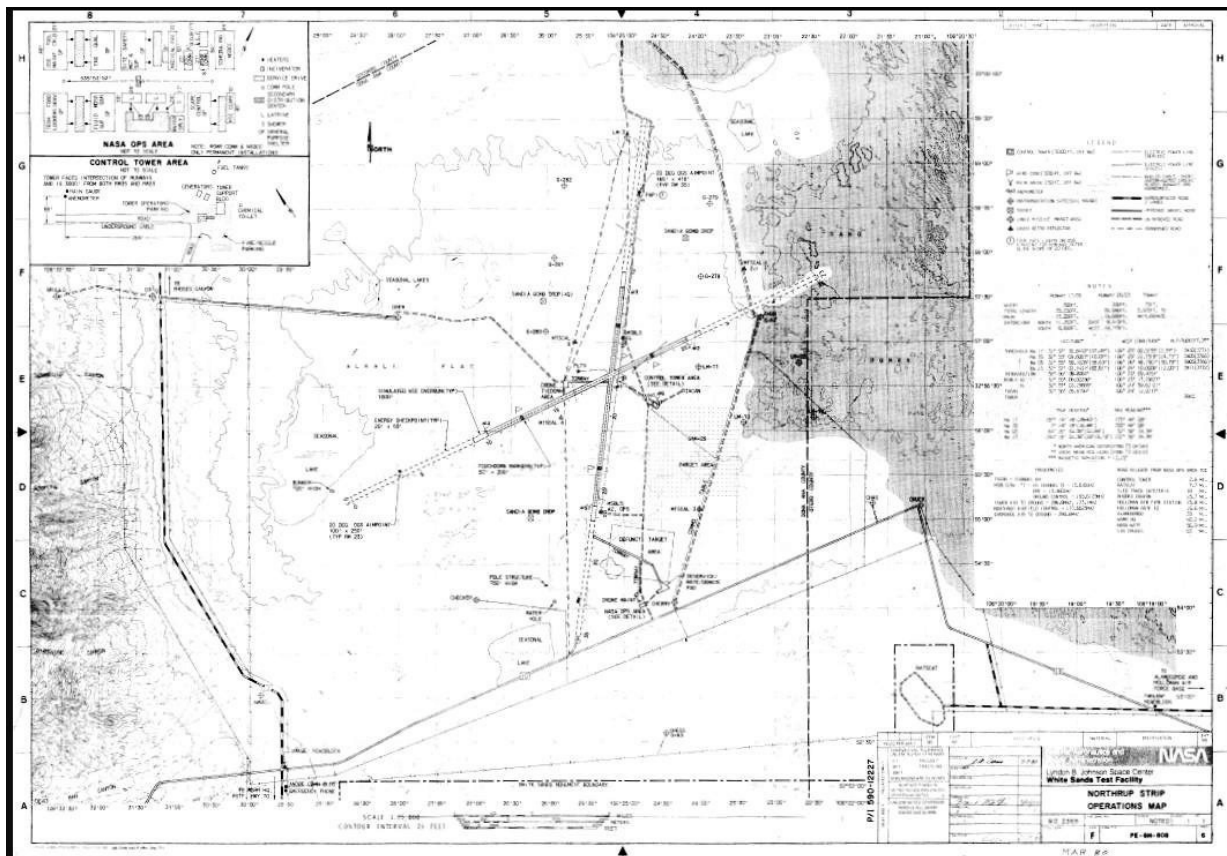


Figure 4B. Map of WSSH, drawn by J.A. "Andy" Dorris under the direction of NASA engineer Dennis Perrin on March 7, 1980, showing location of Runway 17/35 and Runway 23/05 (Source: NASA WSTF).



Figure 5. Map of Runways, USGS Topographic Map, 1978.

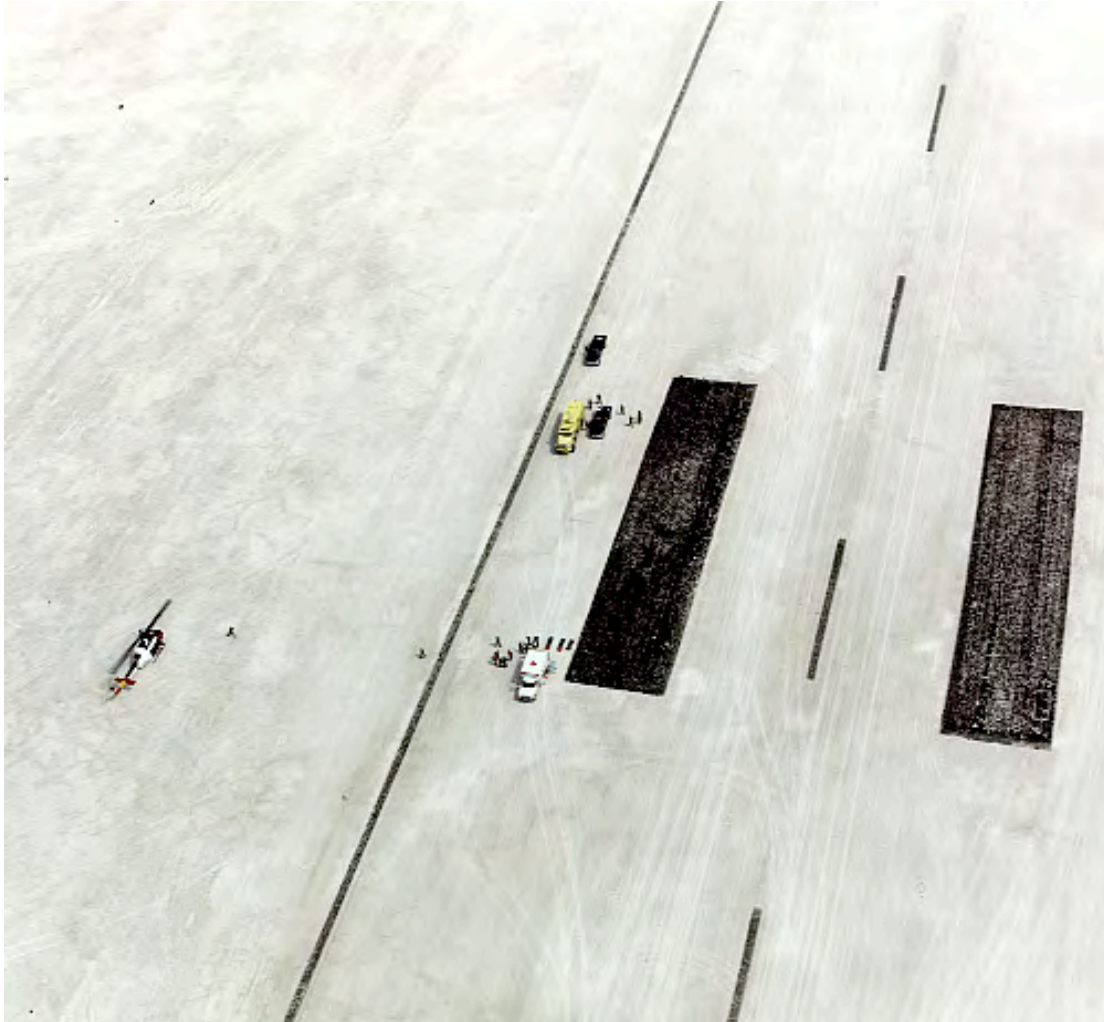


Figure 6. Aerial view of a runway showing "Normal Aimpoint" Markings, November 1999 (Source: NASA WSTF).



Figure 7A. View of Space Shuttle *Columbia* landing on Runway 17/35 on March 30, 1982, looking West towards the San Andres Mountain Range (Source: NASA WSTF).



Figure 7B. View of Space Shuttle *Columbia* taking off atop a 747 on Runway 17/35 on April 6, 1982, looking East towards Sacramento Mountain Range (Source: NASA WSTF).

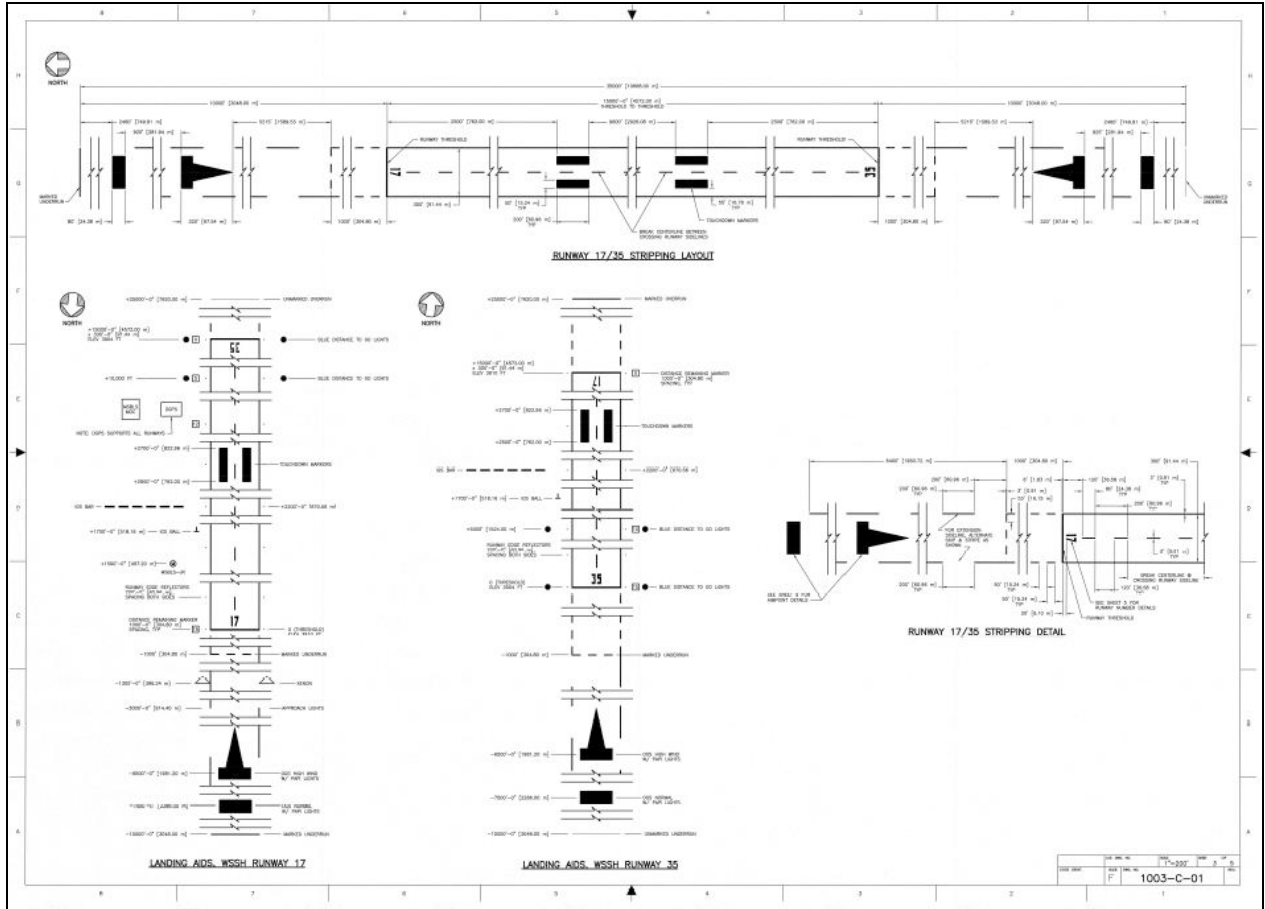


Figure 8. Drawing of Runway 17/35 Landing Aids Markings, ca.1988
 (Source: NASA WSTF).

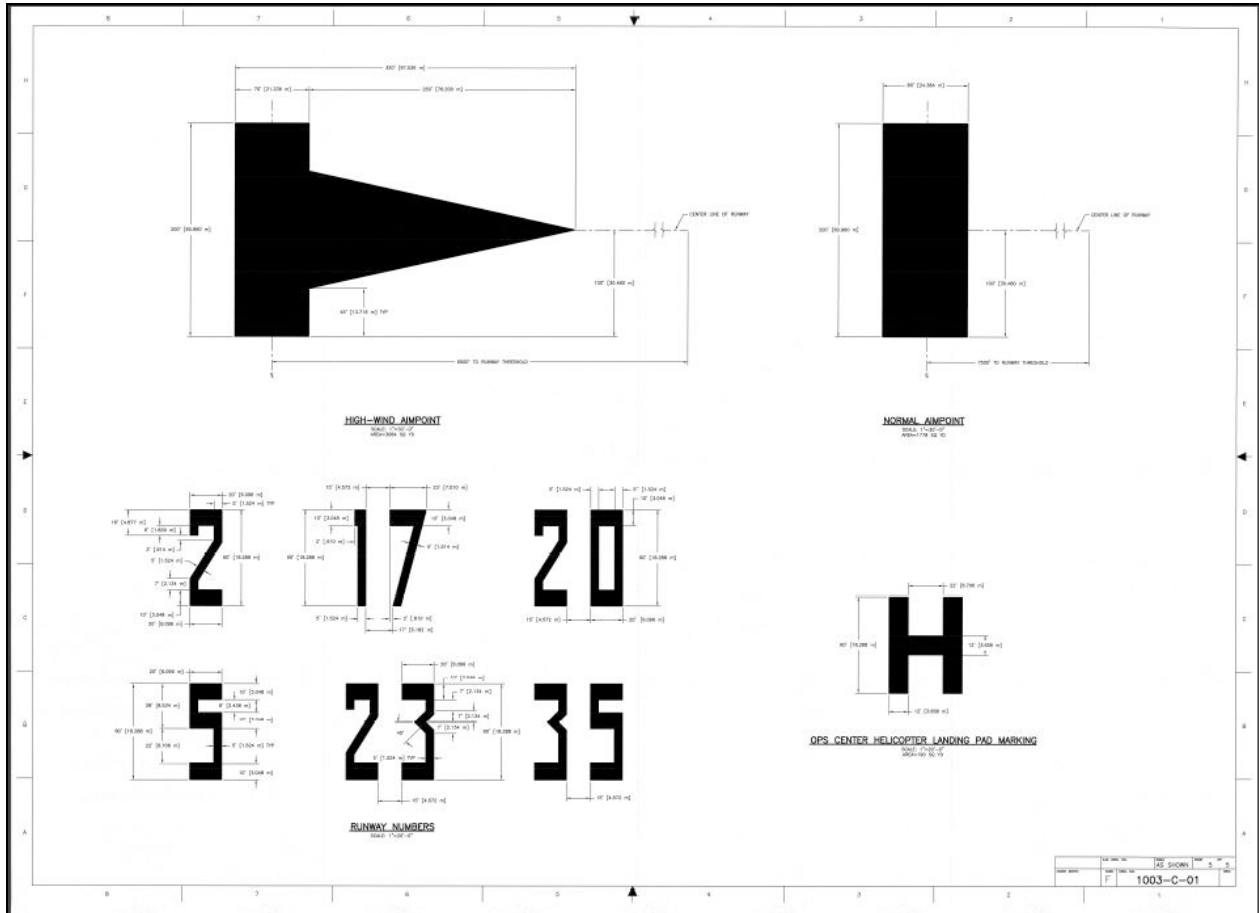


Figure 9. Drawing of Runway Landing Aids Markings, ca.1988
 (Source: NASA WSTF).



Figure 10. Aerial view of Runway 17/35, looking South towards the San Andres Mountain Range, April 2007 (Source: NASA WSTF).



Figure 11. Aerial view of Intersection of Runways 17/35 and 23/05, looking West towards the San Andres Mountain Range, June 2006 (Source: NASA WSTF).



Figure 12. Aerial View of Runway 17/35 (foreground) and Runway 20/02 (background), looking Southwest towards the San Andres Mountains, 2006 (Source: NASA WSTF).



Figure 13. Aerial View of Intersection of Runway 17/35 and Runway 23/05 looking Southeast, 2007 (Source: NASA WSTF).



Figure 14. Aerial View of Runway 17/35 looking North towards the Sand Andres Mountains, 2006 (Source: NASA WSTF).



Figure 15A. View of Inner Glide Slope (IGS) Indicator Ball/Bar Lights on Runway 17/35, looking West towards San Andres Mountain Range, 2011.



Figure 15B. View of an original Northrup Airstrip sign now on display at the WSMR Museum (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 17/35 HAER NM-28-A
(Space Shuttle Landing Facility Area 1, Runway 17/35)
White Sands Missile Range
Extending 35,000 feet north from Range Road 10, beginning
approximately 4.2 miles northeast of intersection with Range Road 7
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

NM-28-A-1 CONTEXT VIEW OF RUNWAYS LOOKING NORTHWEST TOWARDS
SAN ANDRES MOUNTAINS AND HUB COMPLEX FROM SOUTH END OF
RUNWAY 17/35.

NM-28-A-2 VIEW OF RUNWAY 17/35 LOOKING NORTH FROM SOUTH END WITH
NAVIGATIONAL PAPI LIGHTS IN FOREGROUND.

NM-28-A-3 VIEW OF RUNWAY 17/35 LOOKING NORTH FROM WEST EDGE OF
SOUTH END WITH ASPHALT NAVIGATIONAL MARKING IN
FOREGROUND.

NM-28-A-4 VIEW OF RUNWAY 17/35 LOOKING NORTH FROM SOUTH END WITH
ASPHALT DIRECTIONAL ARROW MARKING AND NAVIGATIONAL
PAPI LIGHTS IN FOREGROUND.

NM-28-A-5 VIEW OF RUNWAY 17/35 LOOKING NORTH FROM SOUTH END WITH
ASPHALT "35" MARKING IN FOREGROUND.

NM-28-A-6 VIEW OF RUNWAY 17/35 LOOKING SOUTH FROM NORTH END WITH
ASPHALT "17" MARKING IN FOREGROUND AND SAN ANDRES
MOUNTAINS IN BACKGROUND.

NM-28-A-7 VIEW OF RUNWAY 17/35 LOOKING NORTH FROM CENTER OF
INTERSECTION OF RUNWAYS 17/35 AND 23/05 WITH ASPHALT
EDGE MARKING IN FOREGROUND.

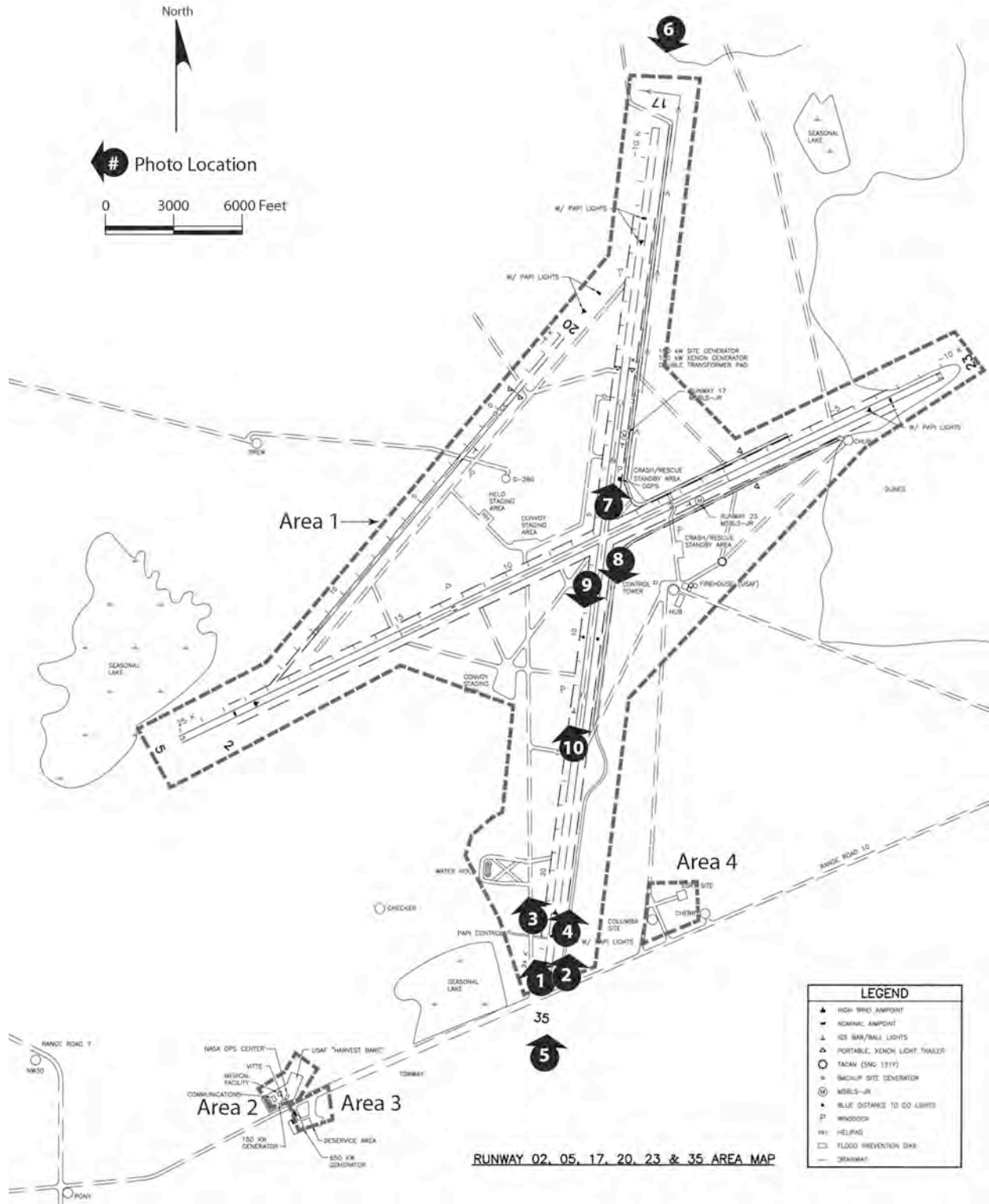
NM-28-A-8 VIEW OF RUNWAY 17/35 LOOKING SOUTH FROM CENTER OF
INTERSECTION OF RUNWAYS 17/35 AND 23/05 WITH ASPHALT
EDGE MARKING IN FOREGROUND AND SAN ANDRES MOUNTAINS IN
BACKGROUND.

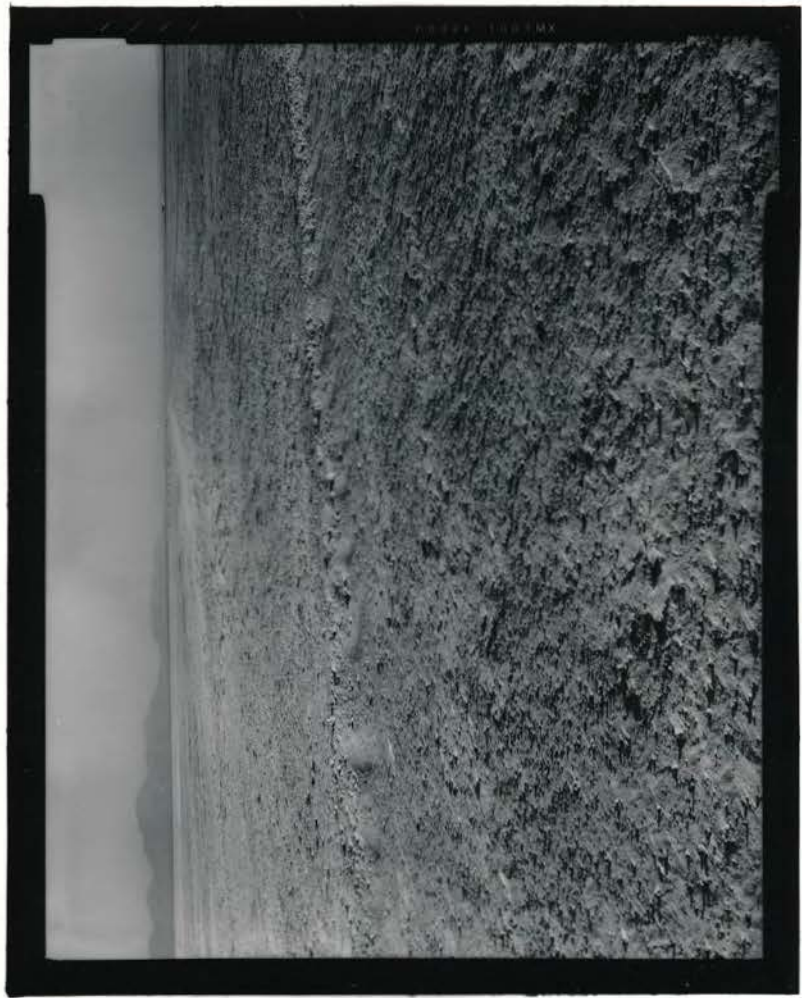
NM-28-A-9 VIEW OF WEST EDGE OF RUNWAY 17/35 LOOKING SOUTH FROM
CENTER OF INTERSECTION OF RUNWAYS 17/35 AND 23/05 WITH
ASPHALT EDGE MARKING IN FOREGROUND AND SAN ANDRES
MOUNTAIN RANGE IN BACKGROUND.

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 17/35
HAER No. NM-28-A
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(Page 2)

NM-28-A-10 VIEW OF TYPICAL NAVIGATIONAL EDGE LIGHTS LOOKING
NORTHWEST, MARKING WEST EDGE OF RUNWAY 17/35 AT MARKER
13 NORTH OF ACCESS ROAD 15.

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 17/35
 HAER No. NM-28-A
 INDEX TO PHOTOGRAPHS
 (Page 3)



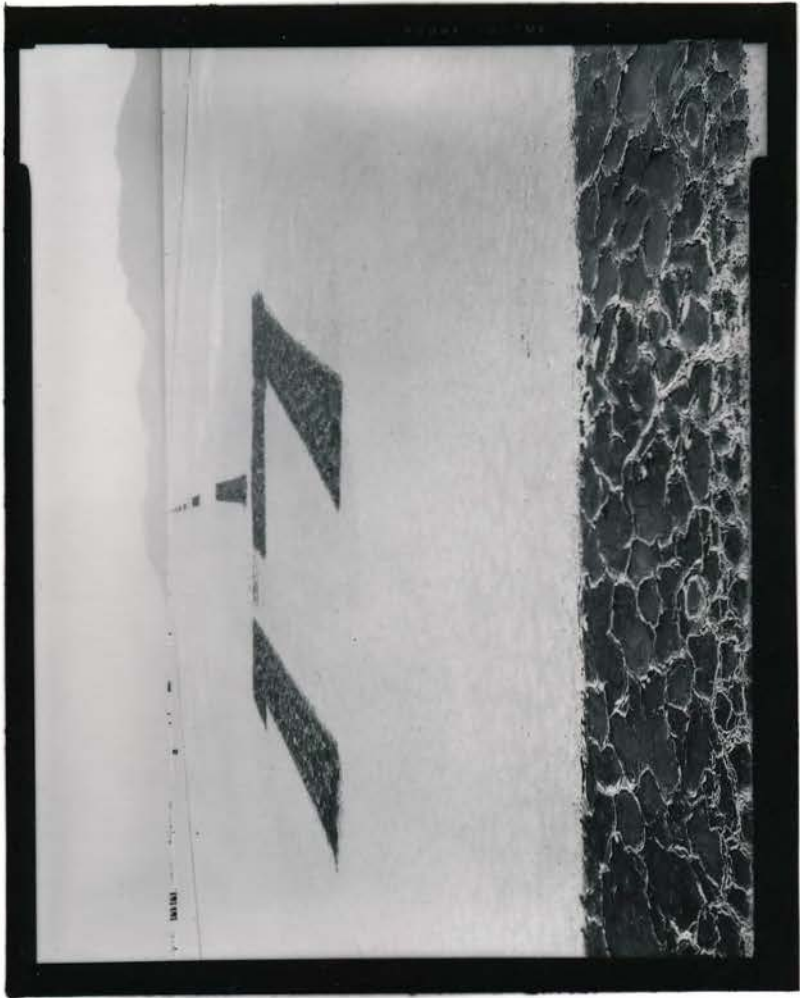




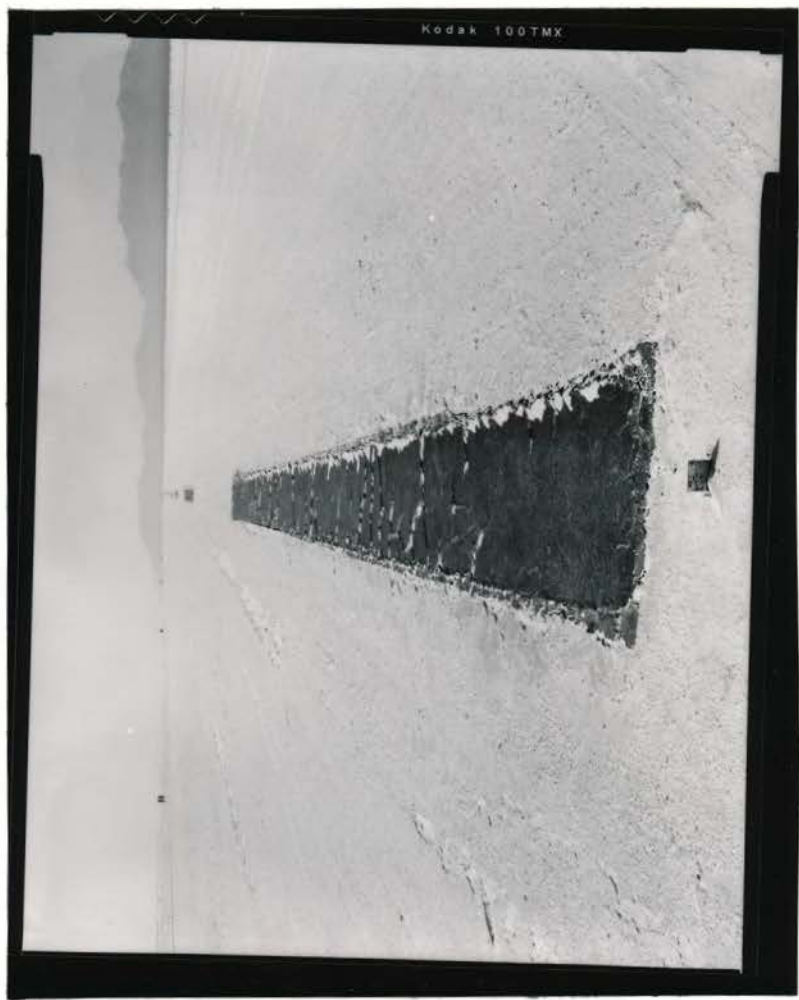
















WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 23/05

HAER No. NM-28-B

(Space Shuttle Landing Facility Area 1, Runway 23/05)

White Sands Missile Range

Extending 35,000 feet in a southwest/northeast direction, intersecting
with Runway 17/35 to form an X-shaped footprint

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 23/05
(Space Shuttle Landing Facility Area 1, Runway 23/05)

HAER No. NM-28-B

Location: White Sands Missile Range
Extending 35,000' in a southwest/northeast direction,
intersecting with Runway 17/35 to form an X-shaped
footprint
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983.

Construction: 1977-1978

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: Runway 23/05 was an essential component of the White
Sands Space Harbor (WSSH) from 1976-2011. It has a
direct association with the U.S. Space Shuttle Program
(SSP) as the site of the landing of Space
Transportation System (STS)-3 *Columbia* in March 1982;
this is the only STS landing to take place outside
Edwards Air Force Base in California and Kennedy Space
Center in Florida. Runway 23/05 is considered to have
national significance and is eligible for listing in
the National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA SSP with
a period of significance of 1976-2011. Because it

achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

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CCC	Civilian Conservation Corps
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CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids

NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

Runway 23/05 was constructed from 1977-1978.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

The Runway is constructed of a compacted, natural gypsum surface and has been upgraded with modern navigational aids such as lighting and asphalt directional markings.

Once the runway was abandoned in 2011, routine maintenance ceased. Due to the harsh desert environment, the runway began to deteriorate quickly. The U.S. Army initiated occupation of WSSH in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Located in Area 1, the three natural surface gypsum runways, including Runway 23/05, are located within a 10-square mile area at WSSH. The runways are constructed of compacted gypsum sand with a 1-2" thick soft top layer and a hard-paved under layer. Due to the harsh desert environment, the runways required constant grading, repairs, and maintenance.

Each of the three runways duplicates a shuttle landing runway: 17/35 replicates the runway at Kennedy Space Center in Florida; 23/05 replicates the runway at Edwards Air Force Base in California; and 20/02 replicates the Transoceanic Abort Landing (TAL) runways in other countries.

Runways 17/35 and 23/05 cross each other at their approximate center lines, creating an X shaped site plan. Runway 17/35 is oriented along the north-south axis and 23/05 along the east-west axis. Both runways are 15,000' in length with 10,000' overruns at either end. Both runways are 300' wide with 300' wide shoulders flanking both sides. Navigational aids such as lighting and markings made of asphalt are located along the entire length of both runways.

At 1,000' into the overruns at runways 17 and 23 are two portable xenon light trailers, one on each side of the runway. At 7,500' into each overrun are the Nominal Aimpoints; at 6,500' into the overruns are the High-Wind Aimpoints. Both High-Wind Aimpoints in Runway 17/35 and the east Aimpoint of Runway 23/05 contain PAPI lights. At 2,000' into the actual runways, at each end, are Inner Glide Slope (IGS) Indicator Bar/Ball lights, except on Runway 05.

Runway 20/02 is located in the northwest quadrant created by the intersection of Runways 17/35 and 23/05. Runway 20/02 is oriented along a northeast-southwest axis and measures 19,800' in length and 200' in width. This runway does not feature overruns.

Navigational aids such as lighting and markings made of asphalt are located along its entire length. This runway does not have maintained overruns.

At 6,500' from the northeast end of runway 20 is the Nominal Aimpoint and at 5,500' is the High-Wind Aimpoint with PAPI lights. At 2,000' into the runway at the northeast end are the IGS Bar/Ball lights.

Within the northwest quadrant of the intersection of Runway 17/35 and 23/05 is a Helicopter Staging Area, consisting of a natural surface landing pad for eight helicopters. The pad features a row of H-shaped markings made of asphalt.

A shuttle towway, approximately 400' wide and constructed of compacted natural surface gypsum, begins at the southern terminus of Runway 17/35 and continues southwest along Range Road 10 where it terminates at the Deservice Pad in Area 2.

2. DESCRIPTION

The following is a more detailed description of Runway 23/05, also known as "Edwards."

Runway 23/05 is 35,000' long and 900' wide runway with runway markings and navigational aids, including: two sets of Precision Approach Path Indicator (PAPI) lights, IGS Ball/Bar lights, touchdown markers, distance-to-go markers, xenon lights, nominal night strobes, and runway side lights.

Runway 23/05 was constructed from 1977-1978 to replicate the runway located at the Edwards Air Force Base near Los Angeles, California. The runway was improved in 1992 with upgraded navigational aids such as lighting.

Once the decision was made in 1984 for the Orbiter to land regularly at KSC, Edwards AFB became the primary backup and WSSH would be used only in the event that the shuttle could not land at KSC or Edwards AFB. After 1984, the primary use of the runways at WSSH was astronaut training, allowing pilots to become

familiar with the Orbiter's primary backup landing site at Edwards AFB.

3. CONDITION OF FABRIC

When documented in March 2012, the Runway had been abandoned for over six months and was in fair condition. Due to the harsh desert environment and lack of maintenance, the runway had quickly deteriorated due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Runway is constructed of compacted natural surface gypsum with landing aid markings made of asphalt.

C. MECHANICAL/OPERATION

The Runway does not feature any mechanical equipment, with the exception of navigational aids, which are documented separately.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Runway, however, plans were created around 1988 for construction of the asphalt navigational markings.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH, including the Runways, are very limited. Some of these views can be found on pages 21, 24, and 25 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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Paczynski." Published online, 2000. Website
[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and
secondary sources. Sources that were not investigated that may
contain secondary information are archived at NASA's Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army White Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 2012. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

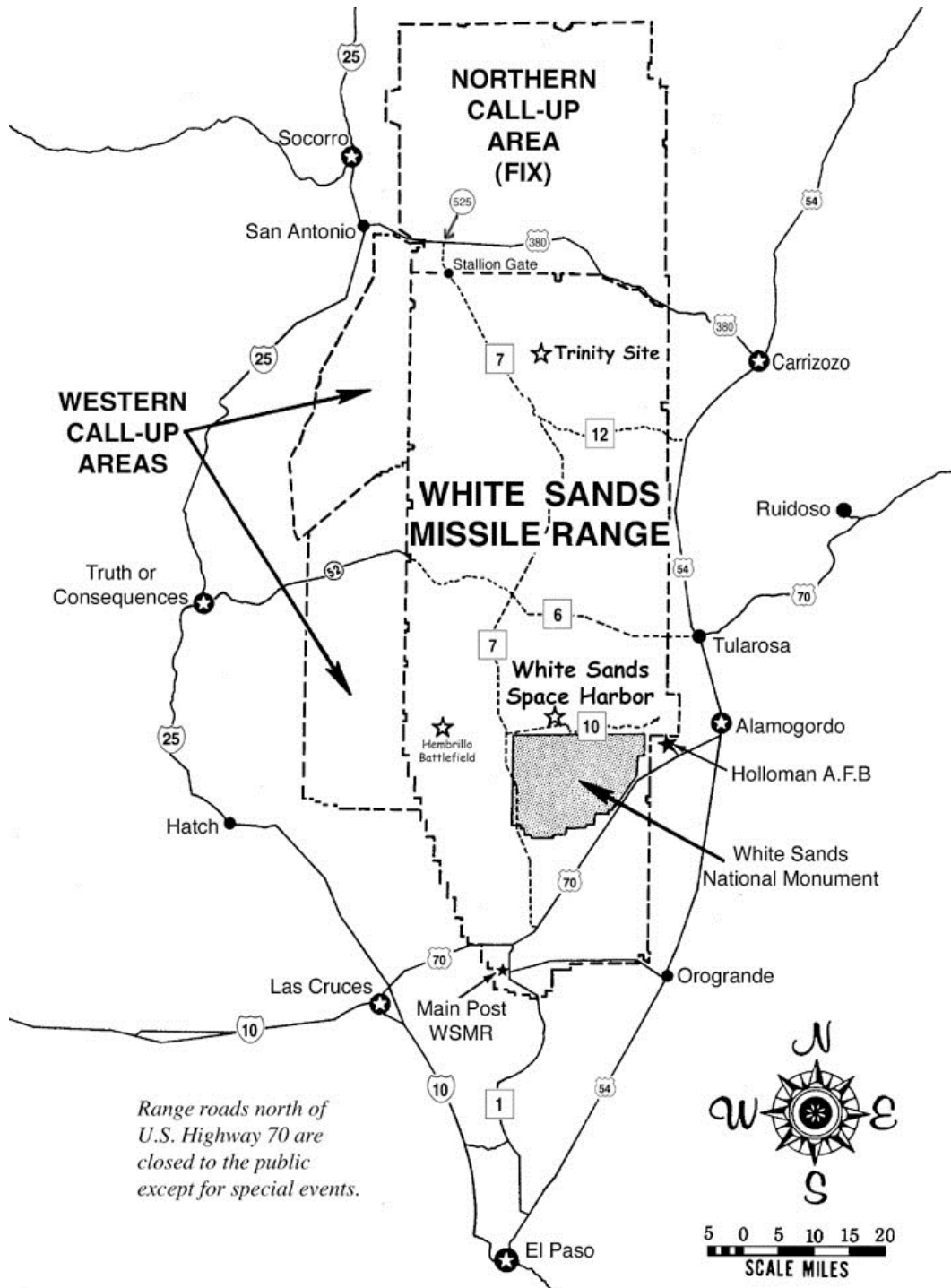


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

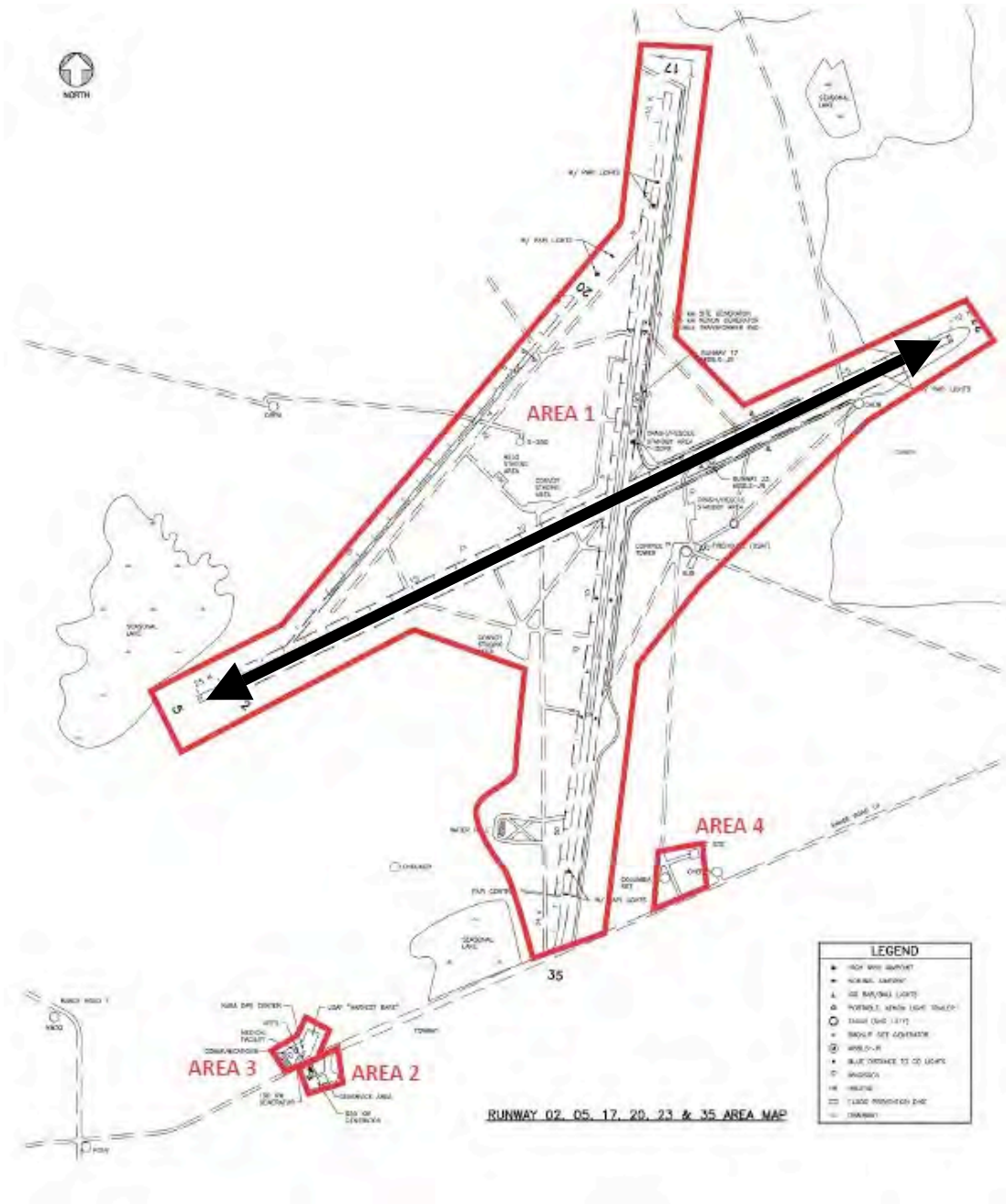


Figure 2. Map of White Sands Space Harbor showing location of Runway 23/05 in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

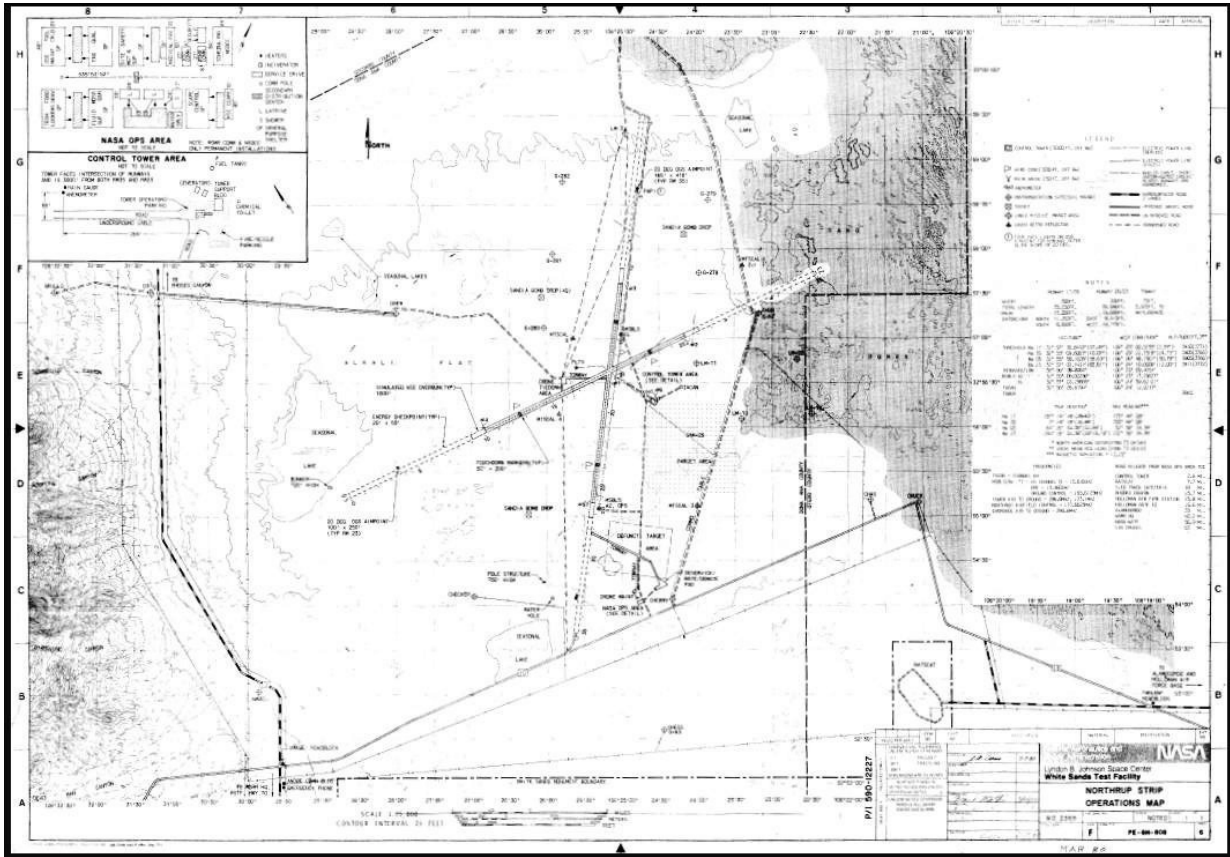


Figure 4. Map of WSSH, drawn by J.A. "Andy" Dorris under the direction of NASA engineer Dennis Perrin on March 7, 1980, showing location of Runway 17/35 and Runway 23/05 (Source: NASA WSTF).



Figure 5. Map of Runways, USGS Topographic Map, 1978.

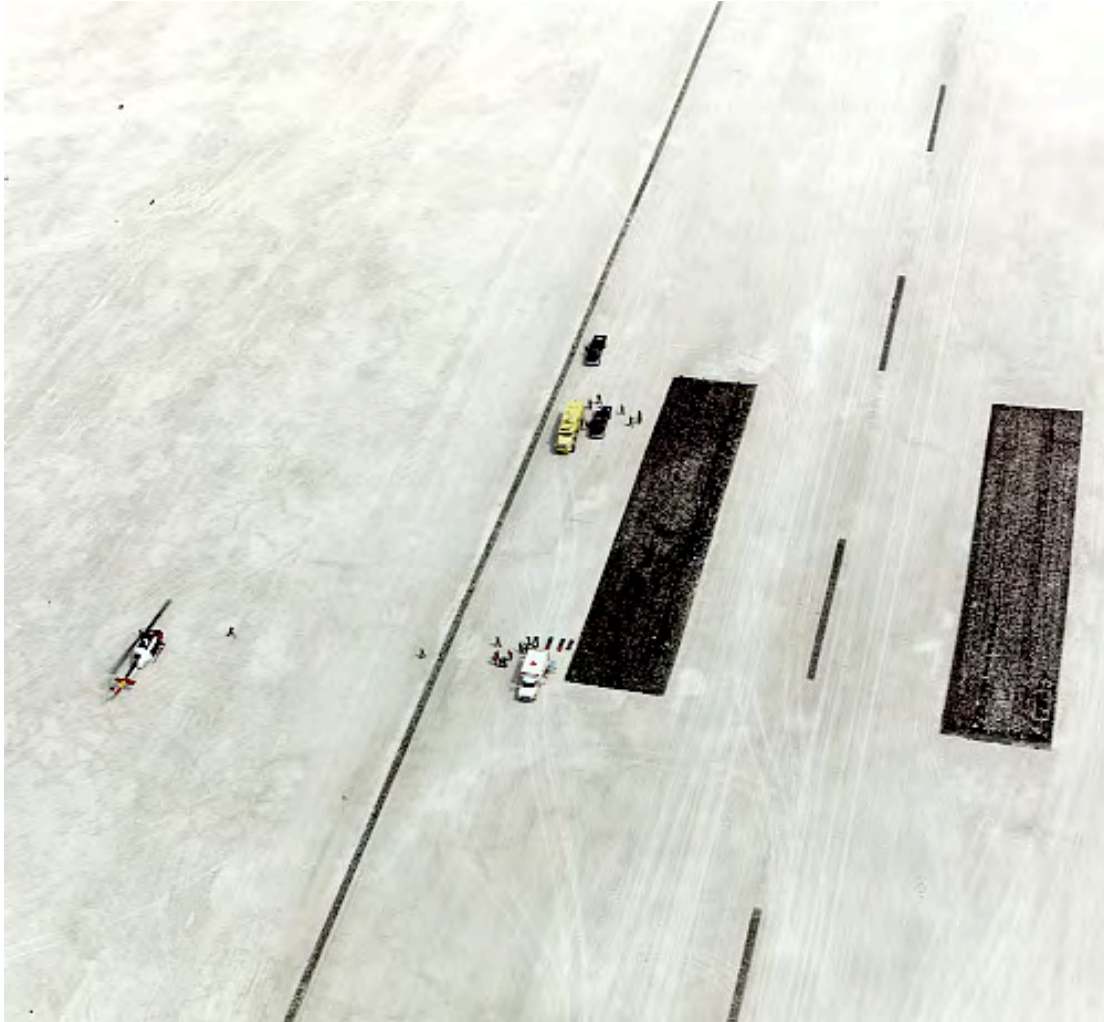


Figure 6. Aerial view of a runway showing "Normal Aimpoint" Markings, November 1999 (Source: NASA WSTF).

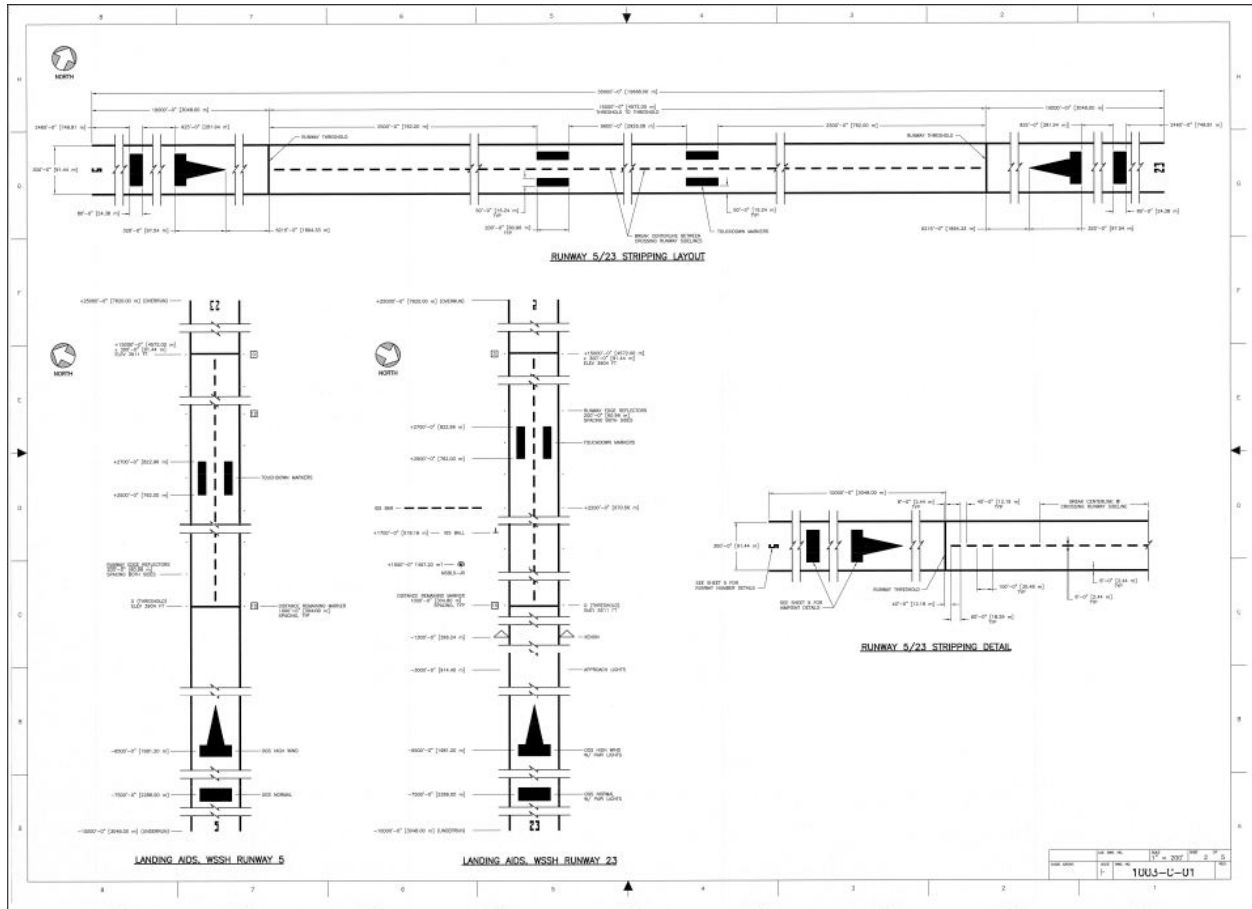


Figure 7. Drawing of Runway 23/05 Landing Aids Markings, ca.1988
 (Source: NASA WSTF).

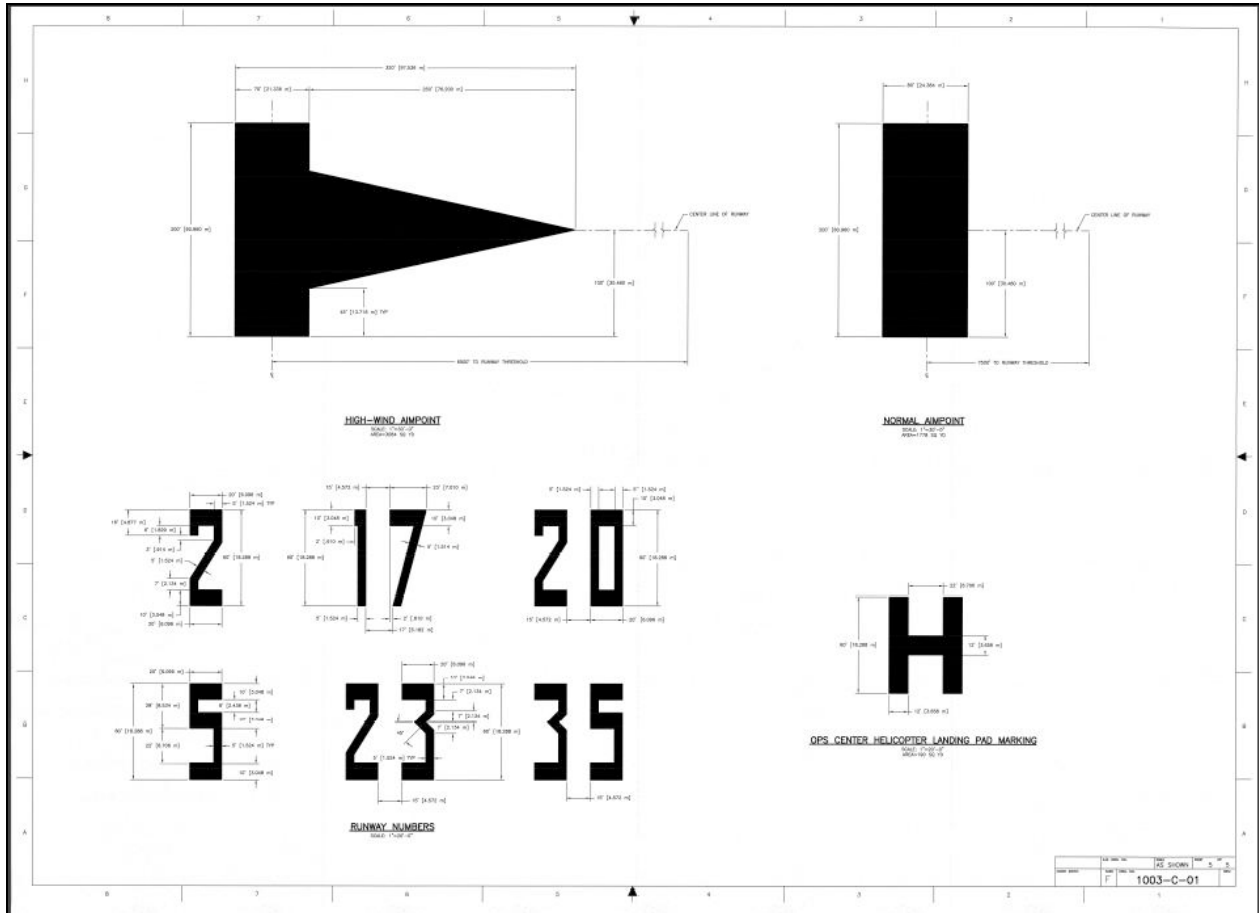


Figure 8. Drawing of Runway Landing Aids Markings, ca.1988
 (Source: NASA WSTF).



Figure 9. Aerial view of Runway 23/05, looking Southwest towards the San Andres Mountain Range, April 2007 (Source: NASA WSTF).



Figure 10. Aerial view of Intersection of Runways 17/35 and 23/05, looking West towards the San Andres Mountain Range, June 2006
(Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

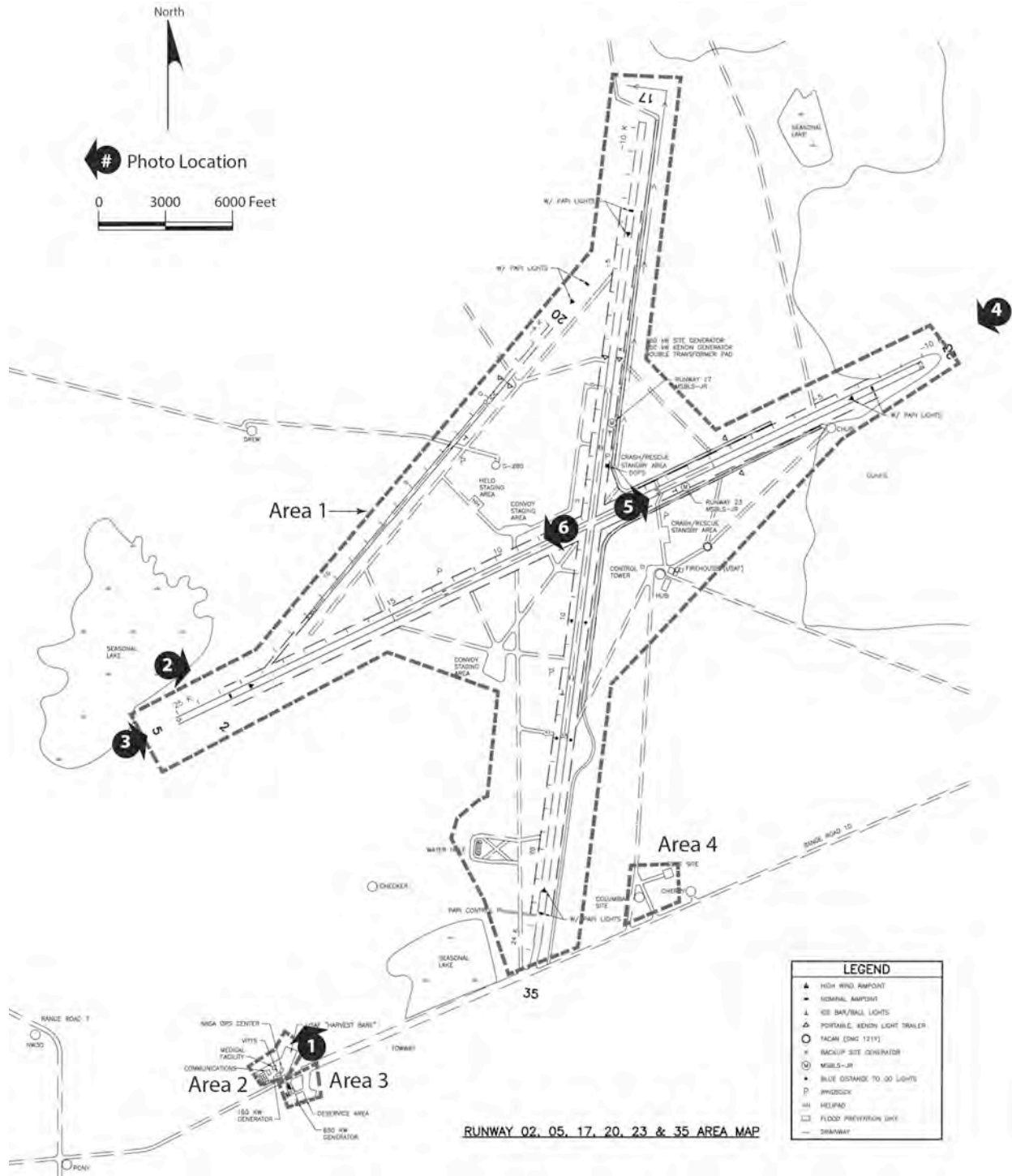
WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 23/05 HAER No. NM-28-B
(Space Shuttle Landing Facility Area 1, Runway 23/05)
White Sands Missile Range
Extending 35,000 feet in a southwest/northeast direction, intersecting
with Runway 17/35 to form an X-shaped footprint
White Sands vicinity
Doña Ana County
New Mexico

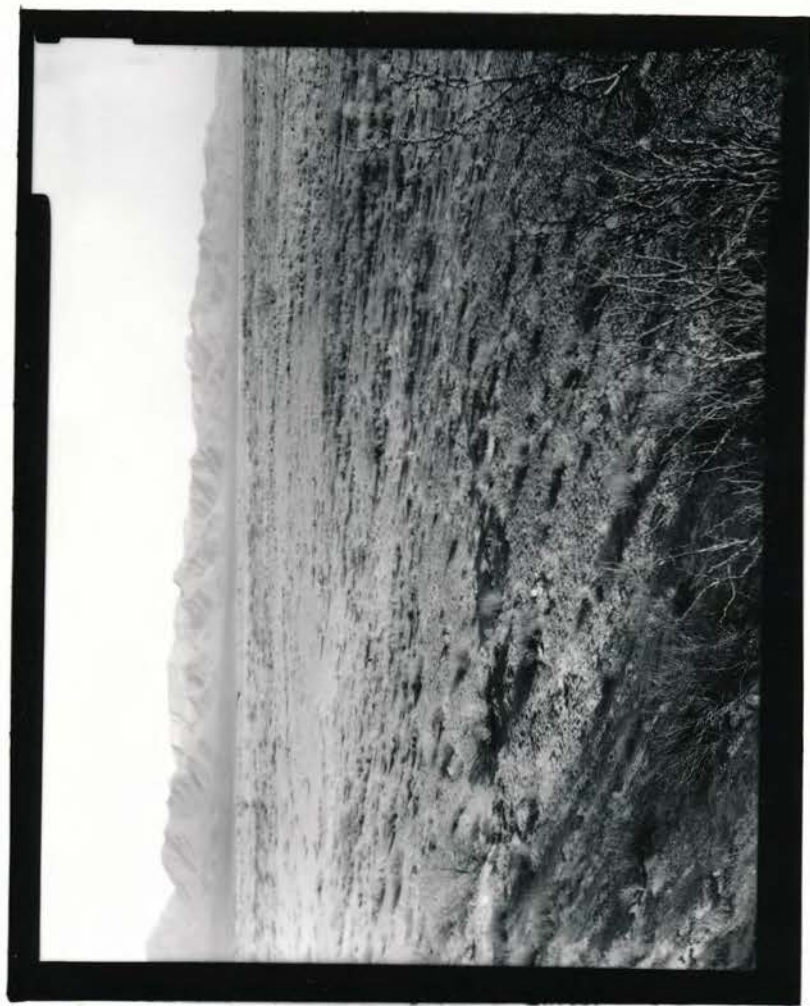
David Diener, Photographer

March 27-29, 2012

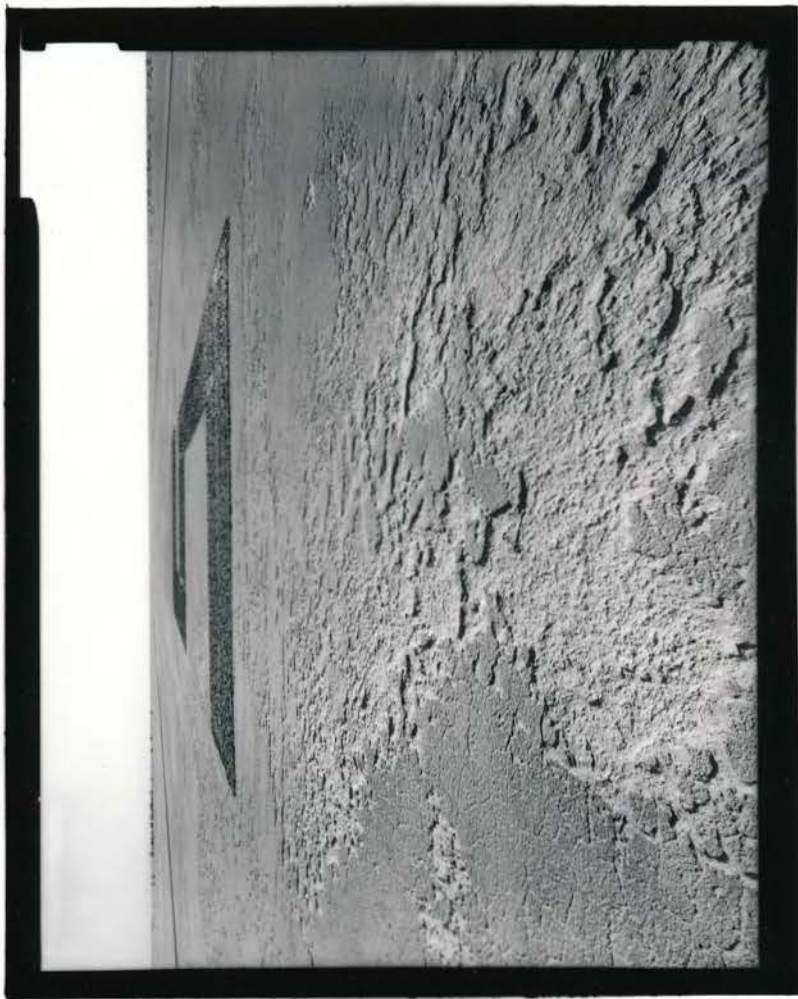
- NM-28-B-1 CONTEXT VIEW OF RUNWAYS LOOKING NORTHWEST TOWARDS
SAN ANDRES MOUNTAINS FROM OPERATIONS CONTROL CENTER
(AREA 3).
- NM-28-B-2 CONTEXT VIEW OF RUNWAYS LOOKING EAST FROM ATOP
ABANDONED U.S. ARMY WSMR BUNKER AT WEST END OF RUNWAY
23/05 TOWARDS HUB COMPLEX WITH SACRAMENTO MOUNTAINS IN
BACKGROUND.
- NM-28-B-3 VIEW OF RUNWAY 23/05 LOOKING NORTHEAST FROM WEST END
WITH ASPHALT "5" MARKING IN FOREGROUND AND SACRAMENTO
MOUNTAINS IN BACKGROUND.
- NM-28-B-4 VIEW OF RUNWAY 23/05 LOOKING WEST FROM EAST END AT
EDGE OF SAND DUNES WITH ASPHALT "23" MARKING IN
FOREGROUND AND SAN ANDRES MOUNTAINS IN BACKGROUND.
- NM-28-B-5 VIEW OF RUNWAY 23/05 LOOKING EAST FROM CENTER OF
INTERSECTION OF RUNWAYS 17/35 AND 23/05 WITH ASPHALT
EDGE MARKING IN FOREGROUND AND SACRAMENTO MOUNTAINS IN
BACKGROUND.
- NM-28-B-6 VIEW OF RUNWAY 23/05 LOOKING WEST FROM CENTER OF
INTERSECTION OF RUNWAYS 17/35 AND 23/05 WITH ASPHALT
EDGE MARKING IN FOREGROUND AND SAN ANDRES MOUNTAINS IN
BACKGROUND.

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 23/05
 HAER No. NM-28-B
 INDEX TO PHOTOGRAPHS
 (Page 2)



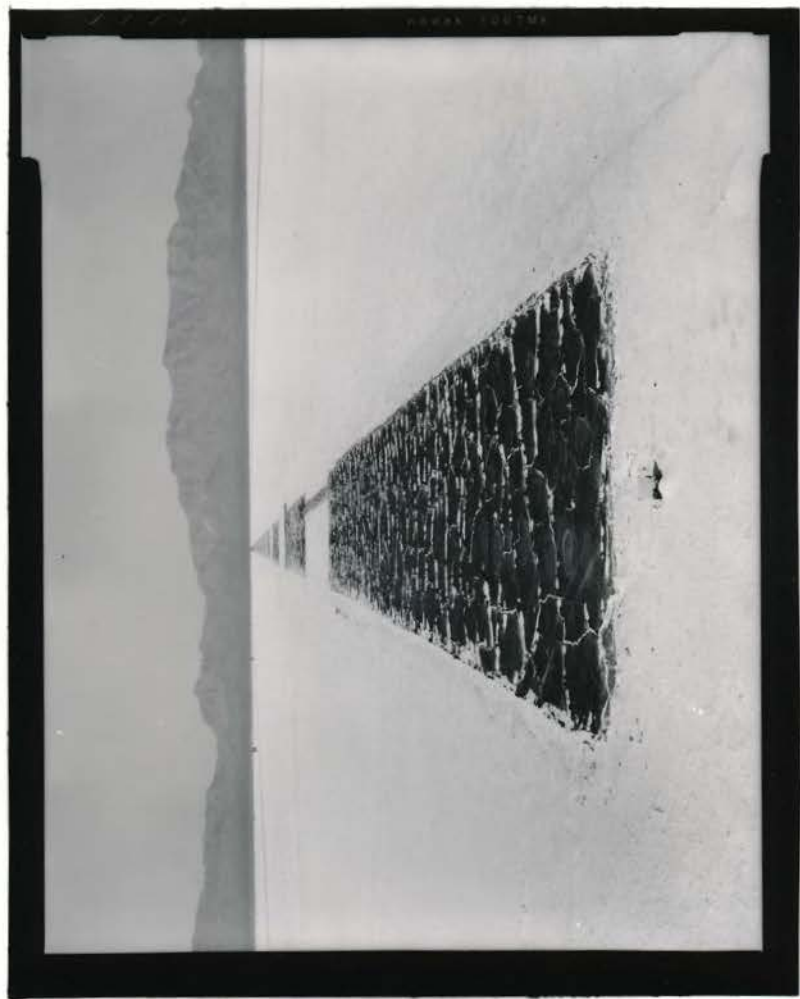












WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 20/02
(Space Shuttle Landing Facility Area 1, Runway 20/02)

HAER No. NM-28-C

White Sands Missile Range

Extending 19,800 feet in a southwest/northeast direction, connecting
with Runways 17/35 and 23/05

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 20/02
(Space Shuttle Landing Facility Area 1, Runway 20/02)

HAER No. NM-28-C

Location: White Sands Missile Range
Extending 19,800' in a southwest/northeast direction,
connecting with Runway 17/35 and Runway 23/05
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983.

Construction: 1988

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: Runway 20/02 was an essential component of the White Sands Space Harbor (WSSH) from 1988-2011. It is considered to have national significance and is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because it achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. Physical History

1. DATE OF CONSTRUCTION

Runway 20/02 was constructed in 1988.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

A single sheet of to-scale engineering drawings were created in 1988 for Runway 20/02. The engineer-of-record is unknown.

5. ALTERNATIONS AND ADDITIONS

The Runway is constructed of a compacted, natural gypsum surface and has been upgraded with modern navigational aids such as lighting and asphalt directional markings.

Once the runway was abandoned in 2011, routine maintenance ceased. Due to the harsh desert environment, the runway began to deteriorate quickly. The U.S. Army initiated occupation of WSSH in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Located in Area 1, the three natural surface gypsum runways, including Runway 20/02, are located within a 10-square mile area at WSSH. The runways are constructed of compacted gypsum sand with a 1-2" thick soft top layer and a hard-paved under layer. Due to the harsh desert environment, the runways required constant grading, repairs, and maintenance.

Each of the three runways duplicates a shuttle landing runway: 17/35 replicates the runway at Kennedy Space Center in Florida; 23/05 replicates the runway at Edwards Air Force Base in California; and 20/02 replicates the Transoceanic Abort Landing (TAL) runways in other countries.

Runway 20/02 is located in the northwest quadrant created by the intersection of Runways 17/35 and 23/05. Runway 20/02 is oriented along a northeast-southwest axis and measures 19,800' in length and 200' in width. This runway does not feature maintained overruns. Navigational aids such as lighting and markings made of asphalt are located along its entire length.

At 6,500' from the northeast end of runway 20 is the Nominal Aimpoint and at 5,500' is the High-Wind Aimpoint with PAPI lights. At 2,000' into the runway at the northeast end are the IGS Bar/Ball lights.

2. DESCRIPTION

The following is a more detailed description of Runway 20/02, also known as "TAL."

Runway 20/02 is smaller than the other two runways, measuring 19,800' by 200'. This natural surface gypsum runway is located on a northeastern/southwestern diagonal direction along the north side of the other two runways. The runway features runway markings and navigational aids, including: one set of Precision

Approach Path Indicator (PAPI) lights, touchdown markers, distance-to-go markers, xenon lights, and nominal night strobes.

This runway was constructed to replicate the following runways: Transoceanic Abort Landing (TAL) runways at Zaragoza Air Base in Spain; Moron Air Base in Spain; and Istres Air Base in France, as well as former runways at Ben Guerir Air Base, Morocco (1988-2002); Casablanca, Morocco (1986-1988); and Banjul International Airport, The Gambia (1988-2002). Like the other two runways at WSSH, Runway 20/02 was used primarily for astronaut training after 1984, with Shuttle pilots simulating landings at Transatlantic Abort Landing sites.

3. CONDITION OF FABRIC

When documented in March 2012, the Runway had been abandoned for over six months and was in fair condition. Due to the harsh desert environment and lack of maintenance, the runway had quickly deteriorated due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Runway is constructed of compacted natural surface gypsum with landing aid markings made of asphalt.

C. MECHANICAL/OPERATION

The Runway does not feature any mechanical equipment, with the exception of navigational aids, which are documented separately.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

A single sheet of to-scale engineering drawings were created in 1988 for Runway 20/02. The engineer-of-record is unknown. In addition, plans were created around 1988 for construction of the asphalt navigational markings.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH, including the Runways, are very limited. Some of these views can be found on pages 20-23 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and
secondary sources. Sources that were not investigated that may
contain secondary information are archived at NASA's Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

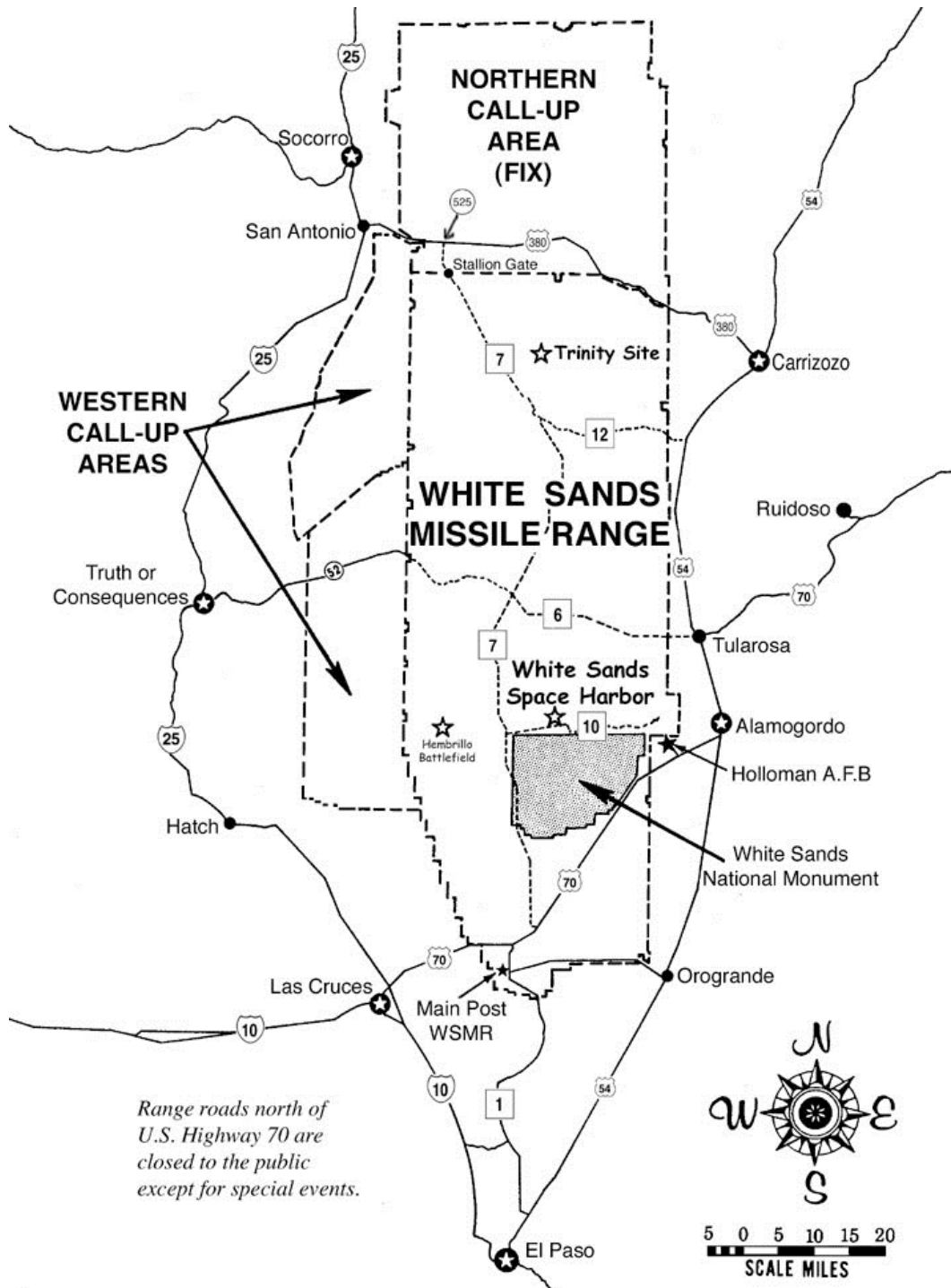


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

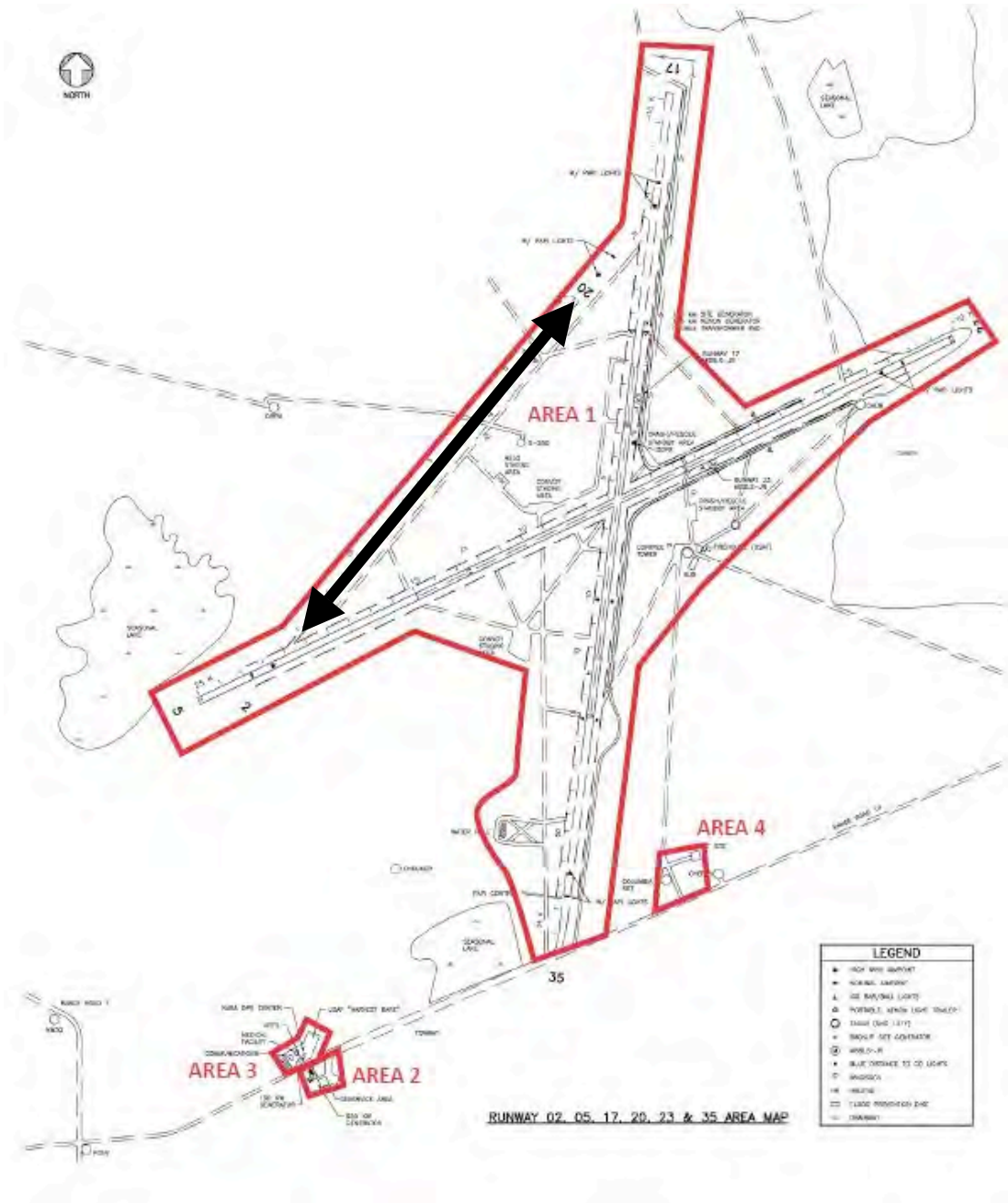


Figure 2. Map of White Sands Space Harbor showing location of Runway 20/02 in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 20/02
 HAER No. NM-28-C
 (Page 17)

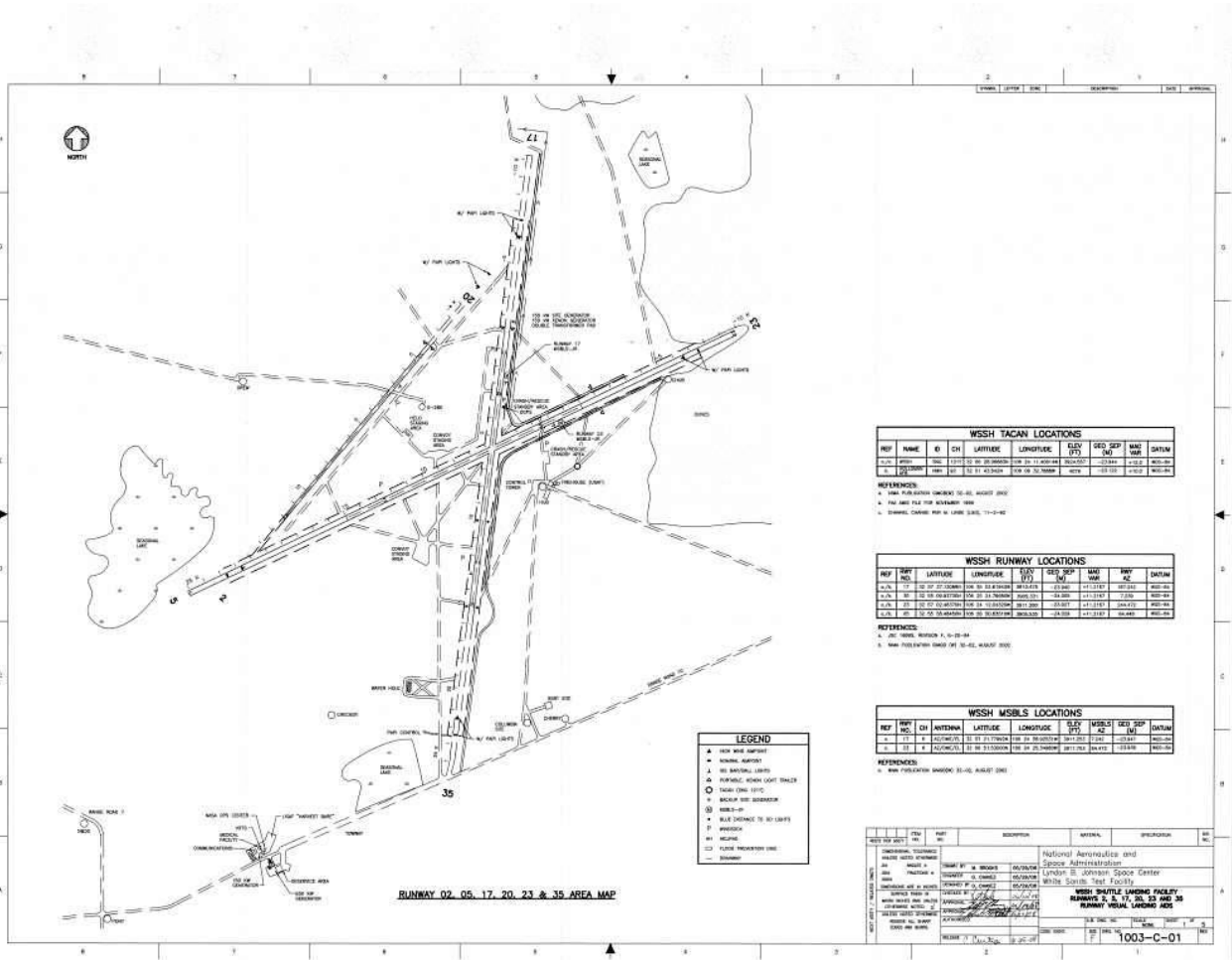


Figure 3. Map of WSSH showing location of all three of the Runways, with latitude and longitude, 2008 (Source: NASA WSTF).

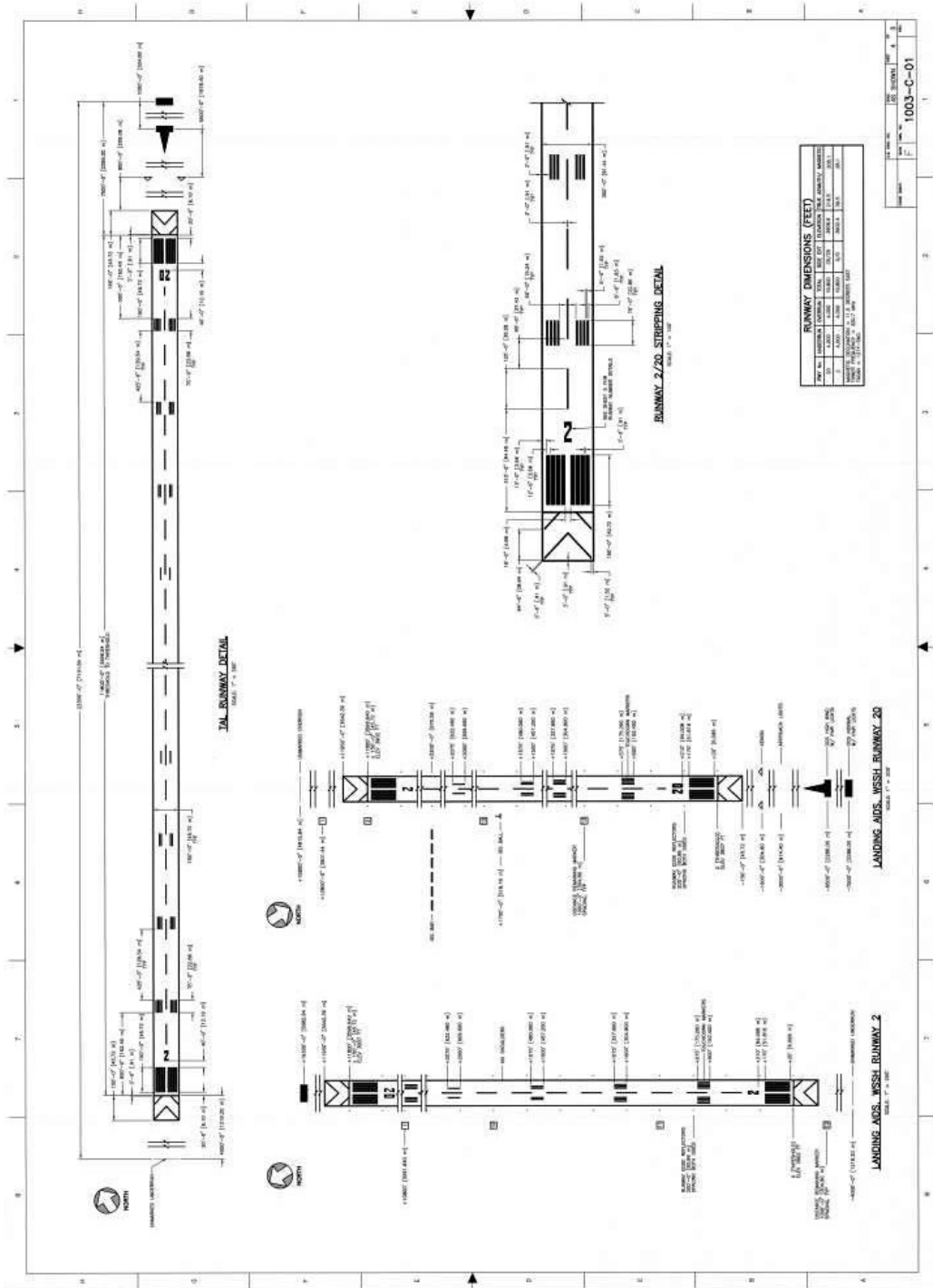


Figure 4. Engineering Plan Sheet and Landing Aid Markings, Runway 20/02, ca.1988 (Source: NASA WSTF).

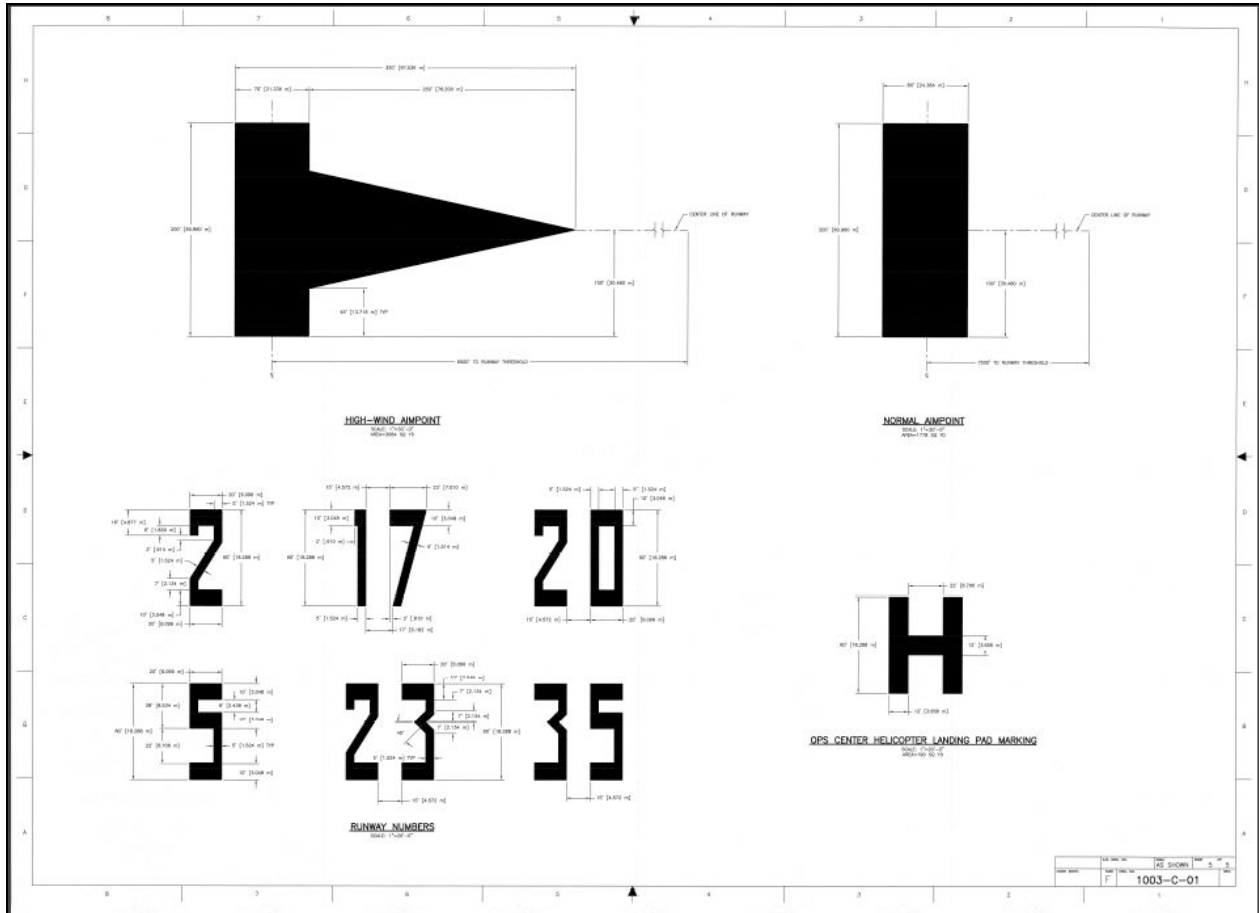


Figure 5. Drawing of Runway Landing Aids Markings, ca.1988
 (Source: NASA WSTF).



Figure 6. Aerial view of Runway 20/02, looking Northwest towards the San Andres Mountain Range, undated (Source: NASA WSTF).



Figure 7. Aerial view of Runway 20/02, looking North towards the Sacramento Mountains, 2006 (Source: NASA WSTF).



Figure 8. Aerial view of Runway 20/02, looking West towards the San Andres Mountain Range, 2007 (Source: NASA WSTF).



Figure 9. Aerial view of Runway 17/35 (Foreground) and Runway 20/02 (Background), looking Southwest towards the San Andres Mountains, 2006 (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

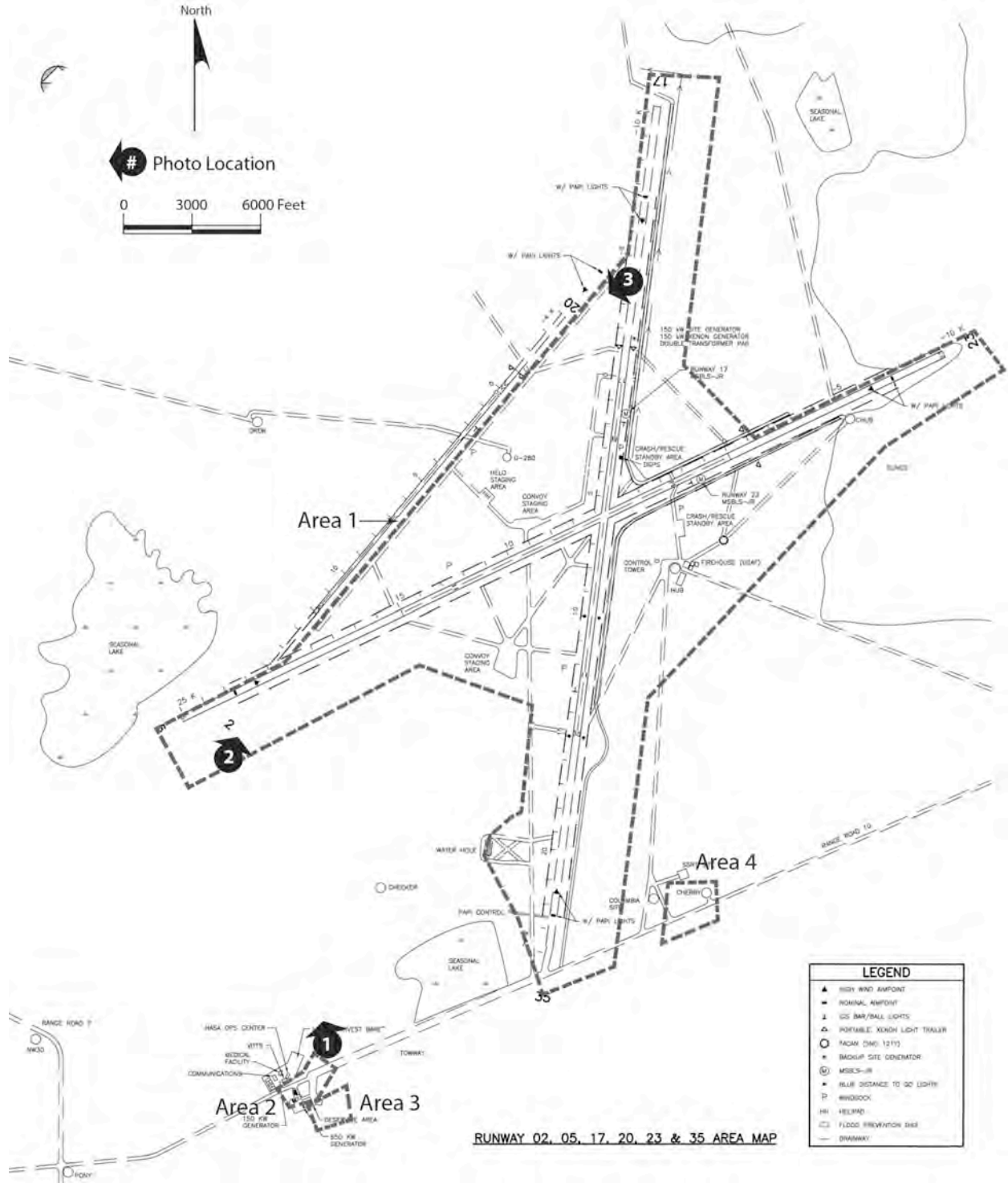
INDEX TO PHOTOGRAPHS

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 20/02 HAER No. NM-28-C
(Space Shuttle Landing Facility Area 1, Runway 20/02)
White Sands Missile Range
Extending 19,800 feet in a southwest/northeast direction, connecting
with Runways 17/35 and 23/05
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer March 27-29, 2012

- NM-28-C-1 CONTEXT VIEW OF RUNWAYS LOOKING NORTHWEST TOWARDS
SAN ANDRES MOUNTAINS FROM OPERATIONS CONTROL CENTER
(AREA 3).
- NM-28-C-2 VIEW OF RUNWAY 20/02 LOOKING NORTHEAST FROM SOUTH END
WITH ASPHALT "2" MARKING IN FOREGROUND.
- NM-28-C-3 VIEW OF RUNWAY 20/02 LOOKING SOUTHWEST FROM NORTH END
WITH ASPHALT "20" MARKING IN FOREGROUND AND SAN ANDRES
MOUNTAINS IN BACKGROUND.

WHITE SANDS SPACE HARBOR AREA 1, RUNWAY 20/02
 HAER No. NM-28-C
 INDEX TO PHOTOGRAPHS
 (Page 2)



RUNWAY 02, 05, 17, 20, 23 & 35 AREA MAP







WHITE SANDS SPACE HARBOR AREA 1, CONTROL TOWER HAER No. NM-28-D
(Space Shuttle Landing Facility Area 1, Control Tower)
White Sands Missile Range
Approximately 3,500 feet southwest of intersection of Runways 17/35
and 23/05
White Sands vicinity
Doña Ana County
New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1
(Space Shuttle Landing Facility Area 1, Control Tower)

HAER No. NM-28-D

Location: White Sands Missile Range
Approximately 3,500' southeast from intersection of
Runways 17/35 and 23/05
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates:
E 32.93827 N 106.41034 Zone 13S, NAD 1983

Construction: 1979

Architect: Dennis G. Perrin, NASA WSTF engineer

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Air Traffic Control Tower, commonly known as the
"Control Tower," was an essential component of the
White Sands Space Harbor (WSSH) from 1976-2011. The
Control Tower has a direct association with the U.S.
Space Shuttle Program (SSP) as the site of the landing
of Space Transportation System (STS)-3 *Columbia* in
March 1982; this is the only STS landing to take place
outside Edwards Air Force Base in California and
Kennedy Space Center in Florida. The Control Tower is
considered to have national significance and is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA SSP with a period of
significance of 1976-2011. Because it achieved
significance within the past fifty years, Criterion
Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The cab section of the Control Tower was originally located at NASA's Ellington Field in Houston, Texas. In May 1976, it was relocated to WSSH. At that time, the cab was attached to an Elevated Mobile Platform. In 1979, the mobile Control Tower was modified into its current configuration by attaching the original cab to a stationary structure at WSSH.

2. ENGINEER

Dennis G. Perrin, NASA WSTF Facility Manager, is the engineer-of-record for the 1979 modifications.

3. BUILDER/CONTRACTOR/SUPPLIER

None identified.

4. ORIGINAL PLANS

In the spring of 1979, NASA WSTF Facility Manager and engineer Dennis G. Perrin drafted a set of engineering drawings with the assistance of Lockheed Martin contract employee J.A. "Andy" Dorris. Robert Maveety served as engineering supervisor and Ken Blair as drafting supervisor. There are four sheets of drawings, including a site plan, base foundation plan, plan view, elevations, and construction details (Figures 7-10). The drawings are designated "594-1222B."¹

5. ALTERATIONS AND ADDITIONS

The original Air Traffic Control Tower consisted of a cab unit attached to an Elevated Mobile Platform. In May 1976, the Mobile Air Traffic Control Tower was relocated from NASA's Ellington

¹ Offutt, Frank H. Personal communication with Robbie D. Jones, July 2012; Dennis G. Perrin. Telephone interview with Robbie D. Jones, June 13, 2013, and electronic mail to Robbie D. Jones, June 13, 2013.

Field at Houston, Texas, to WSSH via a flatbed truck. The Mobile Control Tower's cab unit was raised and lowered on pneumatic scissor jacks and moved on a mobile platform. The extreme desert weather, however, quickly damaged the cab's mechanical elements so that it could no longer be raised and lowered.

In the spring of 1979, WSSH Project Manager Alex Paczynski requested WSTF Facility Manager Dennis G. Perrin to create a set of plans so the mobile Control Tower could be modified into a stationary Control Tower. Perrin's plans resulted in the rectangular cab being removed from the mobile platform and mounted atop a repurposed Apollo Propulsion Test Stand with structural parts salvaged from the WSTF. The octagon-shaped support structure was mounted to concrete foundation piers. The alterations were completed by NASA staff and private contractors on site with the assistance of two mobile cranes.²

Since 1979, alterations to the Control Tower have been minimal. By April 1980, two wooden 75' tall poles with radio communication antennas were erected on the north and south sides of the tower. Around 1982, a cantilevered walkway was constructed to the north, west, and south elevations of the bridge, connecting to the original walkway atop the support structure. The walkway was added so that the exterior windows could be more easily cleaned.³

The entire structure was originally painted canary yellow with the "worm" NASA logotype in black on the north and south sides of the bridge. The yellow color had been selected by Dennis G. Perrin so that the Control Tower would be visible to low-flying military jets. By the late 1980s, the tower had been repainted white with the red "worm" NASA logotype on the north and south sides. This logo was in use from 1975 to 1992. In the 1990s, the original logo was painted over.⁴

² Perrin, 2013.

³ Perrin, 2013.

⁴ Perrin, 2013.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The lone purpose-built facility was the Control Tower (NASA Inventory #1000), which NASA engineers created in 1979 by attaching the cab from a Mobile Air Traffic Control Tower to a repurposed Apollo Propulsion Test Stand relocated from the WSTF on the opposite side of the San Andres Mountains. The Control Tower housed the ground-based controller who directed aircraft on the ground and through controlled airspace. With a 360-degree elevated view of the desert, the controller provided information and other support for pilots in order to prevent collisions, provide weather and navigation information, and organize landings.

From 1979-2012, the Control Tower was located 3,000' southeast of the centerline of where Runway 17/35 and Runway 23/05 intersected, allowing controllers a 90-degree view of both runways. This was the first permanent NASA support structure constructed at the Northrup Strip. Two small, prefabricated metal generator and support buildings were located east of the Control Tower.

Standing two stories tall, the steel cab faced northwest with flat-pane windows on the north, west, and south sides and a pedestrian door on the east side. Measuring 12'6" x 10'5", the cab was bolted to an octagon-shaped, steel base supported by four, circular steel columns, which were bolted to four concrete foundation pads forming a 12' square. The pads measured 3' x 2'. Each side of the octagon based measured 6-feet in length. A metal staircase was bolted to the east side and supported by a concrete foundation pad at the landing, which later connected to a concrete sidewalk leading to the adjacent HUB Maintenance Facility.

A 2' wide observation platform and walkway with metal railings surrounded the exterior of the bridge. Originally, the platform only partially surrounded the bridge, on the north, south, and

east sides. However, it was later reconfigured and enlarged so that it surrounded all four sides of the cab, which cantilevers over the west side of the base, so that the windows could be more easily cleaned. A ladder in the northeast corner provides access to the roof of the cab.

By April 1980, two wooden poles approximately 75' tall were erected on the north and south sides of the Control Tower; they were originally used to host radio communication antennas as well as fly flags for determining wind direction and other weather conditions. The poles also allowed low-flying military jets to avoid striking the Control Tower.⁵

The interior of the cab features wood paneling, floor carpeting, and an L-shaped wood counter on the north and west sides. A closet is located in the southwest corner. An air conditioning unit is located in the northeast corner. Modern blinds protect the windows.

2. CONDITION OF FABRIC

When documented in March 2012, the Control Tower had been abandoned for over six months and vacated, but was in overall good condition. The interior equipment had been removed, but the attached furnishings were in place. The exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations. The exterior was exhibiting some rust, particularly around the base.

As a condition of a Memorandum of Agreement executed between NASA, the U.S. Army and the NM-SHPO in August 2012, the Control Tower was relocated from WSSH to the WSMR Museum in the summer of 2012 where it was placed in storage for future exhibition and public interpretation.

⁵ Perrin, 2013.

B. CONSTRUCTION

In 1979, the original Mobile Air Traffic Control Tower was modified into its current stationary configuration based on engineering plans prepared by NASA WSTF Facility Manager Dennis G. Perrin. The original cab, which had been relocated from NASA's Ellington Field in Houston in May 1976, was mounted atop a repurposed Apollo Propulsion Test Stand that had been salvaged from a "HD-1 Rig" at the WSTF. Other structural elements such as the octagon-shaped base were also salvaged from the WSTF. The metal frame cab was bolted and welded to the carbon steel structural base, which was bolted to concrete foundation pads. The modified Control Tower structure was then cleaned and primed with zinc chromate primer and painted with two coats of exterior grade enamel paint. The plans specified flat white paint, but photographs from the early 1980s document that it was painted canary yellow with the original NASA "worm" logo in black lettering on the north and south sides of the bridge. By the late 1980s, it had been repainted white with the "worm" logo in red lettering. In the 1990s, the logo was painted over in white paint.⁶

C. MECHANICAL/OPERATION

The Control Tower featured electricity to power interior lights, electronic navigational equipment, radios, and a wall-mounted air conditioning unit.

⁶ Stevens, Paul. "Desert Missile Range Prepared for Possible Space-Shuttle Landing: New Mexico strip chosen by NASA as alternate site." Associated Press News Release, March 26, 1981; Perrin, 2013.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

The construction plans for the Control Tower are housed at White Sands Test Facility, administered by NASA. There are four sheets of drawings, including a site plan, base foundation plan, plan view, elevations, and construction details. On each sheet, the original drawing date of April 19, 1979, is noted in the title block. The plans were approved and released on June 28, 1979.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH, including the Control Tower, are very limited. Some of these views can be found on pages 28-30 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

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White Sands Missile Range. "White Sands Hall of Fame: Alex
Paczynski." Published online, 2000. Website
[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and
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contain secondary information are archived at NASA's Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.⁷

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

⁷ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

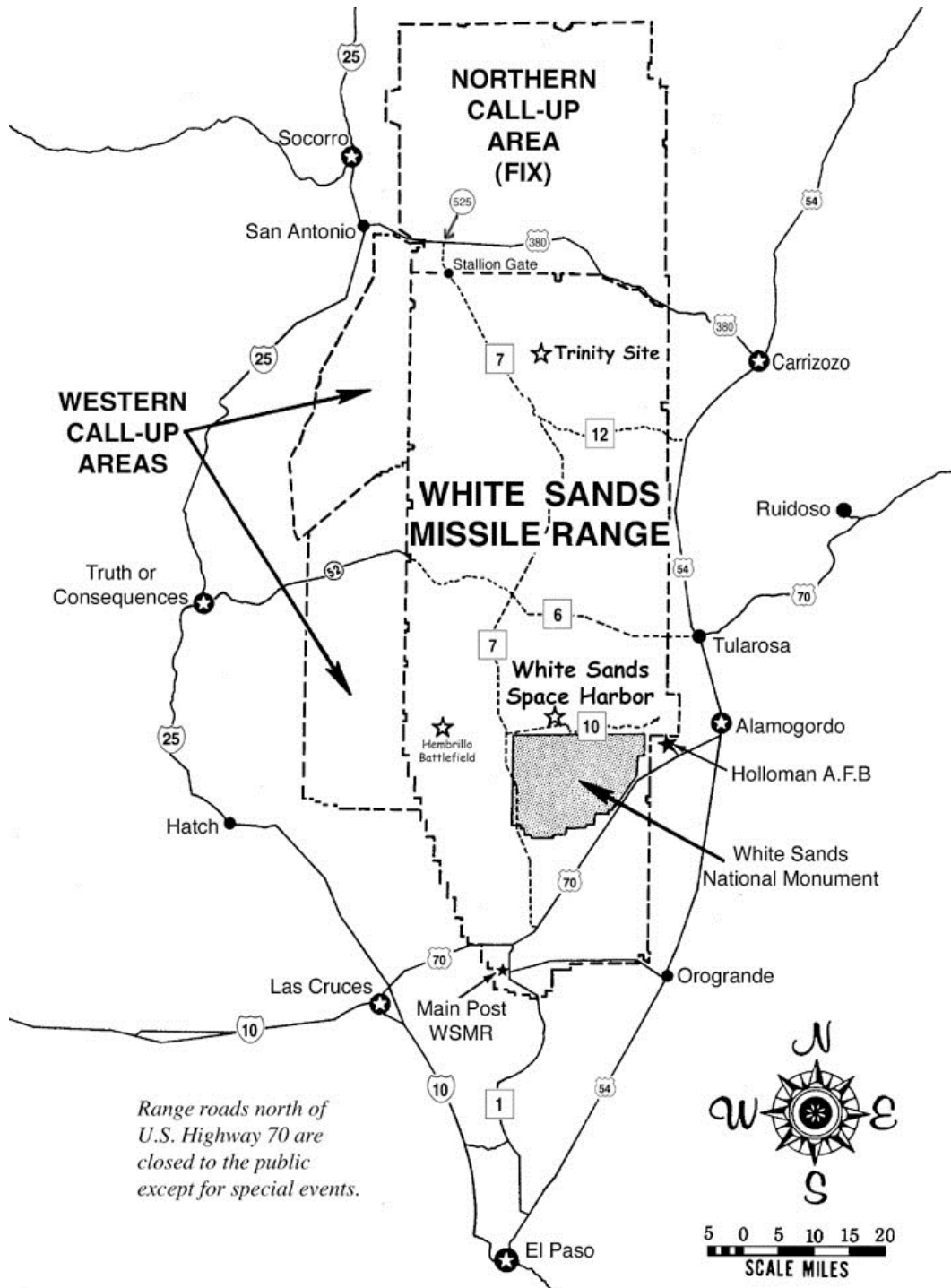


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

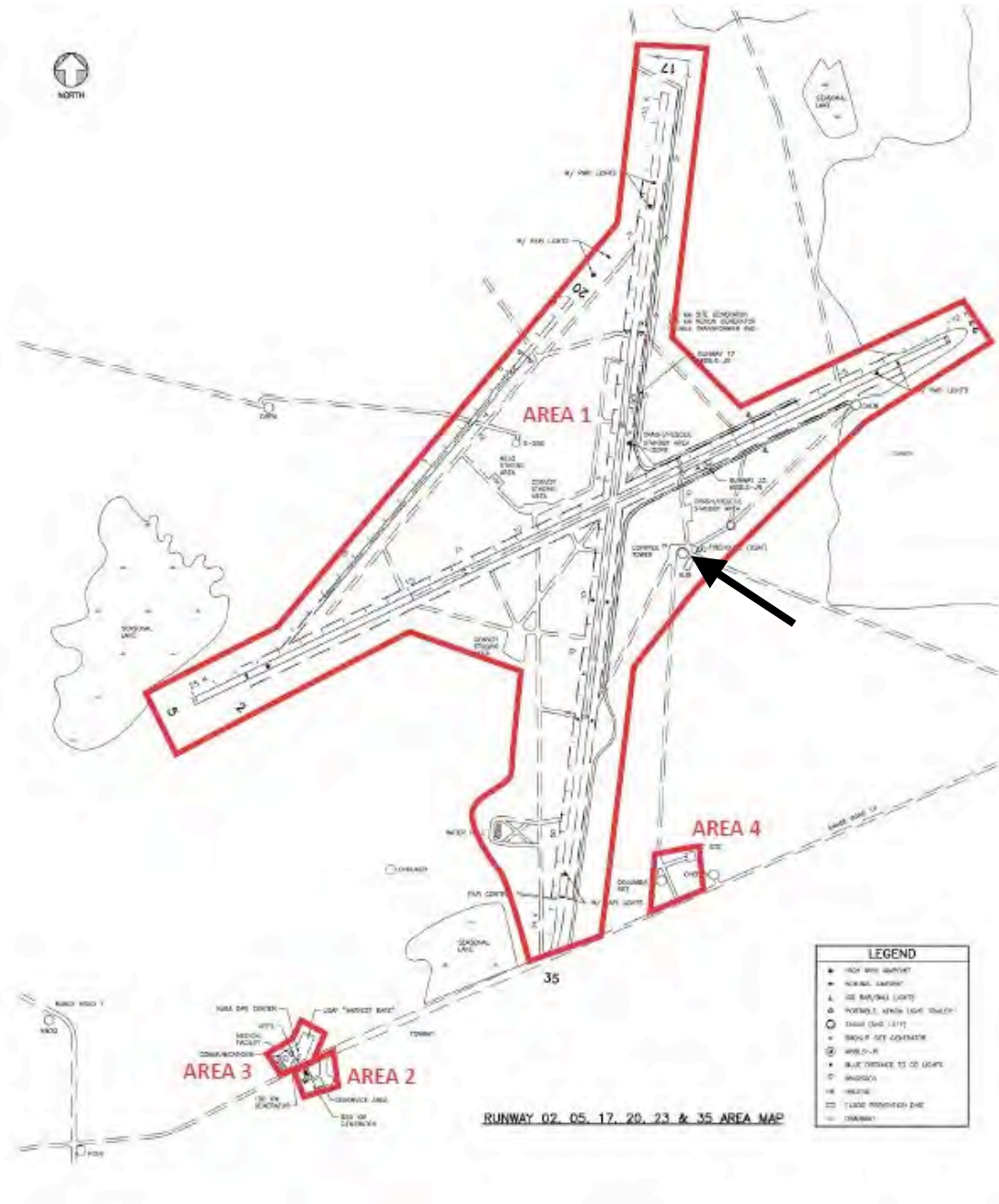


Figure 2. Map of White Sands Space Harbor showing location of the Control Tower in Area 1, which delineates the NRHP boundaries of the WSSH Space Shuttle Landing Facility District (Source: NASA WSTF).



Figure 3. Map of WSSH HUB complex showing the location of the Control Tower (Site Plan Source: NASA WSTF).



Figure 4. Map of White Sands Space Harbor showing the Mobile Air Traffic Control Tower, 1978, USGS Topographical Map.

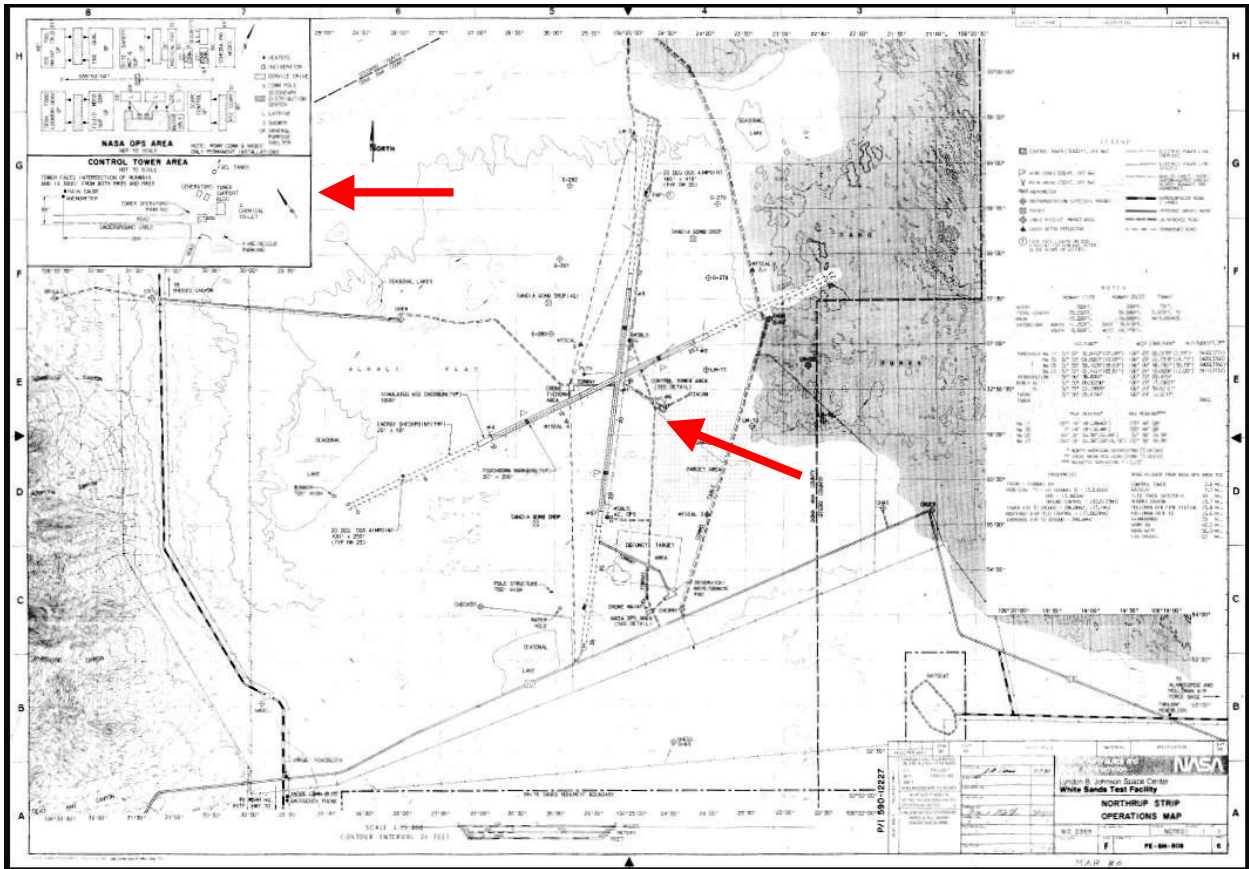


Figure 5. Map of WSSH, drawn by J.A. Dorris on March 7, 1980, showing location of the stationary Control Tower as well as an enlarged site plan of the Control Tower Area (Source: NASA WSTF).

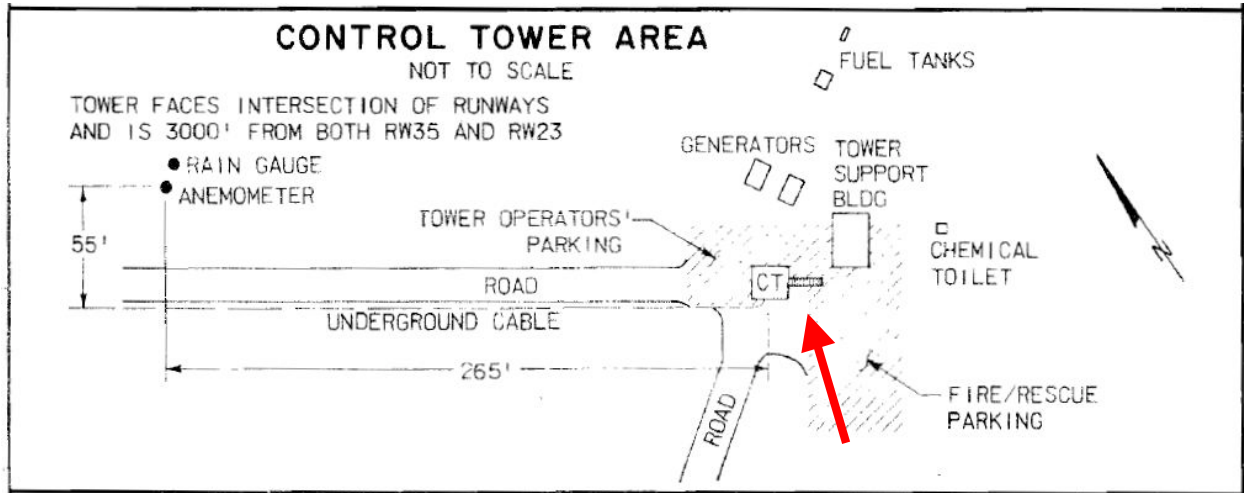


Figure 6. Enlarged section of the Map of WSSH, drawn by J.A. Dorris on March 7, 1980, showing the Control Tower Area (Source: NASA WSTF).

WHITE SANDS SPACE HARBOR AREA 1, CONTROL TOWER
 HAER No. NM-28-D
 (Page 26)

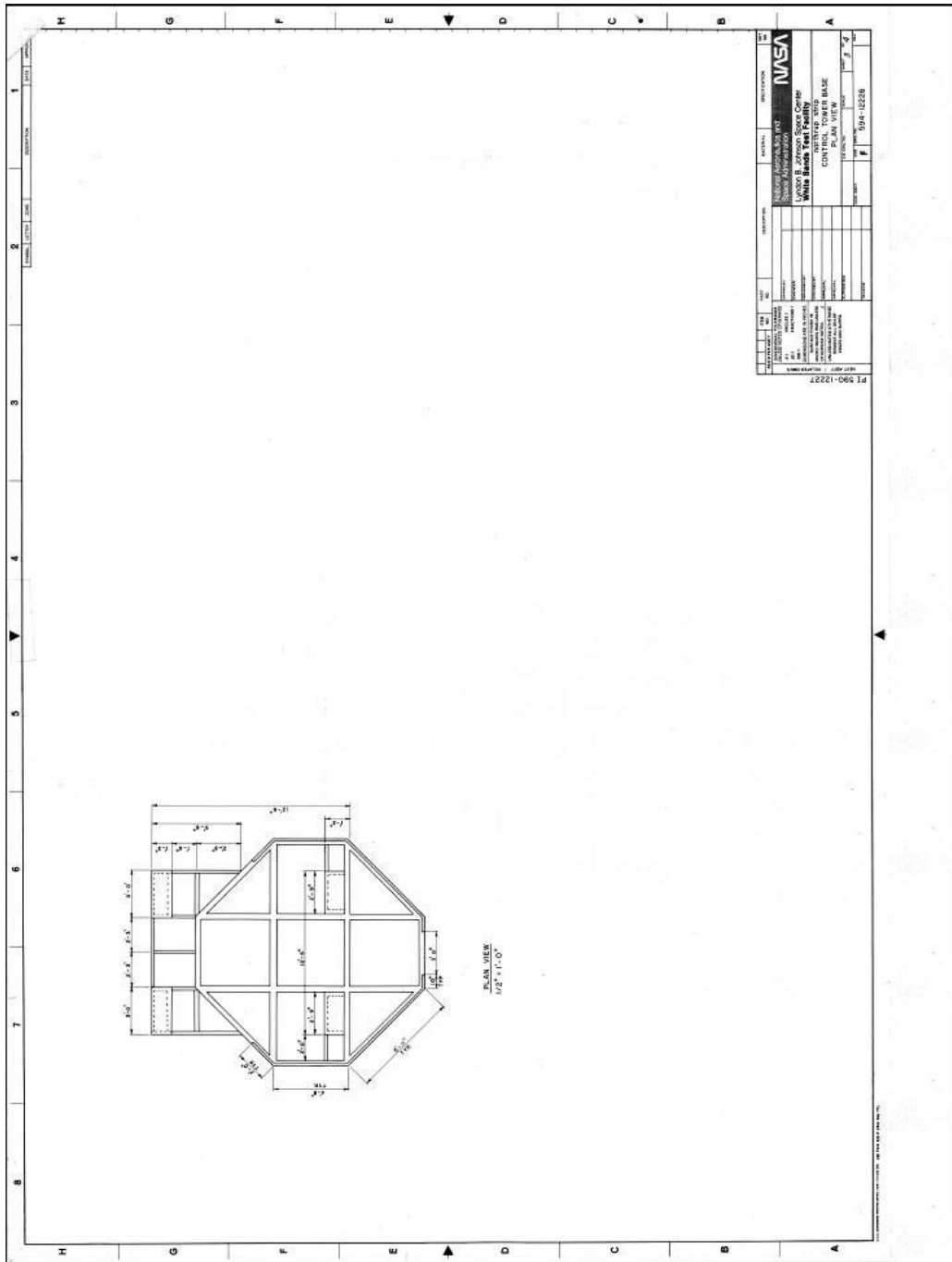


Figure 9. Engineering Plan Sheet, drawn by Dennis G. Perrin, April 1979: 3 of 4 (Source: NASA WSTF).



Figure 11A. View of Control Tower, looking northwest, after the cantilevered observation walkway was added, ca.1982 (Source: NASA WSTF).



Figure 11B. View of Control Tower, looking west, ca.1982 (Source: NASA WSTF).



Figure 12. View of the Control Tower interior, looking north, ca.2005; shown here is Alex S. Paczynski, WSSH Project manager from 1976-1995 (Source: NASA WSTF).



Figure 13. View of the Control Tower interior, looking north, ca.2005
(Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

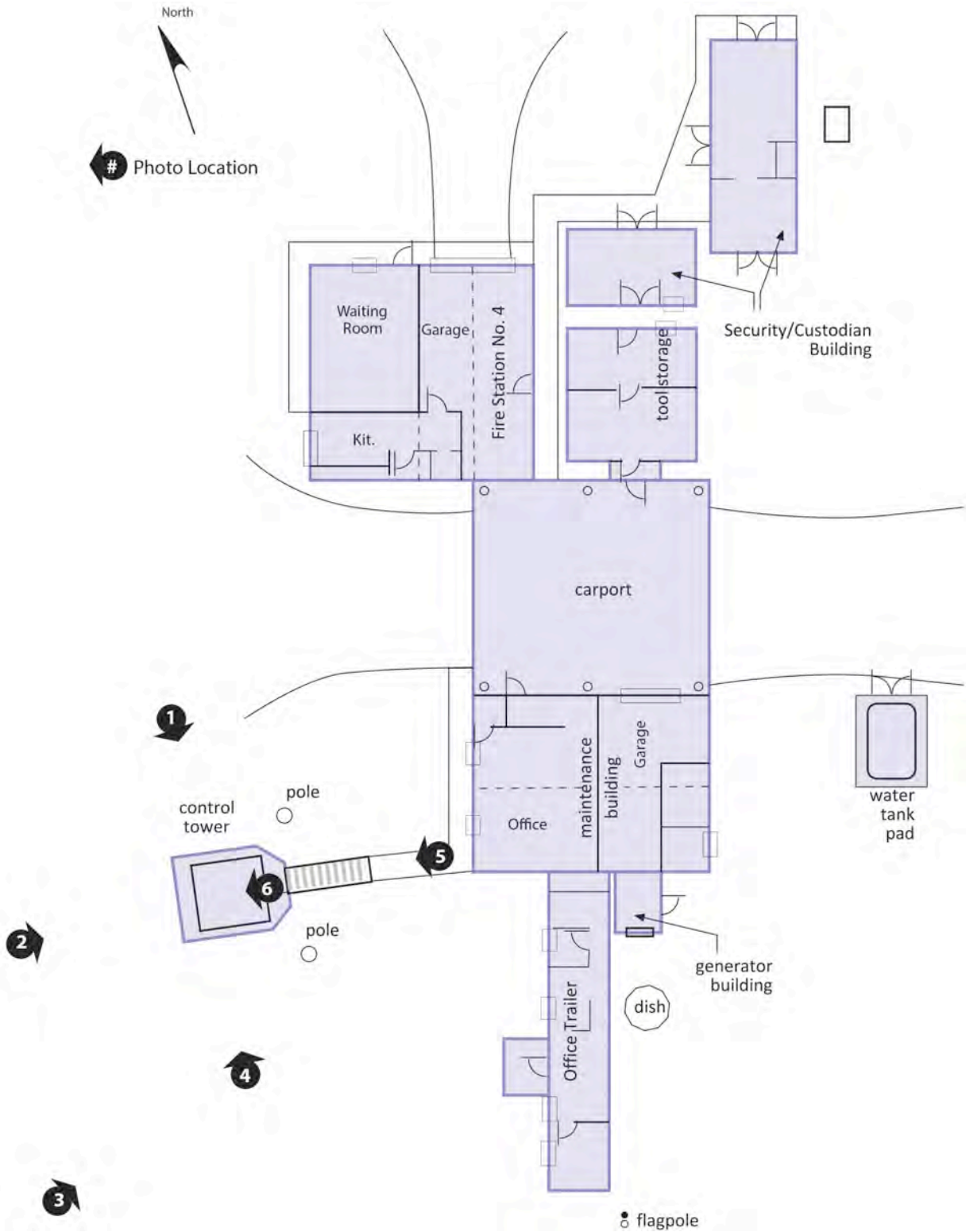
WHITE SANDS SPACE HARBOR AREA 1, CONTROL TOWER HAER No. NM-28-D
(Space Shuttle Landing Facility Area 1, Control Tower)
White Sands Missile Range
Approximately 3,500 feet southwest of intersection of Runways 17/35
and 23/05
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

- | | |
|-----------|--|
| NM-28-D-1 | PROFILE OF NORTH ELEVATION OF CONTROL TOWER LOOKING
SOUTHWEST. |
| NM-28-D-2 | PROFILE OF WEST ELEVATION OF CONTROL TOWER LOOKING
SOUTHEAST. |
| NM-28-D-3 | PROFILE OF WEST AND SOUTH ELEVATIONS OF CONTROL TOWER
LOOKING EAST. |
| NM-28-D-4 | PROFILE OF SOUTH ELEVATION OF CONTROL TOWER LOOKING
NORTHEAST. |
| NM-28-D-5 | ENTRANCE STAIRCASE OF CONTROL TOWER LOOKING NORTHWEST. |
| NM-28-D-6 | INTERIOR OF CONTROL TOWER FROM DOORWAY LOOKING
NORTHWEST. |

WHITE SANDS SPACE HARBOR AREA 1, CONTROL TOWER
HAER No. NM-28-D
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WHITE SANDS SPACE HARBOR AREA 1,
WEATHER TOWER No.4

HAER No. NM-28-E

(Space Shuttle Landing Facility Area 1, Weather Tower No. 4)
White Sands Missile Range
Approximately 375 feet west of the Control Tower
White Sands vicinity
Doña Ana County
New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, WEATHER TOWER NO.4
(Space Shuttle Landing Facility Area 1, Weather Tower No. 4)

HAER No. NM-28-E

Location: White Sands Missile Range
Approximately 375' west of Control Tower
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983.

Construction: 1982-2005

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Operated by U.S. Army, White Sands Missile Range

Significance: The Weather Tower No. 4 was an essential component of the White Sands Space Harbor (WSSH) from 1982-2011. It has a historical association with the landing of Space Transportation System (STS)-3 *Columbia* in March 1982; this is the only STS landing to take place outside Edwards Air Force Base in California and Kennedy Space Center in Florida. The Weather Tower No. 4 is considered to have national significance and is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because it achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places

NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

Weather Tower No. 4 was constructed from 1982-2005.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

The 1982 tower was replaced in 1988 on the original 1982 elevated platform; a second tower was added in 2005.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Weather Tower No. 4 is located approximately 300' west of the HUB Maintenance Facility. Consisting of two separate metal towers, this structure is monitored and maintained by the WSMR. The southernmost tower features modern automated weather observing systems attached to a 1988 tower mounted on a 1982 elevated steel platform. The rectangular platform is accessed by a metal staircase. The solar-powered weather tower is secured to the platform and the ground with cable tie downs. In 2005, the northernmost metal tower was erected on a concrete pad. This triangular-shaped tower is painted red and white and is supported by electronic equipment.

2. CONDITION OF FABRIC

When documented in March 2012, Weather Tower No. 4 was in good condition and operational.

B. CONSTRUCTION

Weather Tower No. 4 is constructed of two steel towers. The southern tower is supported by an elevated steel platform and secured with cable tie downs. The northern tower is supported by a concrete foundation pad.

C. MECHANICAL/OPERATION

Weather Tower No. 4 is monitored and maintained by the U.S. Army at White Sands Missile Range.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for Weather Tower No. 4.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A view of the weather tower from 2006 can be found on page 16 of this document. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

D. BIBLIOGRAPHY

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¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS

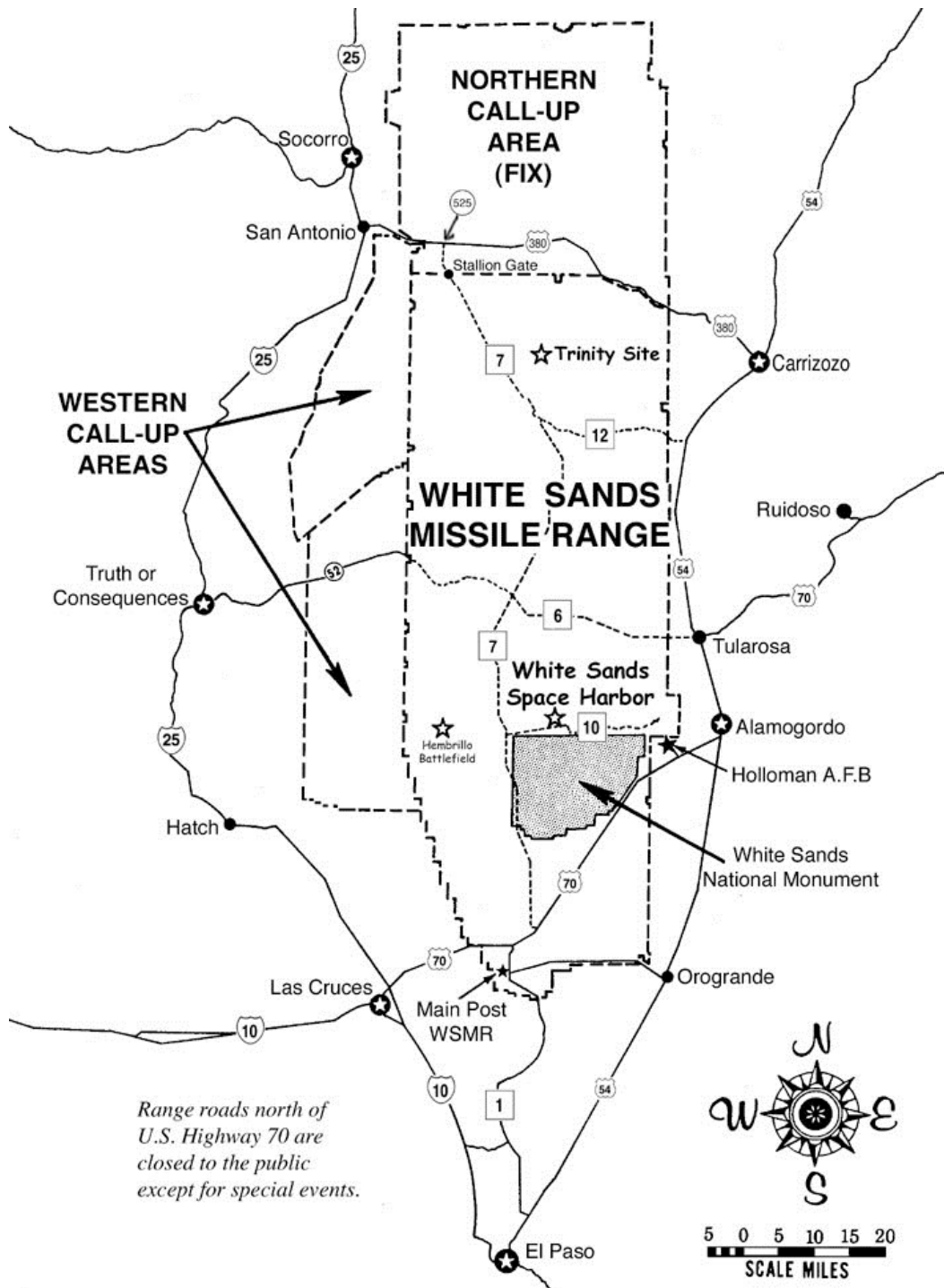


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

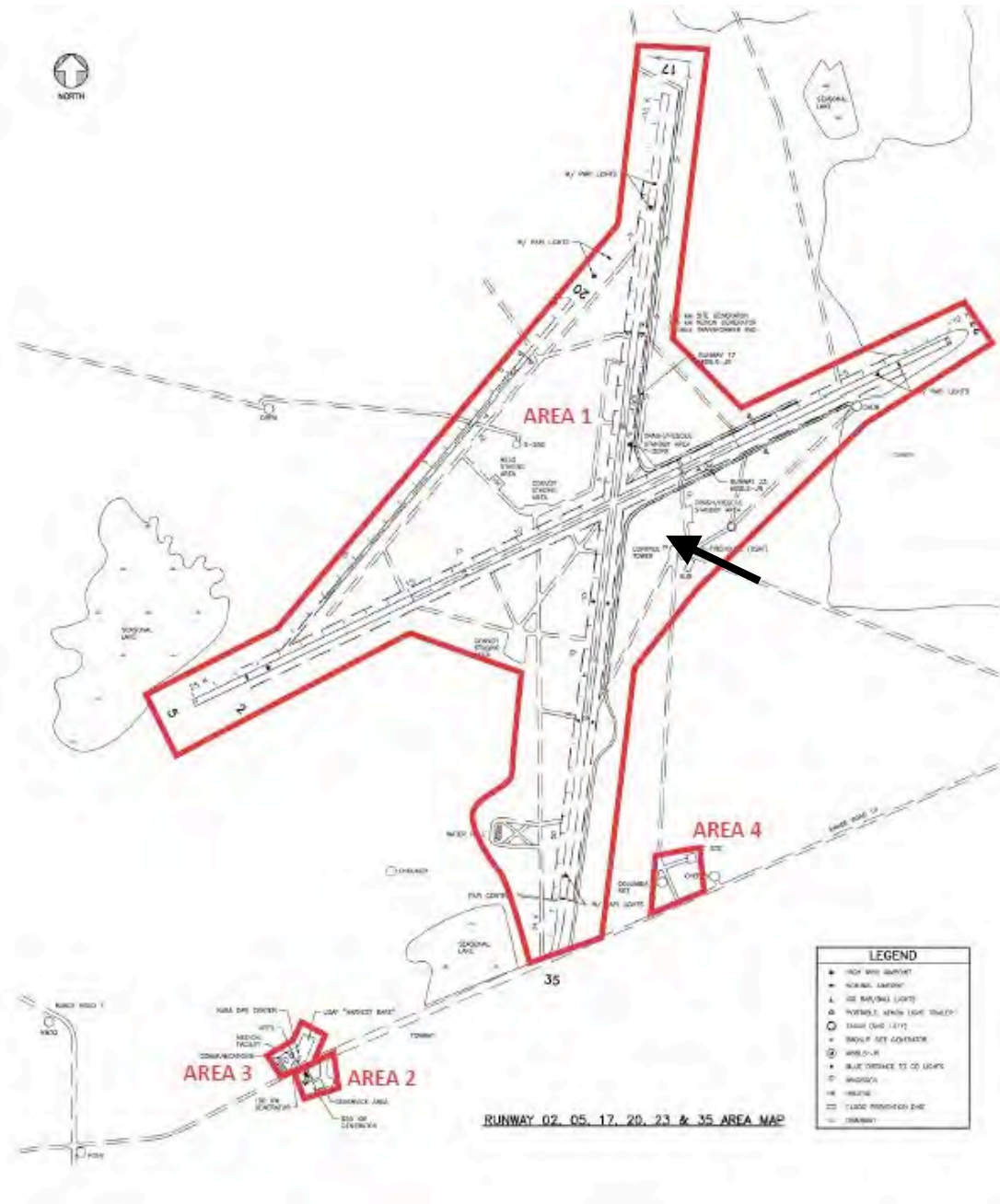


Figure 2. Map of WSSH showing location of Weather Tower No. 4 in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3. Aerial View of HUB Complex, Looking East, Showing Weather Tower No. 4 in Foreground, 2006 (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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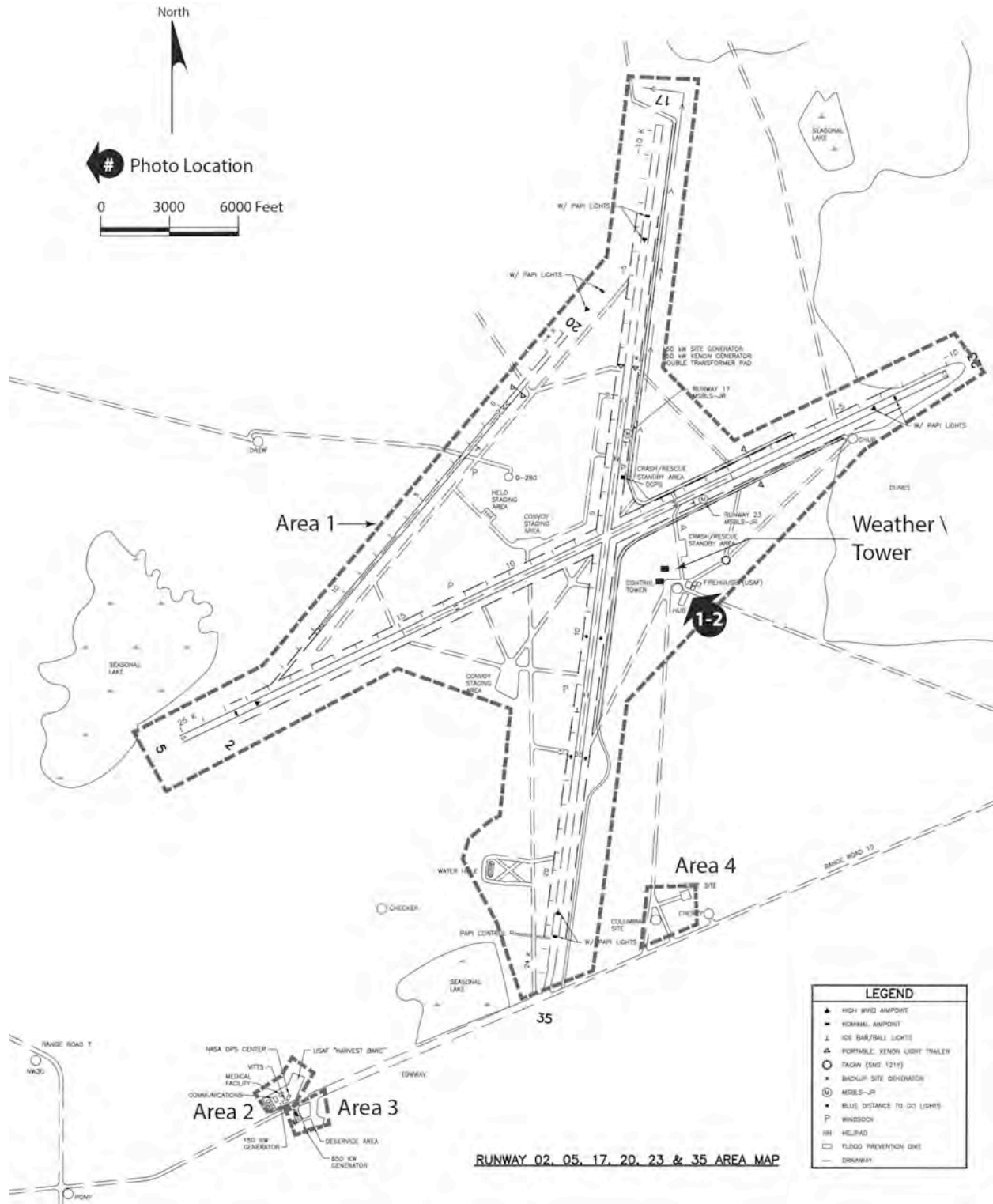
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-E
WEATHER TOWER No.4
(Space Shuttle Landing Facility Area 1, Weather Tower No. 4)
White Sands Missile Range
Approximately 375 feet west of the Control Tower
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer March 27-29, 2012

NM-28-E-1 VIEW OF WEATHER TOWER NO.4 LOOKING NORTHWEST FROM
HUB MAINTENANCE BUILDING TOWARDS SAN ANDRES MOUNTAINS.

NM-28-E-2 VIEW OF WEATHER TOWER NO.4 LOOKING NORTHWEST TOWARDS
SAN ANDRES MOUNTAINS.

WHITE SANDS SPACE HARBOR AREA 1, WEATHER TOWER NO.4
 HAER No. NM-28-E
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WHITE SANDS SPACE HARBOR AREA 1,
HUB MAINTENANCE FACILITY

HAER No. NM-28-F

(Space Shuttle Landing Facility Area 1, HUB Maintenance Facility)

White Sands Missile Range

Approximately 25 feet east of the Control Tower

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, HUB MAINTENANCE FACILITY
(Space Shuttle Landing Facility Area 1, HUB Maintenance Facility)

HAER No. NM-28-F

Location: White Sands Missile Range
Approximately 25' east of Control Tower
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: 1984-1985

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The HUB Maintenance Facility was an essential component of the White Sands Space Harbor (WSSH) from 1984-2011. It is considered to have national significance and is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because it achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places

NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordnance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The HUB Maintenance Facility was constructed from 1984-1985.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

A prefabricated residential trailer was attached to the south elevation around 1988. The entire facility was covered with spray foam insulation. All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The HUB Maintenance Facility (NASA Inventory #1002) is located at the southeast side of the Control Tower approximately 3,000' southeast of the centerline of where Runway 17/34 and Runway 23/05 intersect. This facility replaced the original prefabricated building relocated here in the mid-1970s.

The HUB Maintenance Facility is two-story prefabricated metal garage on a concrete pad with a carport attached to the north elevation and a prefabricated residential trailer attached to the south elevation. The main building features square fixed pane glass windows on the east, west, and south elevations. The north elevation features a metal pedestrian entrance door on the west side and a metal garage door on the east side. Constructed with a prefabricated steel frame, the elevations and shallow gable roof are covered with metal panels. The interior is divided equally by a metal north/south curtain wall with centrally located double wood doors.

The north side of the HUB Maintenance Facility contains an office and storage closet with a drop ceiling and sheetrock walls. The south side contains a maintenance workspace with an open ceiling, exposed walls, and freestanding metal frame storage loft. A bathroom and utility closet are located beneath the loft in the southeast corner. An entrance is located in the center of the south elevation, which leads to small vestibule connected to a 1960s prefabricated residential trailer that was attached around 1988 and repurposed for use as offices.

The trailer was relocated from NASA Johnson Space Center in Houston, Texas, where it was originally used during the Apollo program (1963-1972) to quarantine astronauts after returning from Earth-orbiting flights. At that time, the trailer was housed within a larger metal building.

Manufactured in Texas, the trailer features double hung glass pane windows and a modern replacement metal pedestrian entrance door along the west elevation. Windows and doors on the south

and east elevations have been covered over with foam core. A small wooden, covered porch serves the west entrance. The trailer's foundation piers are hidden by a metal skirt. The interior retains wood paneled walls and a linoleum floor. A bathroom and storage are located on the north end and a bedroom converted into a private office on the south end. The central multi-purpose living room/kitchen/eating area was repurposed into an open office work space.

The exterior of the entire HUB Maintenance Facility was covered with spray foam insulation that assisted with protecting the interior from the harsh desert environment.

The attached pass-through, covered parking and work area at the north elevation is supported by steel I-beams. A modern HVAC unit is located on the exterior of the west elevation of the trailer. A flagpole was installed at the southeast corner of the trailer around 1990 and removed in 2012. Satellite dishes and other communication devices were located on the roof and ground along the eastern side of the trailer and removed in 2012.

2. CONDITION OF FABRIC

When documented in March 2012, the HUB Maintenance Facility had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The HUB Maintenance Facility is constructed of a prefabricated metal building on a concrete pad. A prefabricated residential trailer on concrete piers is attached to the south elevation. A metal carport on a concrete pad is attached to the north elevation. A detached metal water tank on a concrete pad is located southeast of the facility.

C. MECHANICAL/OPERATION

The HUB Maintenance Facility featured electricity to power interior lights, electronic navigational equipment, radios, and wall-mounted air conditioning units. Non potable water was supplied by a freestanding water tank to the east. Generators provided back-up power.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the HUB Maintenance Facility. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. Some of these views can be found on pages 19-24 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

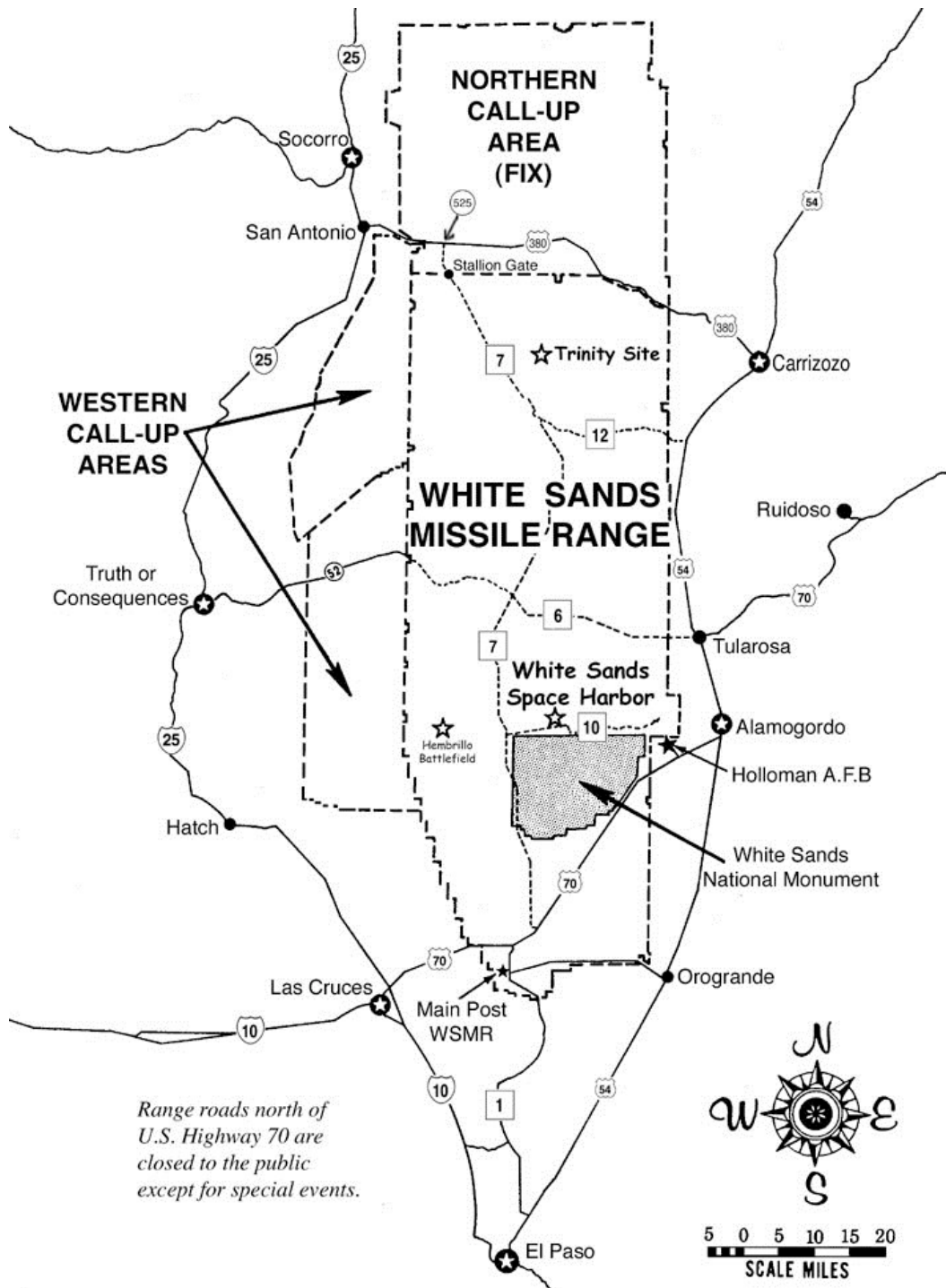


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

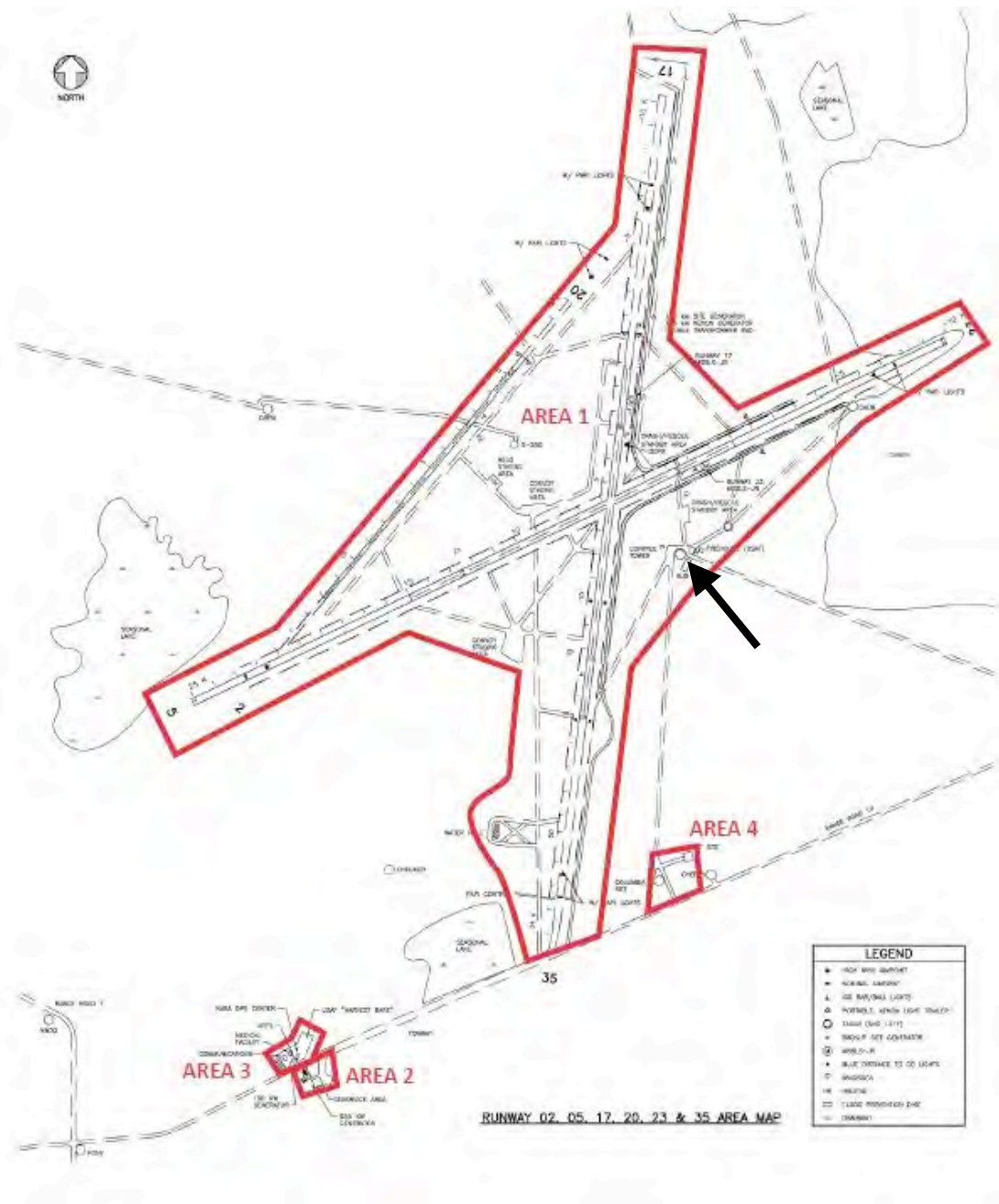


Figure 2. Map of WSSH showing location of HUB Maintenance Facility in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3. Map of the White Sands Space Harbor HUB complex showing the HUB Maintenance Building (#6). (Site Plan Source: NASA WSTF).



Figure 3. Aerial View of HUB Complex, looking West towards the San Andres Mountains, 2007 (Source: NASA WSTF).



Figure 4. Aerial View of HUB Complex, looking East, 2006 (Source: NASA WSTF).



Figure 5A. View of the HUB Maintenance Building, 1988, looking northwest (Source: NASA WSTF).



Figure 5B. View of the HUB Maintenance Building, 1988, looking northeast at the trailer wing (Source: NASA WSTF).



Figure 6A. View of the HUB Maintenance Building, 1988, looking north at the trailer wing (Source: NASA WSTF).



Figure 6B. View of the HUB Maintenance Building, 1988, looking northeast at the trailer wing (Source: NASA WSTF).



Figure 7A. View of the HUB Maintenance Building, 1988, looking southwest from the carport (Source: NASA WSTF).



Figure 7B. View of satellite dish located southeast of the trailer wing, looking southwest, November 2005 (Source: NASA WSTF).



Figure 8. View of the HUB Maintenance Building, 1988, looking north
(Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-F
HUB MAINTENANCE FACILITY
(Space Shuttle Landing Facility Area 1, HUB Maintenance Facility)
White Sands Missile Range
Approximately 25 feet east of the Control Tower
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer March 27-29, 2012

- NM-28-F-1 CONTEXT VIEW OF SOUTH SIDE OF HUB COMPLEX LOOKING NORTH FROM ACCESS ROAD RUNNING PARALLEL TO EAST SIDE OF RUNWAY 17/35.
- NM-28-F-2 CONTEXT VIEW OF EAST SIDE OF HUB COMPLEX LOOKING WEST FROM CRASH/RESCUE STANDBY AREA WITH SAN ANDRES MOUNTAIN RANGE IN BACKGROUND.
- NM-28-F-3 CONTEXT VIEW OF WEST SIDE OF HUB COMPLEX LOOKING SOUTHEAST FROM CENTER OF RUNWAYS 17/35 AND 23/05 WITH SACRAMENTO MOUNTAIN RANGE IN BACKGROUND.
- NM-28-F-4 VIEW OF HUB COMPLEX LOOKING EAST. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-5 VIEW OF HUB COMPLEX LOOKING NORTHEAST. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-6 VIEW OF HUB MAINTENANCE BUILDING LOOKING NORTHEAST FROM CONTROL TOWER.
- NM-28-F-7 VIEW OF HUB COMPLEX LOOKING WEST, WITH SIGN.
- NM-28-F-8 VIEW OF HUB COMPLEX LOOKING WEST, WITH MEASURING STICK. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-9 VIEW OF HUB COMPLEX LOOKING SOUTHEAST. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-10 VIEW OF HUB COMPLEX LOOKING SOUTH. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-11 VIEW OF HUB COMPLEX LOOKING SOUTHEAST. THE CONTROL TOWER, HAER NO. NM-28-D, IS ALSO PICTURED.
- NM-28-F-12 VIEW OF HUB COMPLEX LOOKING EAST.

WHITE SANDS SPACE HARBOR AREA 1, HUB MAINTENANCE FACILITY
HAER No. NM-28-F
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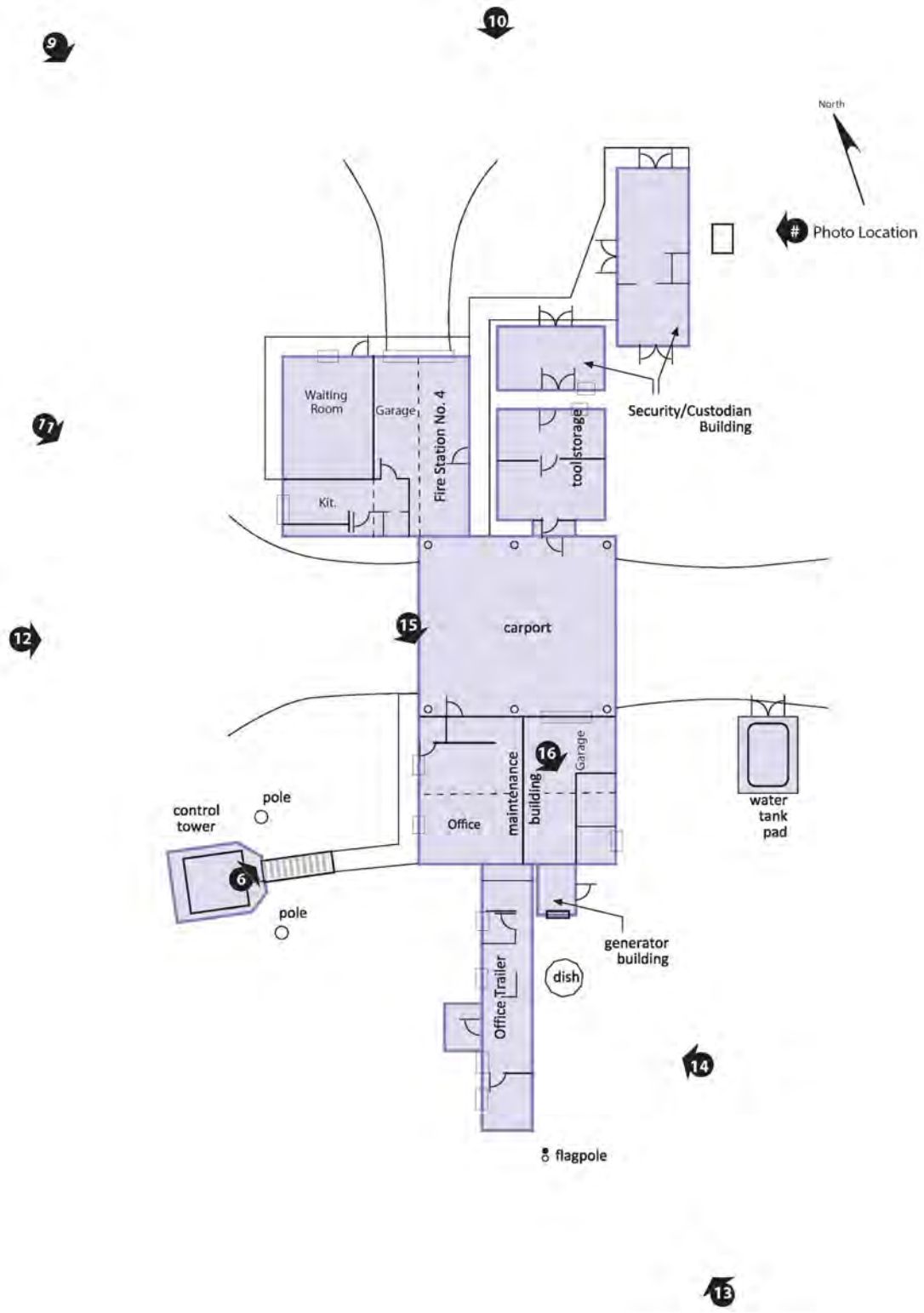
NM-28-F-13 VIEW OF HUB COMPLEX LOOKING NORTH.

NM-28-F-14 VIEW OF HUB MAINTENANCE BUILDING LOOKING NORTH AT
TRAILER WING.

NM-28-F-15 VIEW OF HUB MAINTENANCE BUILDING, LOOKING SOUTHWEST AT
NORTH ELEVATION FROM BENEATH CARPORT.

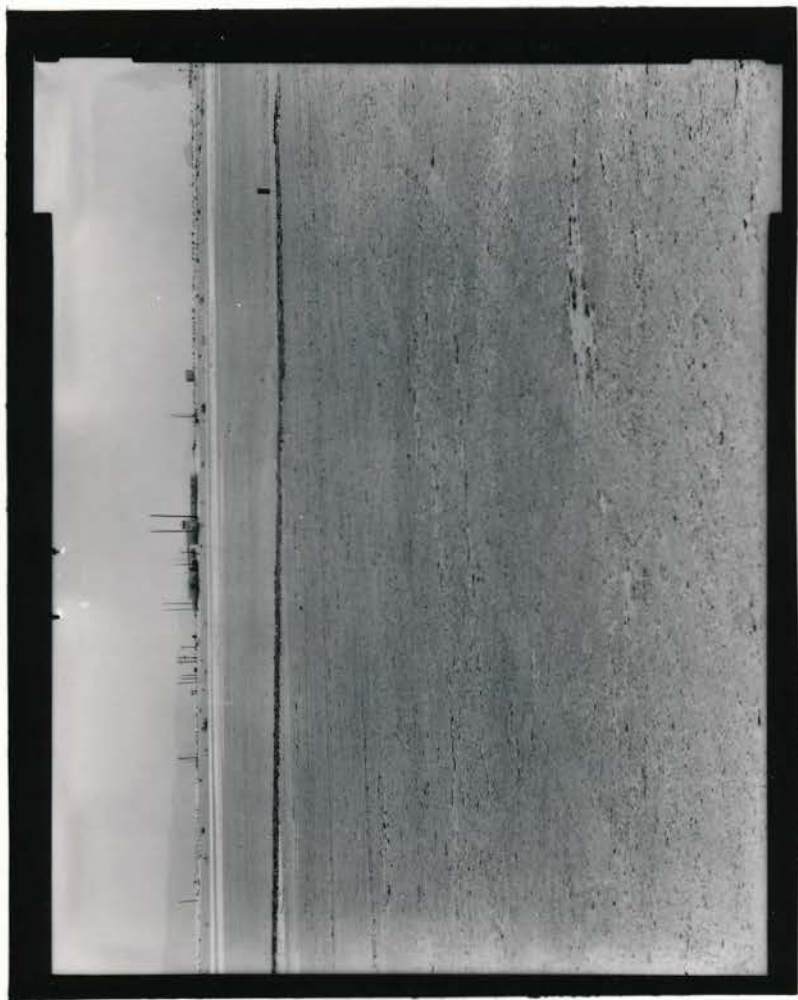
NM-28-F-16 VIEW OF HUB MAINTENANCE BUILDING, INTERIOR LOOKING
SOUTH AT STORAGE LOFT IN GARAGE BAY.

WHITE SANDS SPACE HARBOR AREA 1, HUB MAINTENANCE FACILITY
HAER No. NM-28-F
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WHITE SANDS SPACE HARBOR AREA 1,
FIRE STATION NO.4

HAER NM-28-G

(Space Shuttle Landing Facility Area 1, Fire Station No. 4)

White Sands Missile Range

Attached to the northwest side of HUB Maintenance Facility carport

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, FIRE STATION No.4
(Space Shuttle Landing Facility Area 1, Fire Station No. 4)

HAER No. NM-28-G

Location: White Sands Missile Range
Attached to the northwest side of the HUB Maintenance
Facility carport
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: 1984-1985

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Fire Station No. 4 was an essential component of
the White Sands Space Harbor (WSSH) from 1984-2011.
It is considered to have national significance and is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
it achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

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ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
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A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Fire Station No. 4 was constructed from 1984-1988.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

Around 1988, the building was covered with spray foam insulation. The covered vehicle bay was enclosed around 2005. All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Fire Station No. 4 (NASA Inventory #51) is a freestanding prefabricated metal building connected to the northwest corner of the HUB Maintenance Facility's carport. The Fire Station was operated and staffed by the U.S. Air Force from nearby Holleman Air Force Base at WSMR. Like the HUB Maintenance Building, it rests on a concrete pad and the exterior walls are covered with spray foam insulation as a measure of protection from the harsh desert environment. The shallow gable roof is covered in metal panels.

The Fire Station features a small shed roof wing housing the kitchen and bathroom at the southwest corner; it too is made of prefabricated metal covered in foam core. A small fixed pane window is located on the west elevation of the kitchen wing, which is finished on the interior with sheetrock walls. The high-ceiling garage on the south side of the building has fixed pane windows and a metal pedestrian door on the south elevation and a metal garage door on the north elevation. The interior has exposed metal walls and a drop ceiling.

A covered vehicle parking area was originally located at the northwest corner of the Fire Station. It featured a concrete pad floor and metal shed roof supported by steel columns. The carport was enclosed around 2005 with metal panel walls and converted into a multi-purpose waiting area. Accessed by a metal pedestrian entrance on the north elevation, the enclosed space has sheetrock walls, tile floor, and a dropped ceiling on the interior. A concrete sidewalk is located along the north, east, and west elevations. A modern HVAC unit is located on the exterior of the west elevation.

2. CONDITION OF FABRIC

When documented in March 2012, the Fire Station No. 4 had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Fire Station No. 4 is constructed of a prefabricated metal building on a concrete pad.

C. MECHANICAL/OPERATION

The Fire Station No. 4 featured electricity to power interior lights, electronic navigational equipment, radios, and wall-mounted air conditioning units. Non potable water was supplied by a freestanding water tank to the south. Generators provided back-up power. The Fire Station was maintained and operated by the U.S. Air Force.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the Fire Station No. 4. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. EARLY VIEWS AND HISTORICAL DATA

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C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

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¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, FIRE STATION No.4
HAER No. NM-28-G
(Page 14)

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

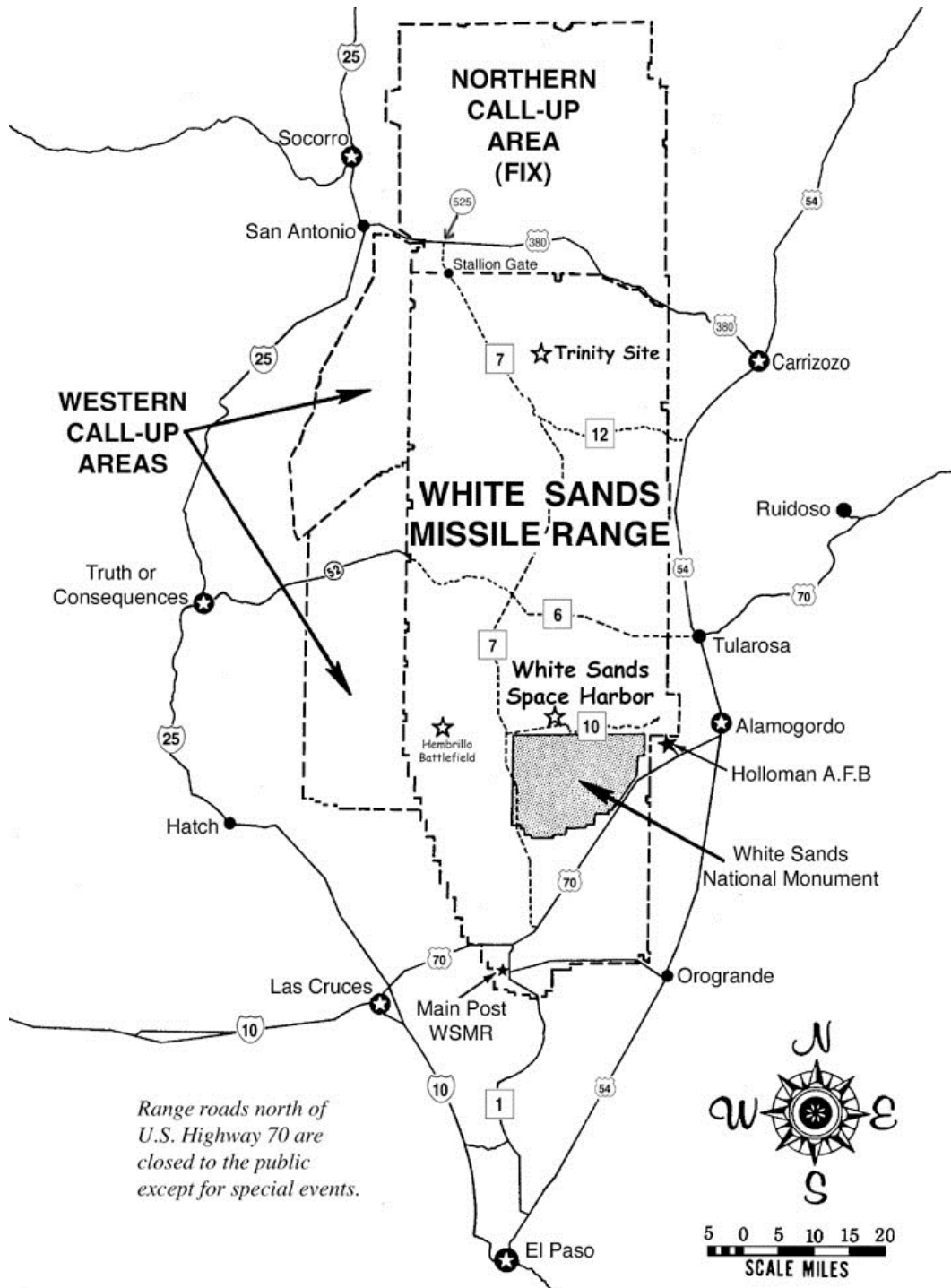


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

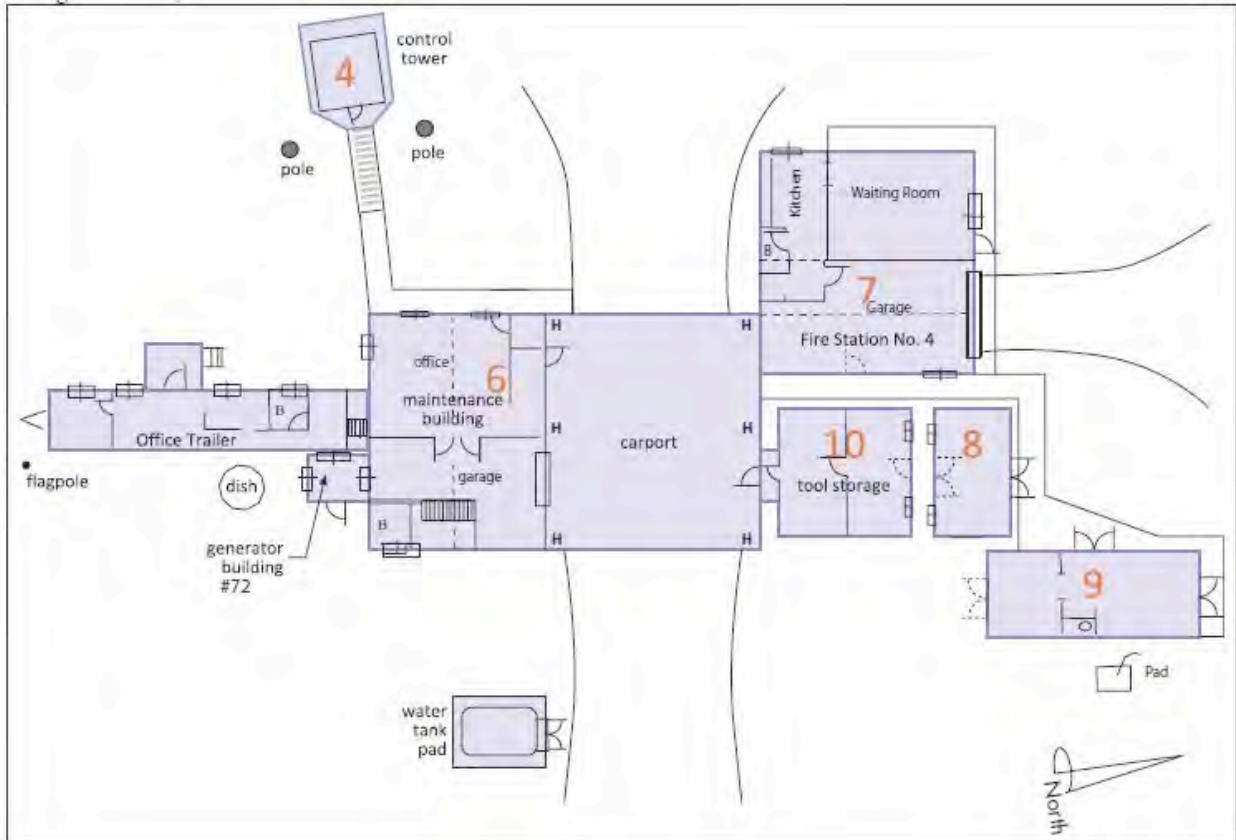


Figure 3. Map of the WSSH HUB complex showing Fire Station No. 4 (#7). (Site Plan Source: NASA WSTF).



Figure 4. View of Fire Station No. 4, 1988, looking southwest
(Source: NASA WSTF).



Figure 5A. View of Fire Station No. 4, 1988, looking east
(Source: NASA WSTF).



Figure 5B. View of Fire Station No. 4, 1988, looking northeast
(Source: NASA WSTF).



Figure 6A. View of Fire Station No. 4, 1988, looking southeast
(Source: NASA WSTF).



Figure 6B. View of Fire Station No. 4, 2003, looking southeast
(Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

WHITE SANDS SPACE HARBOR AREA 1, HAER NM-28-G
FIRE STATION NO.4
(Space Shuttle Landing Facility Area 1, Fire Station No. 4)
White Sands Missile Range
Attached to the northwest side of HUB Maintenance Facility carport
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer March 27-29, 2012

NM-28-G-1 VIEW OF FIRE STATION NO.4 (AT RIGHT WITH GARAGE DOOR),
LOOKING SOUTH.

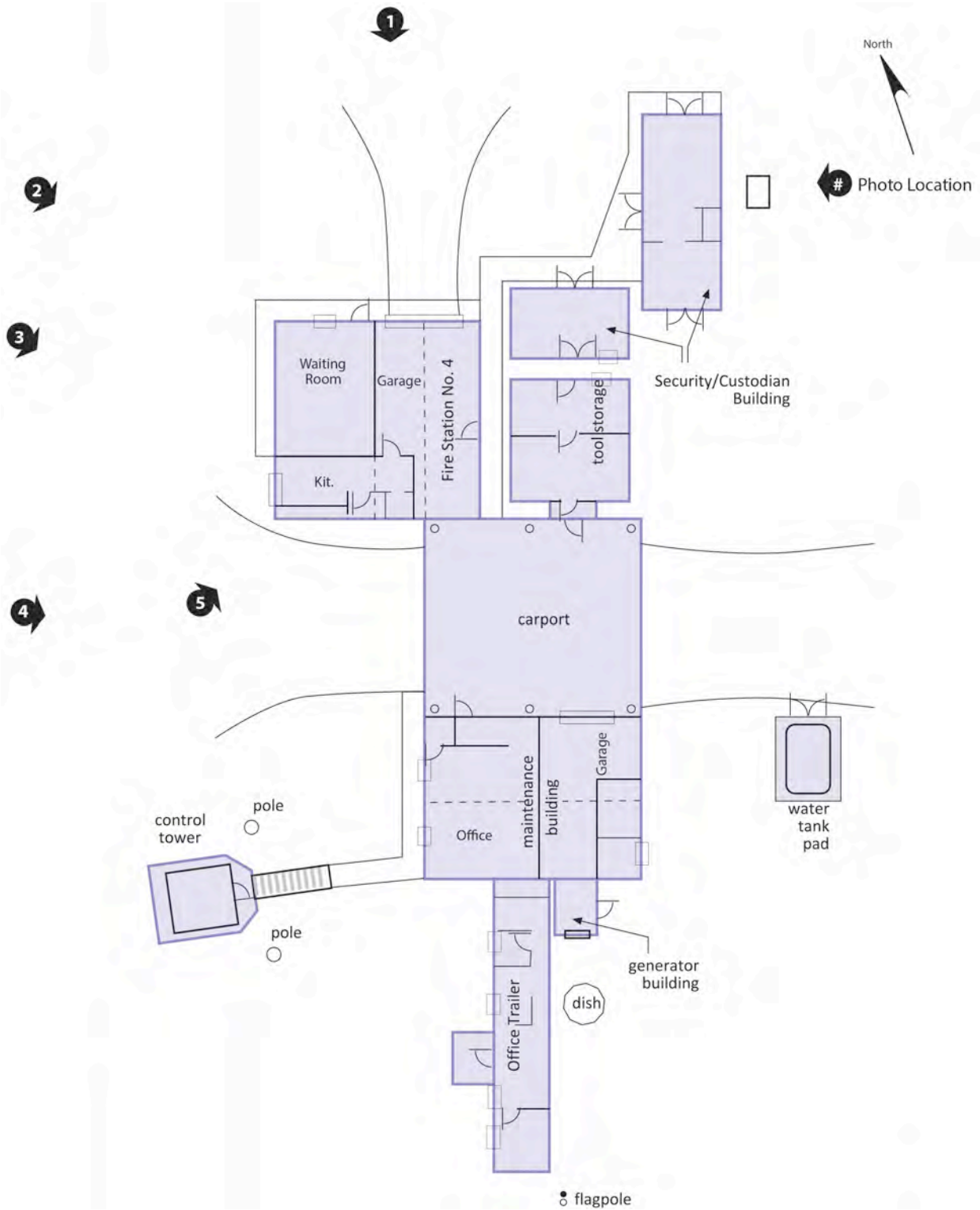
NM-28-G-2 VIEW OF FIRE STATION NO.4 LOOKING SOUTHEAST.

NM-28-G-3 VIEW OF FIRE STATION NO.4 LOOKING SOUTHEAST.

NM-28-G-4 VIEW OF FIRE STATION NO.4 (AT LEFT) LOOKING EAST.

NM-28-G-5 VIEW OF REAR ELEVATION OF FIRE STATION NO.4 LOOKING
NORTHEAST.

WHITE SANDS SPACE HARBOR AREA 1, FIRE STATION No.4
HAER No. NM-28-G
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PAGE 2













WHITE SANDS SPACE HARBOR AREA 1,
HUB GENERATOR BUILDING

HAER No. NM-28-H

(Space Shuttle Landing Facility Area 1, HUB Generator Building)

White Sands Missile Range

Attached to southwest side of HUB Maintenance Facility

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, HUB GENERATOR BUILDING
(Space Shuttle Landing Facility Area 1, HUB Generator Building)

HAER No. NM-28-H

Location: White Sands Missile Range
Attached to the southwest side of the HUB Maintenance Facility
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1976

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The HUB Generator Building was an essential component of the White Sands Space Harbor (WSSH) from 1984-2011. It is considered to have national significance and is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because it achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The HUB Generator Building was relocated to WSSH around 1976 from WSMR and installed in its current location in 1984.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

Around 1988, the building was covered with spray foam insulation. All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The HUB Generator Building is a freestanding building located on the east elevation of the HUB Maintenance Facility where the trailer wing and primary building adjoin. This small prefabricated metal shed on a concrete pad features glass pane windows with wood frames on the north, west, and south elevations that have been covered by spray foam insulation and a metal entrance door on the east elevation. The interior retains plaster walls with hand drawn graffiti dating from January 30, 1976, and March and April 1982. This portable building was most likely one of the original generator buildings relocated to WSSH from elsewhere on WSMR in 1976. It was relocated to its current location in 1984. The interior is vacant.

2. CONDITION OF FABRIC

When documented in March 2012, the HUB Generator Building had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The HUB Generator Building is constructed of a prefabricated metal building on a concrete pad.

C. MECHANICAL/OPERATION

The HUB Generator Building featured electricity to power interior lights.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the HUB Generator Building. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A historical view of the HUB Generator Building can be found on page 19 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

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APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

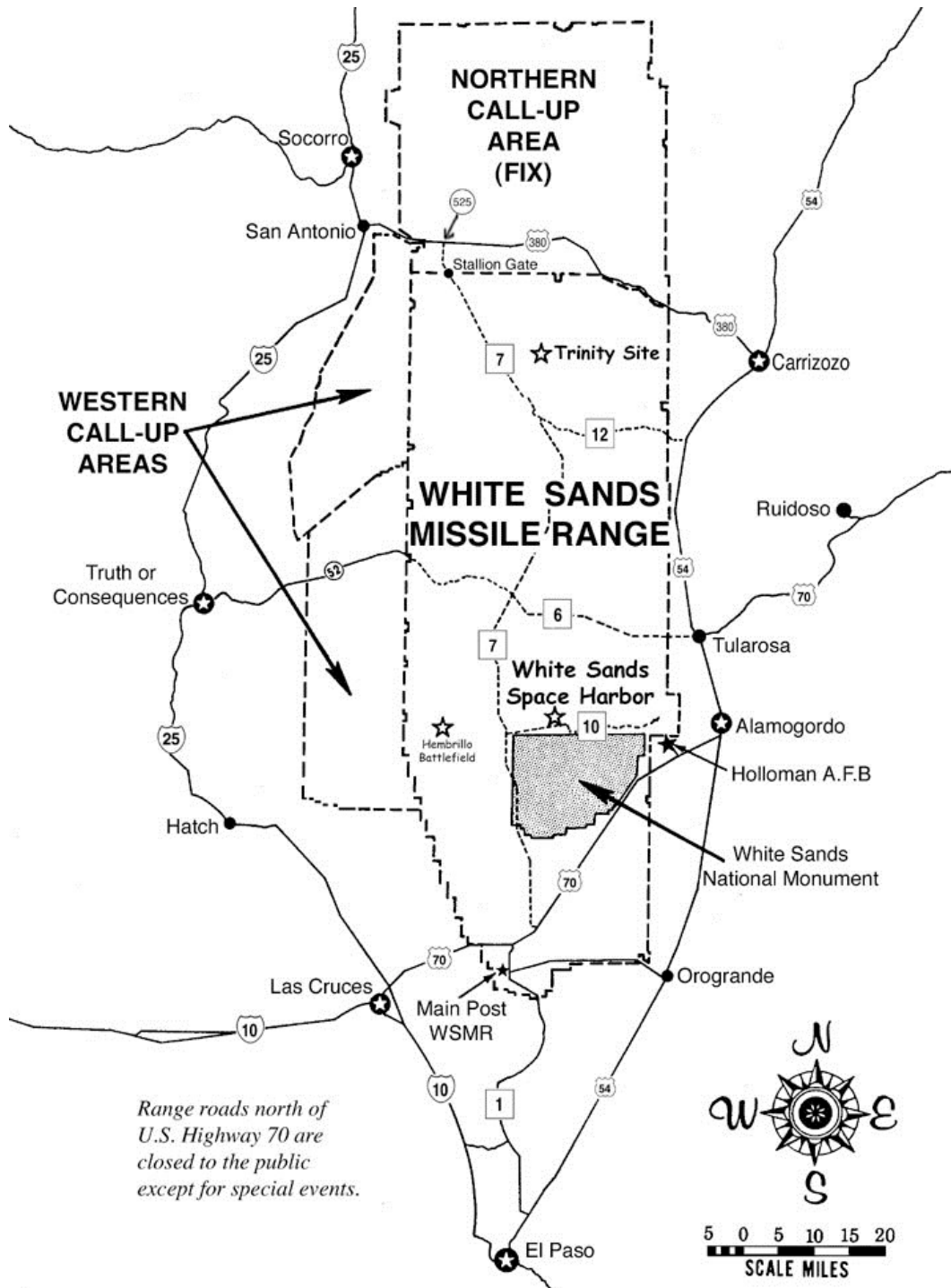


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

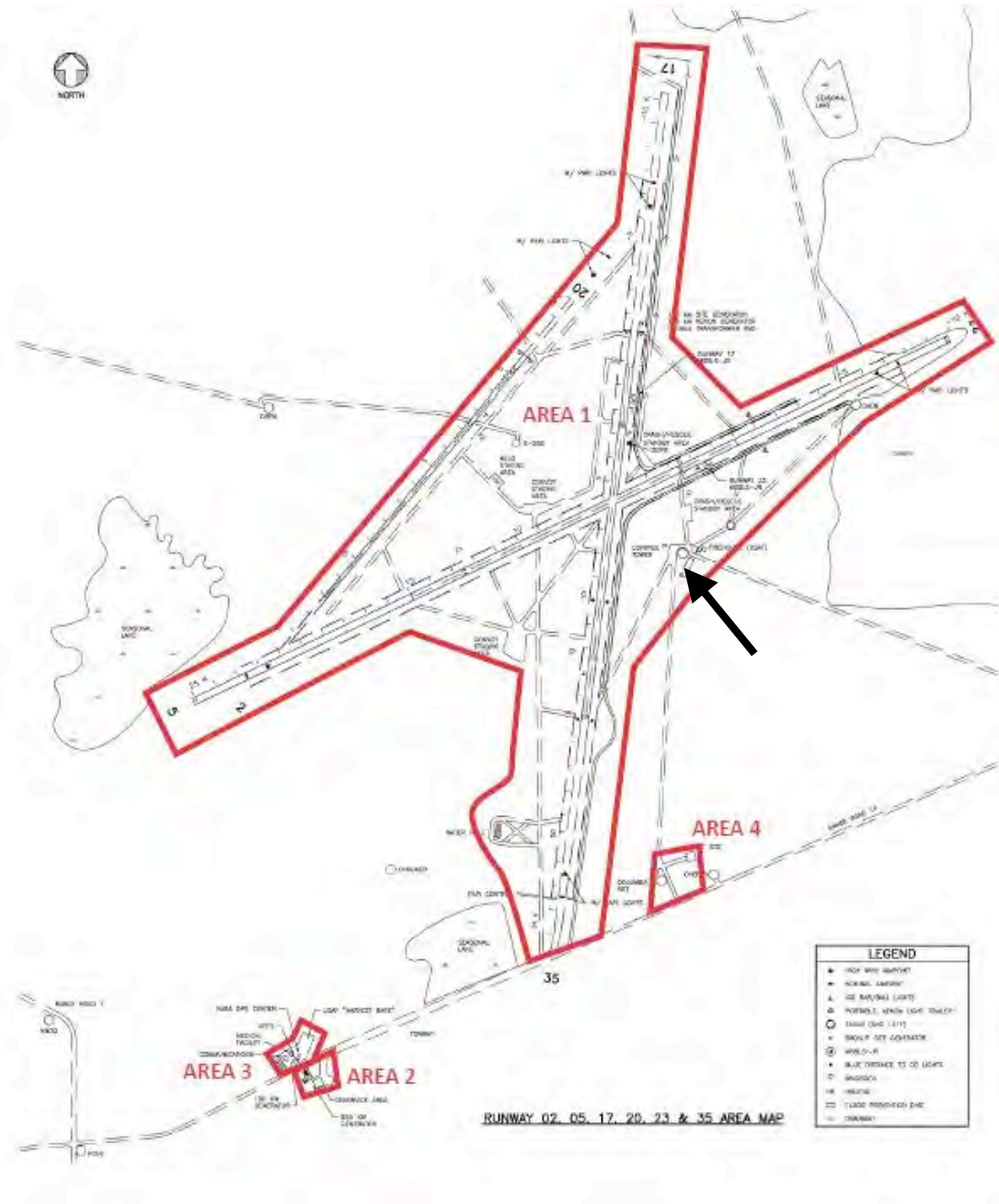


Figure 2. Map of WSSH showing location of HUB Generator Building in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

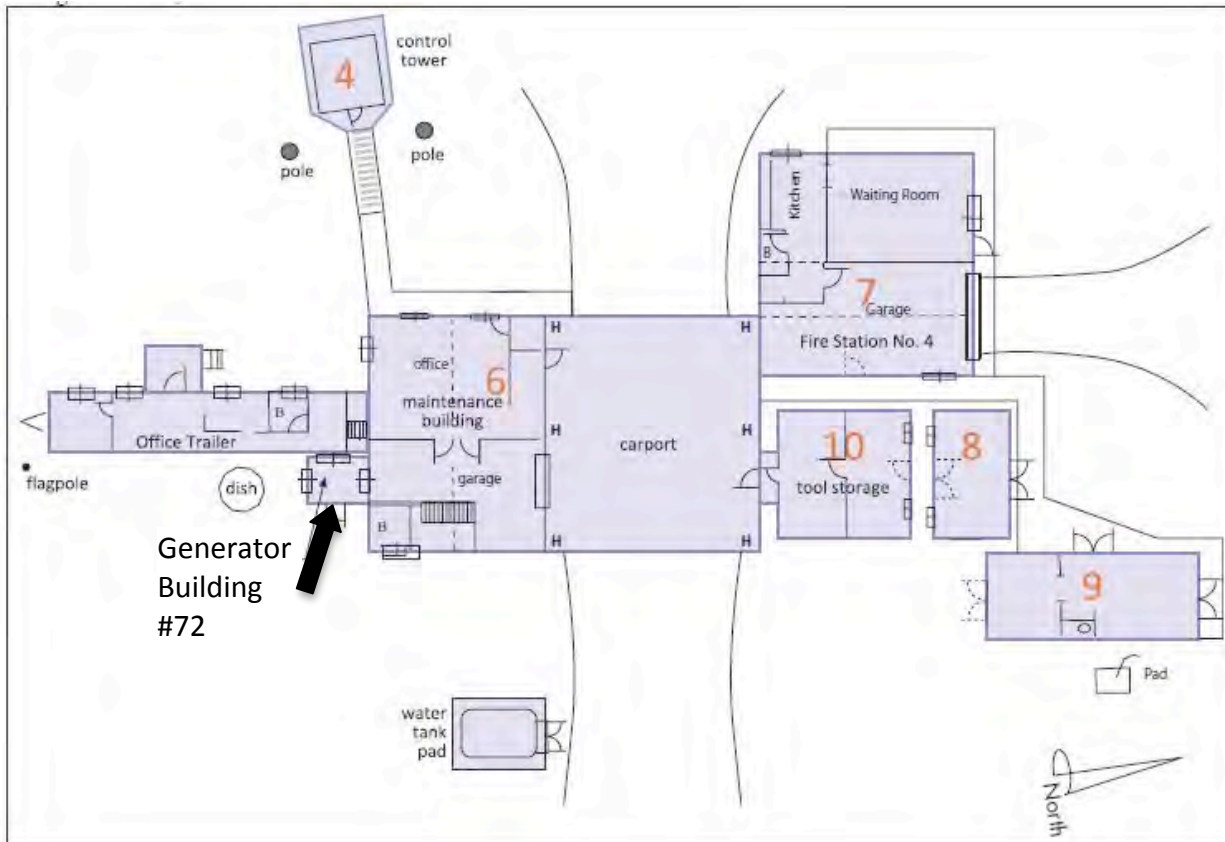


Figure 3. Map of the WSSH HUB complex showing HUB Generator Building (#72). (Site Plan Source: NASA WSTF).

WHITE SANDS SPACE HARBOR AREA 1, HUB GENERATOR BUILDING
HAER No. NM-28-H
(Page 17)

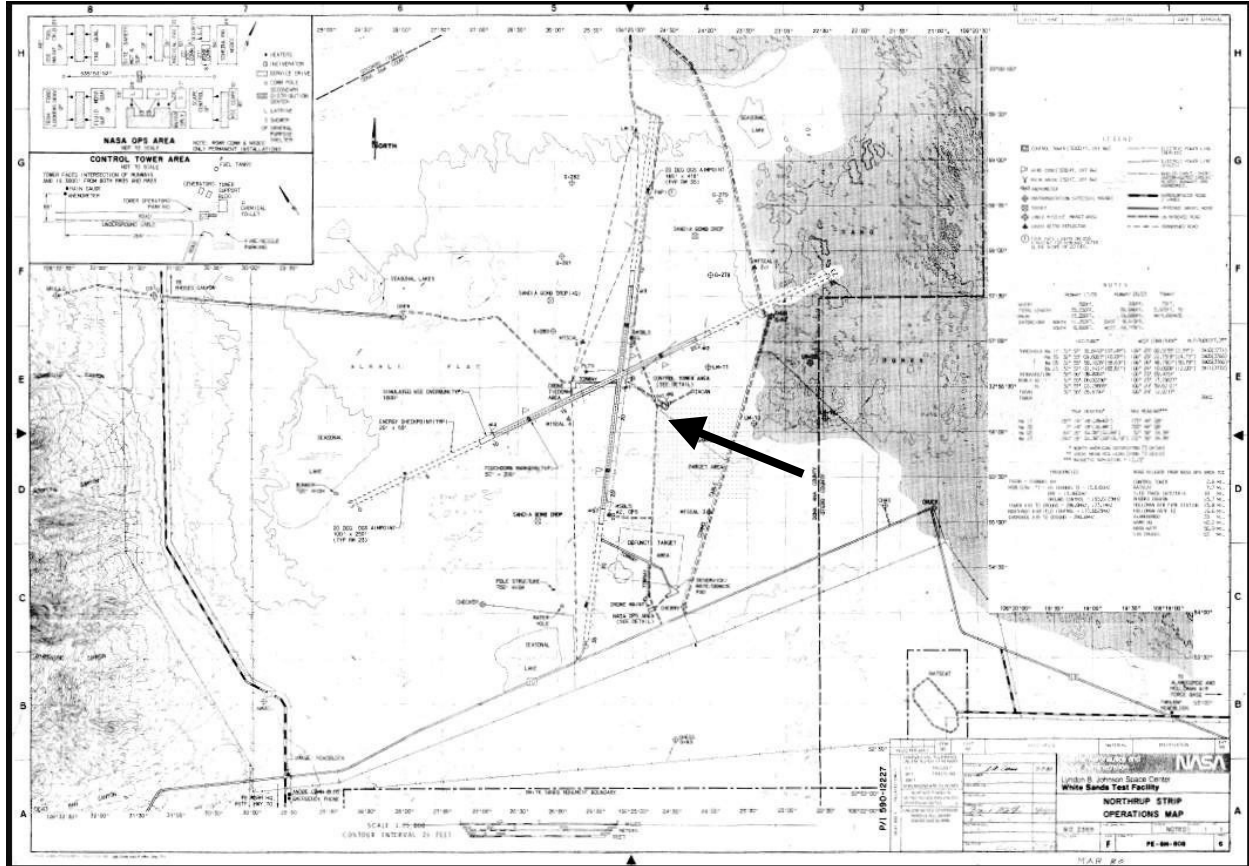


Figure 4. Map of WSSH, drawn by J.A. "Andy" Dorris under the direction of NASA engineer Dennis Perrin on March 7, 1980, showing location of the HUB Complex and an enlarged plan of the Control Tower Area (Source: NASA WSTF).

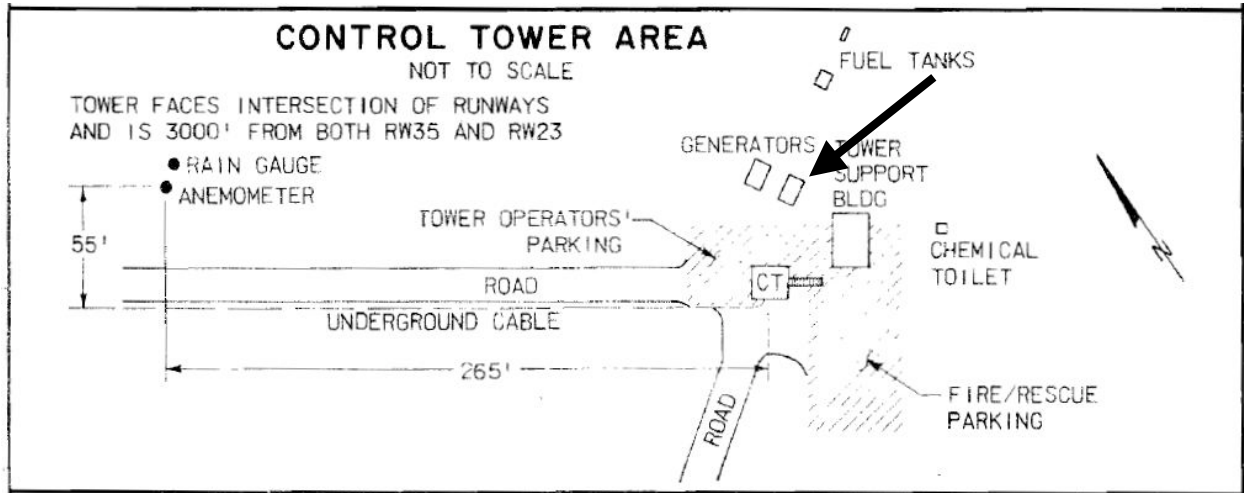


Figure 5. Enlarged section of the Map of White Sands Space Harbor, drawn by J.A. "Andy" Dorris on March 7, 1980, showing the Control Tower Area containing the HUB Complex and generator buildings (Source: NASA WSTF).



Figure 6. View of the HUB Generator Building, 1988, looking northwest
(Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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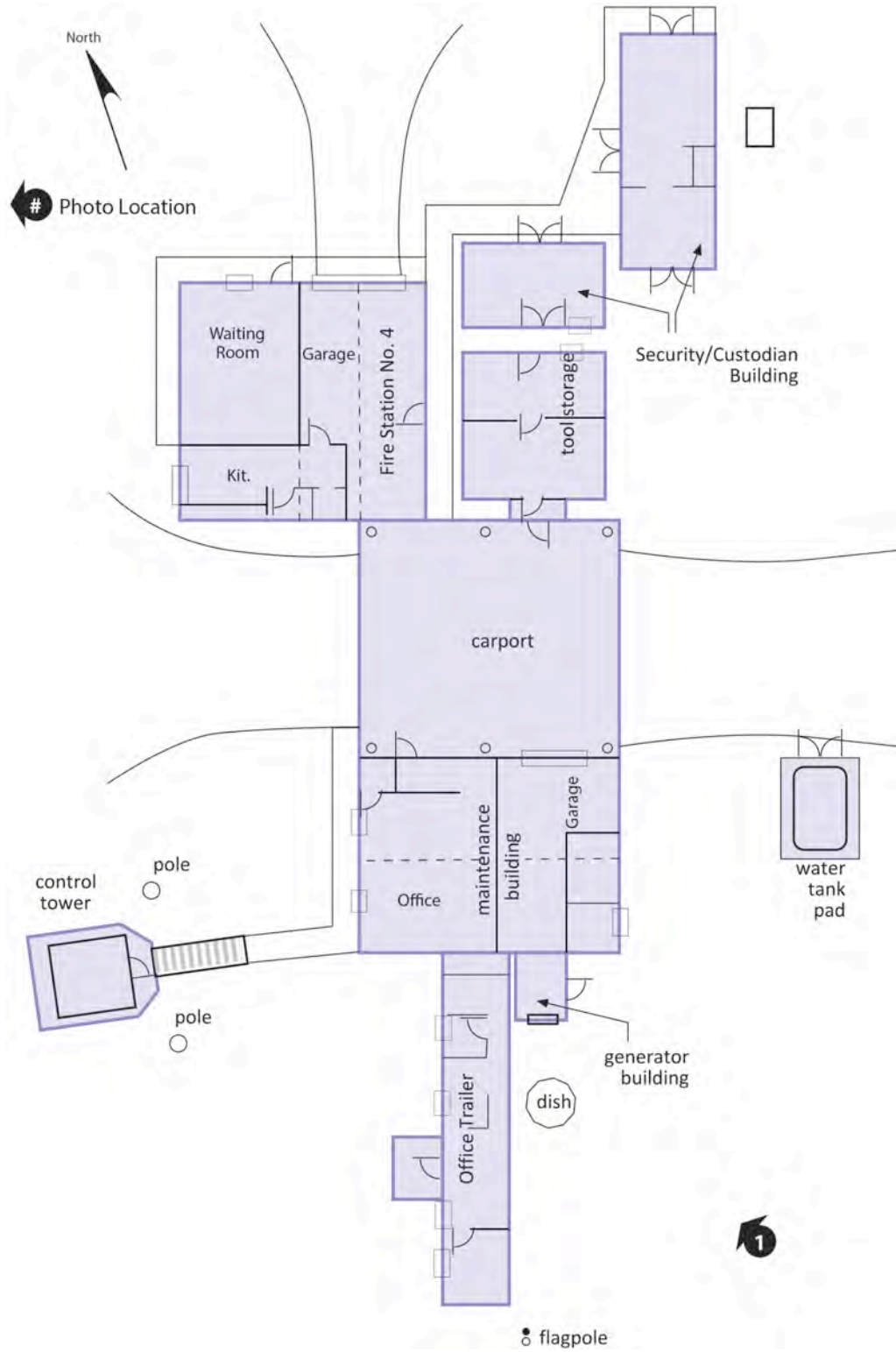
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-H
HUB GENERATOR BUILDING
(Space Shuttle Landing Facility Area 1, HUB Generator Building)
White Sands Missile Range
Attached to southwest side of HUB Maintenance Facility
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

NM-28-H-1 VIEW OF HUB GENERATOR BUILDING, ATTACHED TO NORTH
(RIGHT) END OF TRAILER WING CONNECTING TO THE HUB
MAINTENANCE BUILDING, LOOKING NORTH.

WHITE SANDS SPACE HARBOR AREA 1, HUB GENERATOR BUILDING
HAER No. NM-28-H
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WHITE SANDS SPACE HARBOR AREA 1,
HUB TOOL STORAGE BUILDING

HAER No. NM-28-I

(Space Shuttle Landing Facility Area 1, HUB Tool Storage Building)

White Sands Missile Range

Attached to the north side of the HUB Maintenance Facility

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, HUB TOOL STORAGE BUILDING
(Space Shuttle Landing Facility Area 1, HUB Tool Storage Building)

HAER No. NM-28-I

Location: White Sands Missile Range
Attached to the north side of the HUB Maintenance
Facility carport
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The HUB Tool Storage Building was a component of the
White Sands Space Harbor (WSSH) from 1992-2011.
Playing a minor support role at WSSH, this building is
a non-contributing resource within the WSSH Shuttle
Landing Facility District, which is eligible for
listing in the National Register of Historic Places
(NRHP) under Criterion A for its association with the
NASA Space Shuttle Program (SSP) with a period of
significance of 1976-2011. Because the district
achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The HUB Tool Storage Building was relocated to WSSH around 1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The HUB Tool Storage Building (NASA Inventory #54) is a prefabricated synthetic unit accessed by an entry vestibule on the south elevation that leads to the HUB Maintenance Facility's covered parking area. The rectangular unit is divided by an east/west interior wall with a central metal mesh door, creating a secure storage area on the north side. At the southwest corner is an external HVAC unit serving the unit with roof-mounted circular metal ventilation pipes. The building is currently vacant.

2. CONDITION OF FABRIC

When documented in March 2012, the HUB Tool Storage Building had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The HUB Tool Storage Building is a prefabricated synthetic and metal building on a concrete pad.

C. MECHANICAL/OPERATION

The HUB Tool Storage Building featured electricity to power interior lights, radios, and wall-mounted air conditioning units.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the HUB Tool Storage Building. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

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- White Sands Missile Range. "White Sands Hall of Fame: Alex Paczynski." Published online, 2000. Website

<http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx>, accessed September 19, 2011.

D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS

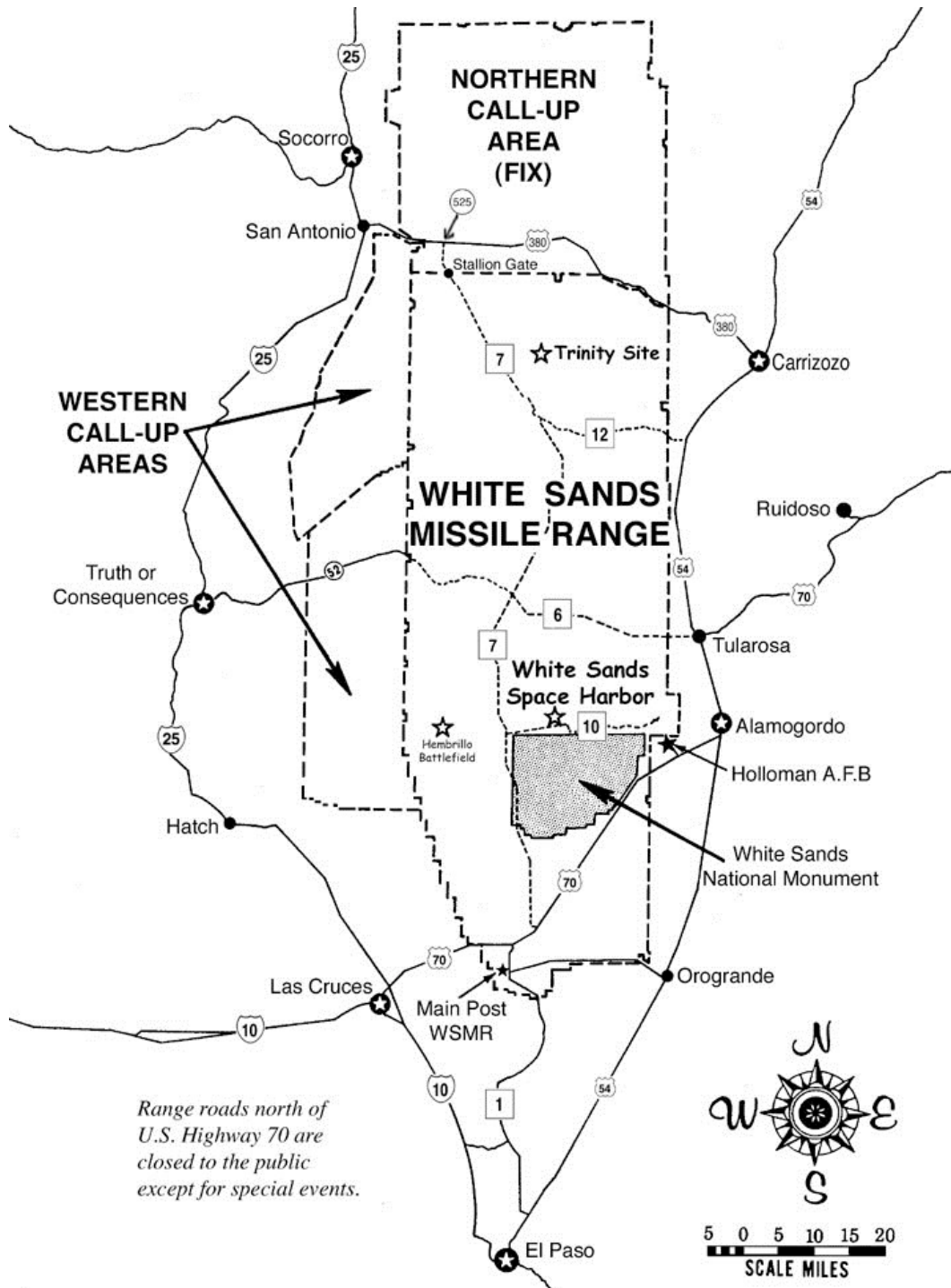


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

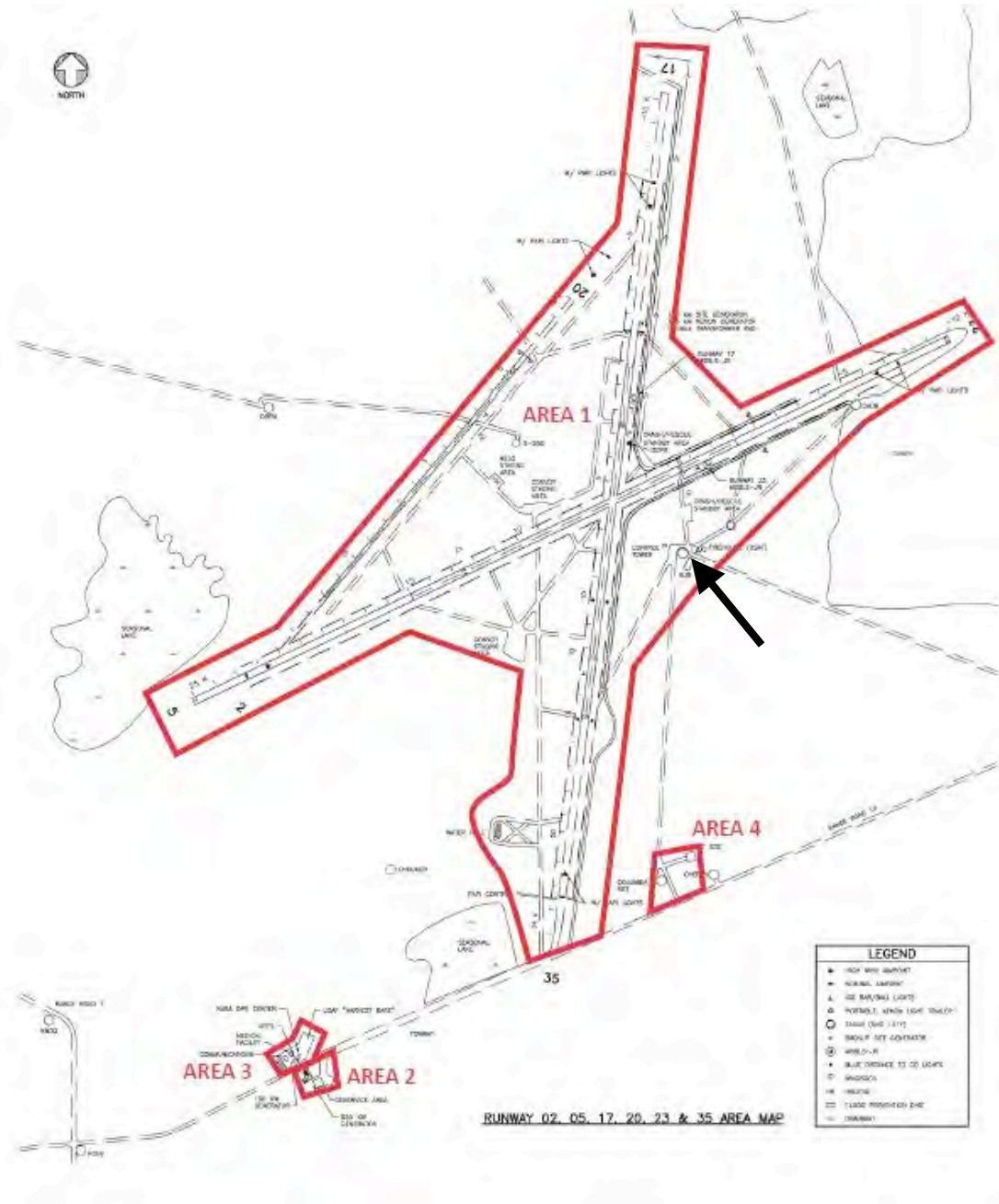


Figure 2. Map of WSSH showing location of HUB Tool Storage Building in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

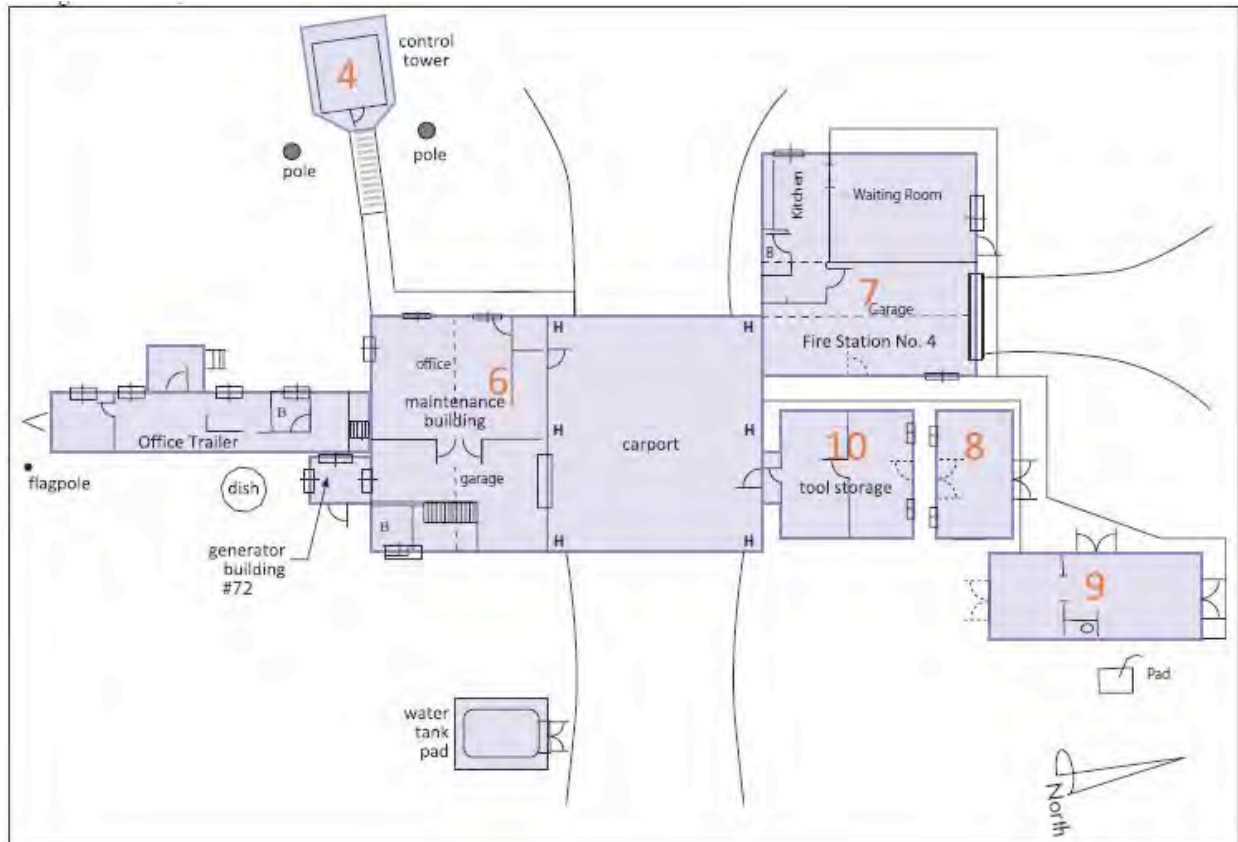


Figure 3. Map of the WSSH HUB complex showing HUB Tool Storage Building (#10). (Site Plan Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-I
HUB TOOL STORAGE BUILDING
(Space Shuttle Landing Facility Area 1, HUB Tool Storage Building)
White Sands Missile Range
Attached to the north side of the HUB Maintenance Facility
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

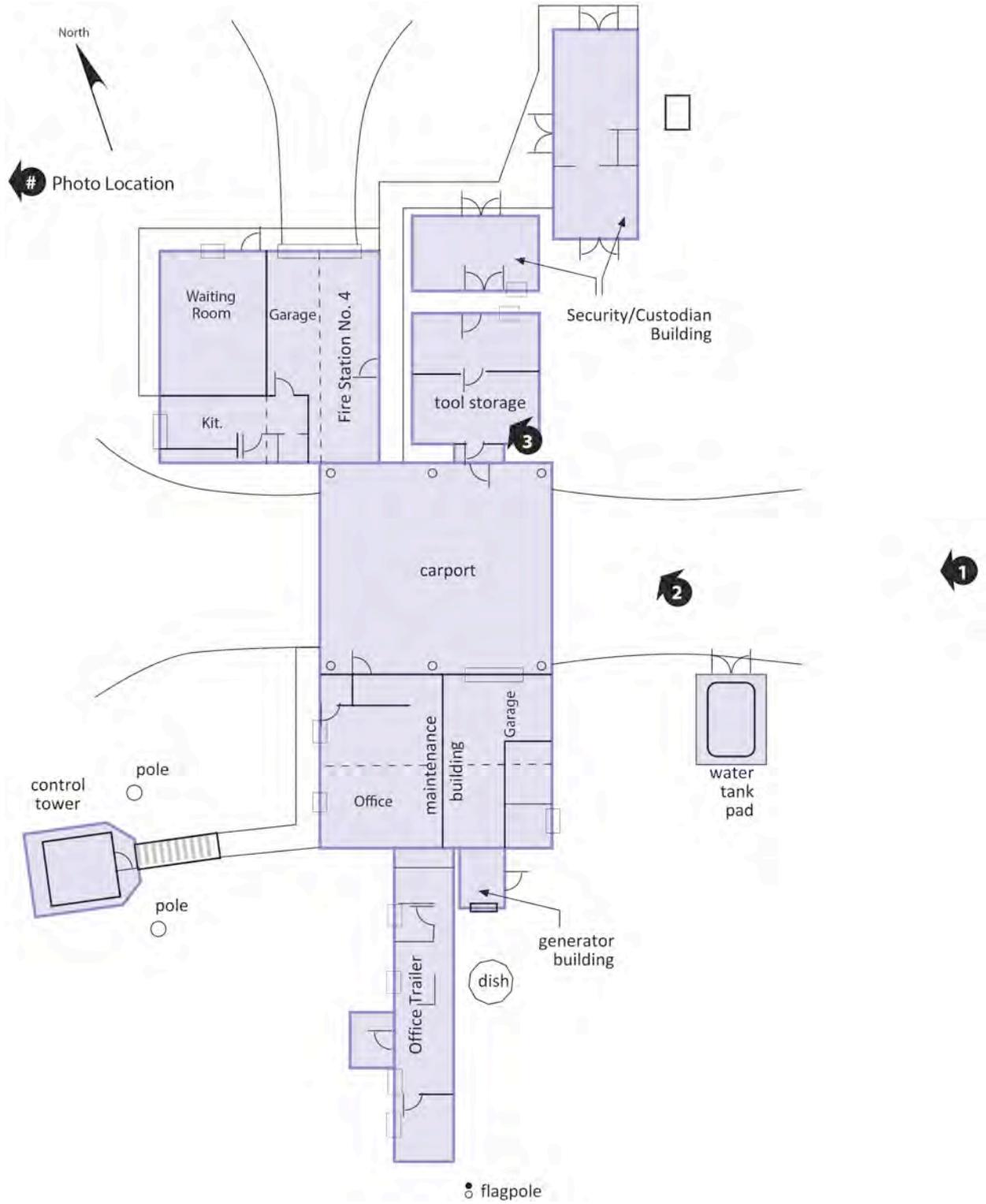
March 27-29, 2012

NM-28-I-1 VIEW OF HUB TOOL STORAGE BUILDING, CENTER RIGHT,
LOOKING WEST, WITH MEASURING STICK.

NM-28-I-2 VIEW OF HUB TOOL STORAGE BUILDING, CENTER LEFT,
LOOKING NORTH.

NM-28-I-3 VIEW OF HUB TOOL STORAGE BUILDING, INTERIOR LOOKING
NORTH FROM SOUTHEAST CORNER.

WHITE SANDS SPACE HARBOR AREA 1, HUB TOOL STORAGE BUILDING
HAER No. NM-28-I
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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-J
NAVIGATIONAL AID (NAVAIDS) CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, NAVAIDS Control Building)
White Sands Missile Range
Approximately 40 feet north of HUB Maintenance Facility
White Sands vicinity
Doña Ana County
New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, NAVIGATIONAL AID (NAVAIDS) CONTROL
BUILDING
(Space Shuttle Landing Facility Area 1, NAVAIDS Control Building)

HAER No. NM-28-J

Location: White Sands Missile Range
Approximately 40 feet northeast of the HUB Maintenance
Facility
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Navigational Aid (NAVAIDS) Control Building was a
component of the White Sands Space Harbor (WSSH) from
1992-2011. Playing a minor support role at WSSH, this
building is a non-contributing resource within the
WSSH Shuttle Landing Facility District, which is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
the district achieved significance within the past
fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
6150 East Ponce de Leon Avenue
Stone Mountain, Georgia 30083

Date: July 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Navigational Aid (NAVAIDS) Control Building was relocated to WSSH around 1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Navigational Aid (NAVAIDS) Control Building (NASA Inventory #52) is a prefabricated synthetic trailer-type unit that has been covered with spray foam insulation. The rectangular building features double metal entrance doors at the center of the west and north elevations. All other entrances are inoperable. The doors exhibit distinctive circular fixed pane windows. It rests on metal piers on the ground. A small concrete pad that supported a dumpster is located at the east elevation. The building is currently vacant.

2. CONDITION OF FABRIC

When documented in March 2012, the Navigational Aid (NAVAIDS) Control Building had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Navigational Aid (NAVAIDS) Control Building is a prefabricated synthetic and metal building on a concrete pad.

C. MECHANICAL/OPERATION

The Navigational Aid (NAVAIDS) Control Building featured electricity to power interior lights, radios, and wall-mounted air conditioning units.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the Navigational Aid (NAVAIDS) Control Building. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

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http://www.nasa.gov/centers/wstf/pdf/216491main_wstfVisGuide031008.pdf, accessed November 19, 2011.

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White Sands Missile Range. "White Sands Hall of Fame: Alex Paczynski." Published online, 2000. Website

<http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx>, accessed September 19, 2011.

D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS

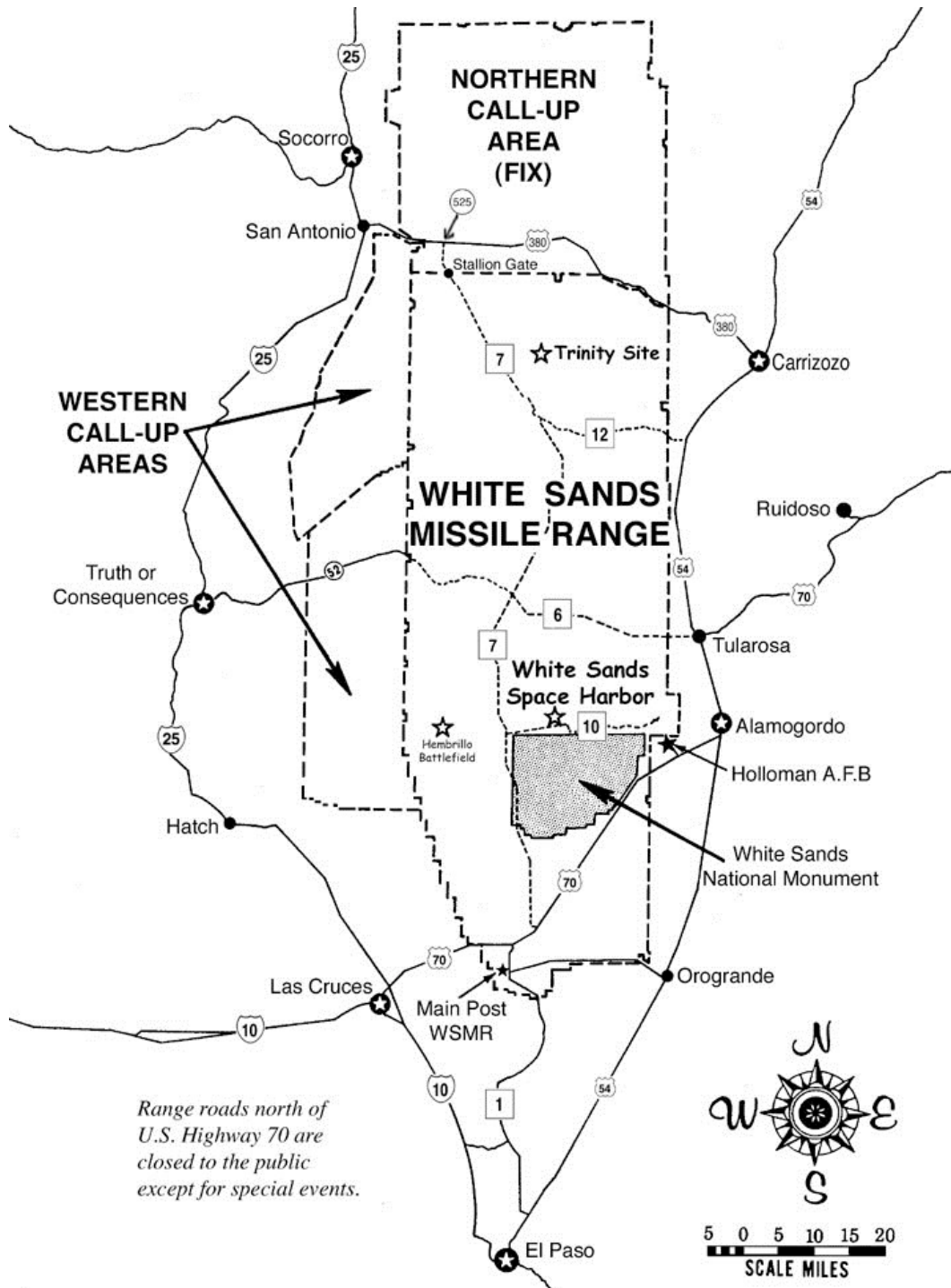


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).



Figure 3. Map of the WSSH HUB complex showing Navigational Aid (NAVAIDS) Control Building (#9) (Site Plan Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-J
NAVIGATIONAL AID (NAVAIDS) CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, NAVAIDS Control Building)
White Sands Missile Range
Approximately 40 feet north of HUB Maintenance Facility
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

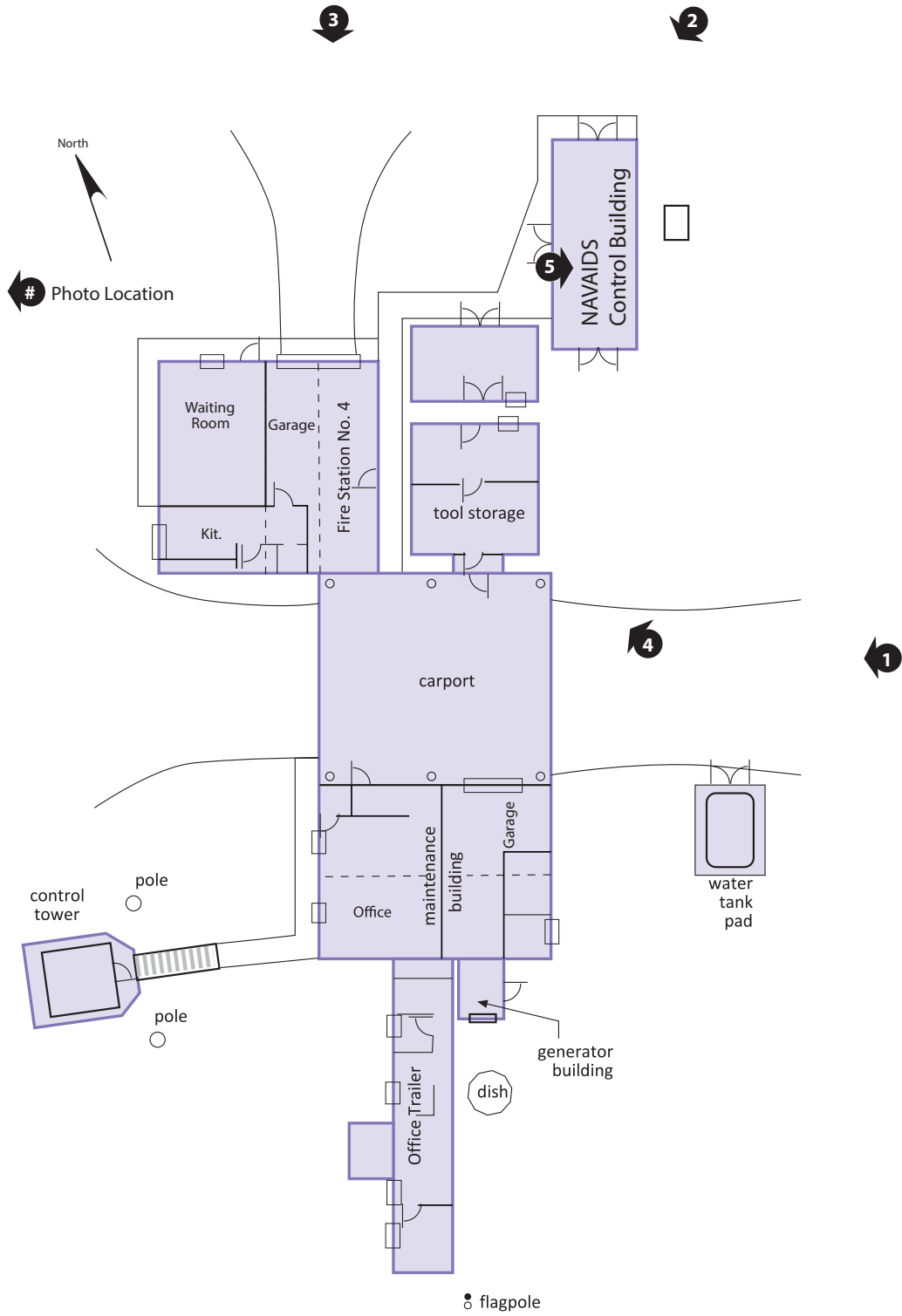
NM-29-J-1 VIEW OF NAVAIDS CONTROL BUILDING, FAR RIGHT, LOOKING
WEST, WITH MEASURING STICK.

NM-28-J-2 VIEW OF NAVAIDS CONTROL BUILDING, FAR LEFT, LOOKING
SOUTHWEST.

NM-28-J-3 VIEW OF NAVAIDS CONTROL BUILDING, FAR RIGHT, LOOKING
NORTH.

NM-28-J-4 VIEW OF NAVAIDS CONTROL BUILDING, INTERIOR LOOKING
SOUTH AT FORMER CONTROL PANEL IN CENTER OF SOUTH WALL.

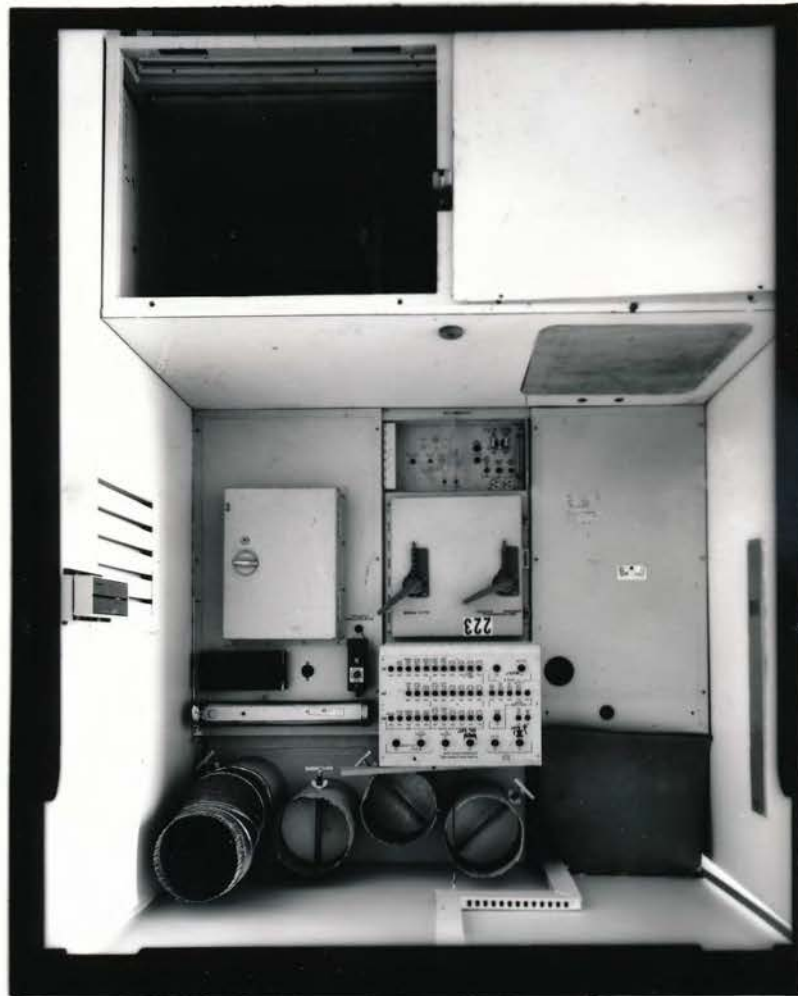
WHITE SANDS SPACE HARBOR AREA 1, NAVIGATIONAL AID CONTROL BUILDING
HAER No. NM-28-J
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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-K
NAVIGATIONAL AID (NAVAIDS) STORAGE BUILDING
(Space Shuttle Landing Facility Area 1, NAVAIDS Storage Building)
White Sands Missile Range
Approximately 2 feet north of Tool Storage Building, between Fire
Station No. 4 and navigational Aid Control Building
White Sands vicinity
Doña Ana County
New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, NAVIGATIONAL AID (NAVAIDS) STORAGE
BUILDING

(Space Shuttle Landing Facility Area 1, NAVAIDS Storage Building)

HAER No. NM-28-K

Location: White Sands Missile Range
Approximately 2' north of HUB Tool Storage Building,
between Fire Station No. 4 and Navigational Aid
Control Building
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Navigational Aid (NAVAIDS) Storage Building played
was a component of the White Sands Space Harbor (WSSH)
from 1984-2011. Playing a minor support role at WSSH,
this building is a non-contributing resource within
the WSSH Shuttle Landing Facility District, which is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
the district achieved significance within the past
fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Navigational Aid (NAVAIDS) Storage Building was relocated to WSSH around 1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment, machinery, and furnishings were removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Navigational Aid (NAVAIDS) Storage Building (NASA Inventory #52) is a synthetic rectangular unit located approximately 2' north of the HUB Tool Storage Building. The storage building rests on metal piers on the ground and is accessed by double metal doors on the north elevation. The building is currently vacant.

2. CONDITION OF FABRIC

When documented in March 2012, the Navigational Aid (NAVAIDS) Storage Building had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Navigational Aid (NAVAIDS) Storage Building is a prefabricated synthetic and metal building on metal piers.

C. MECHANICAL/OPERATION

The Navigational Aid (NAVAIDS) Storage Building featured electricity to power interior lights and wall-mounted ventilation fans.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no original engineering plans or drawings for the Navigational Aid (NAVAIDS) Storage Building. NASA staff created an as-built, not-to-scale site plan, which was used as a base map for this report (Figure 2).

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

C. BIBLIOGRAPHY

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NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

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Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS

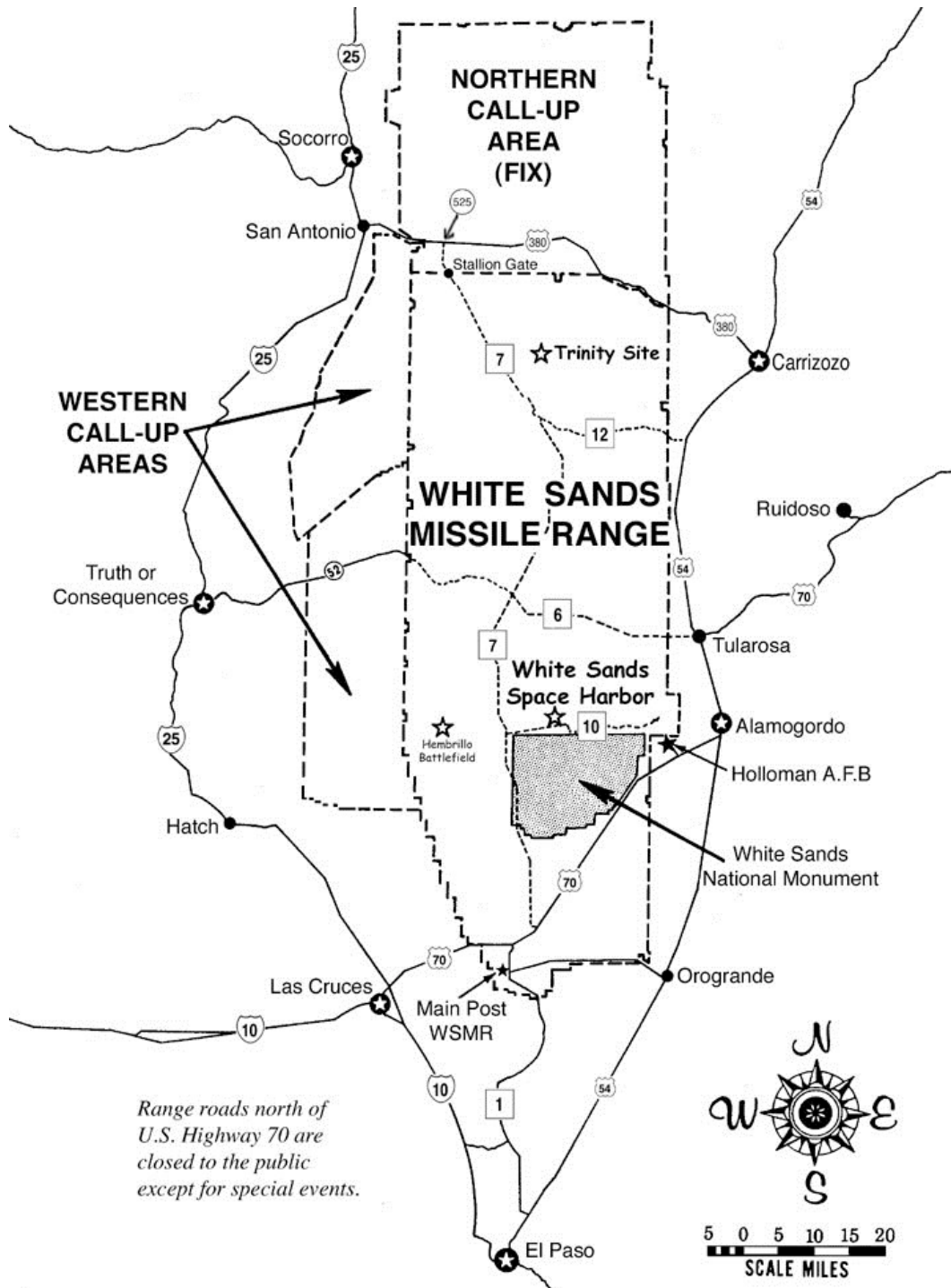


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

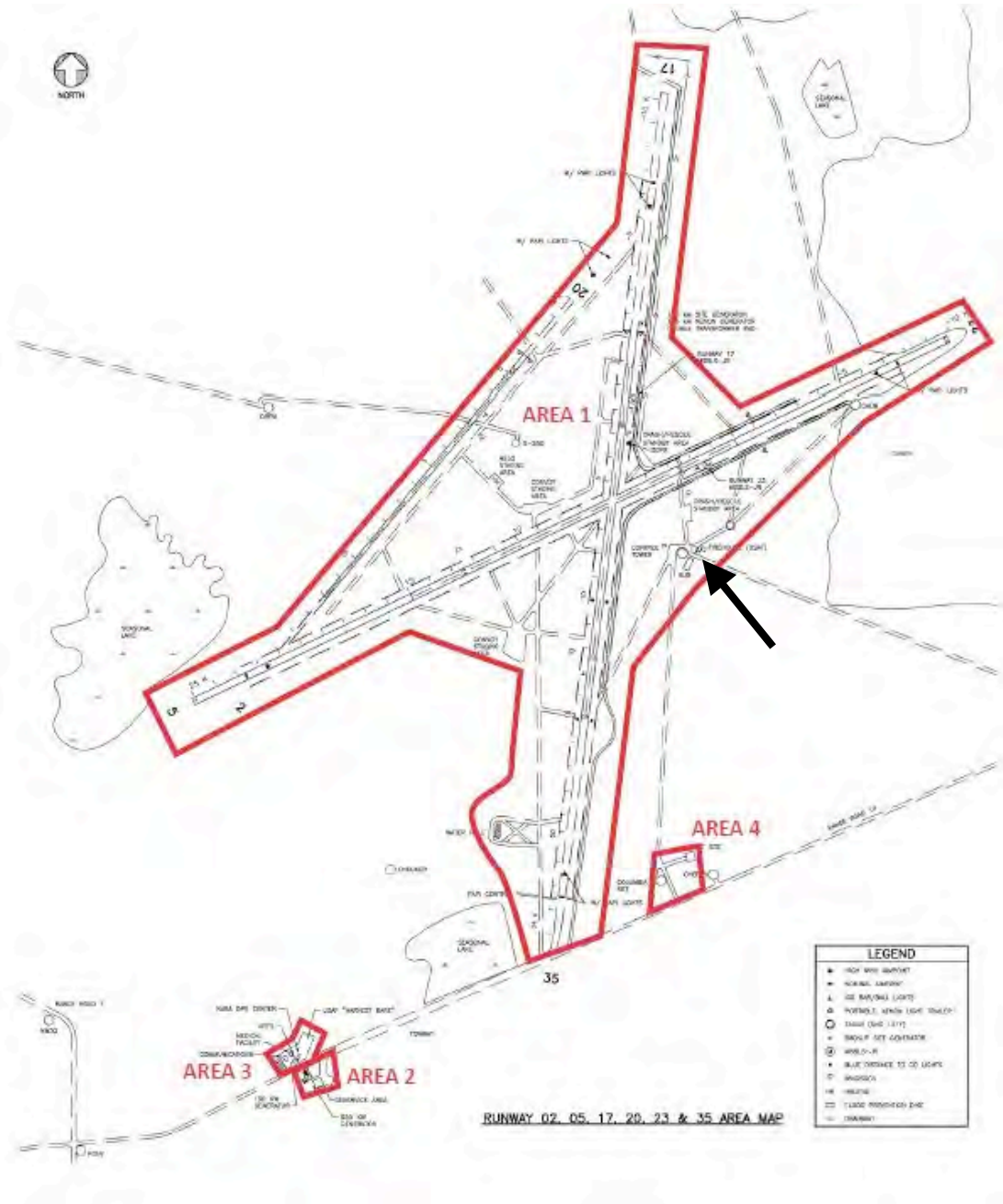


Figure 2. Map of WSSH showing location of Navigational Aid (NAVAIDS) Storage Building in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

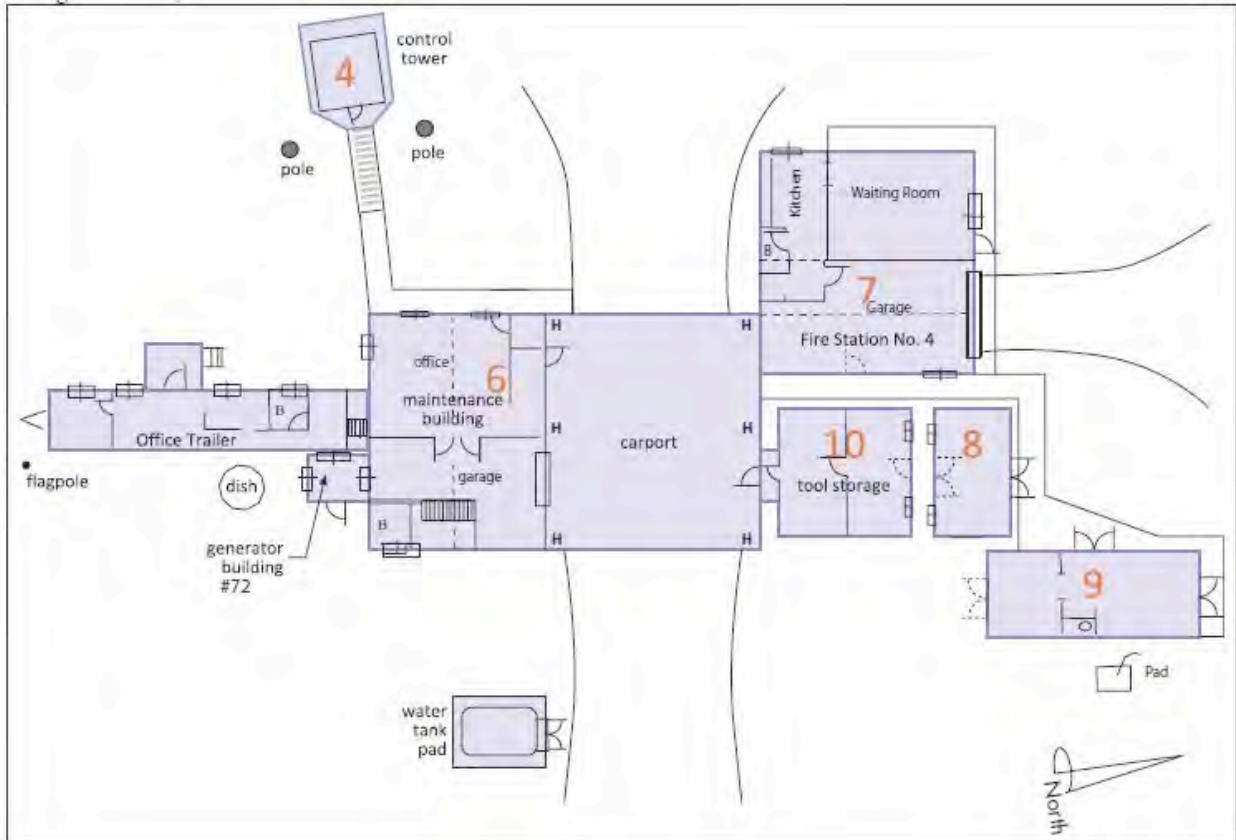


Figure 3. Map of the WSSH HUB complex showing Navigational Aid (NAVAIDS) Storage Building (#8). (Site Plan Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-K
NAVIGATIONAL AID (NAVAIDS) STORAGE BUILDING
(Space Shuttle Landing Facility Area 1, NAVAIDS Storage Building)
White Sands Missile Range
Approximately 2 feet north of Tool Storage Building, between Fire
Station No. 4 and navigational Aid Control Building
White Sands vicinity
Doña Ana County
New Mexico

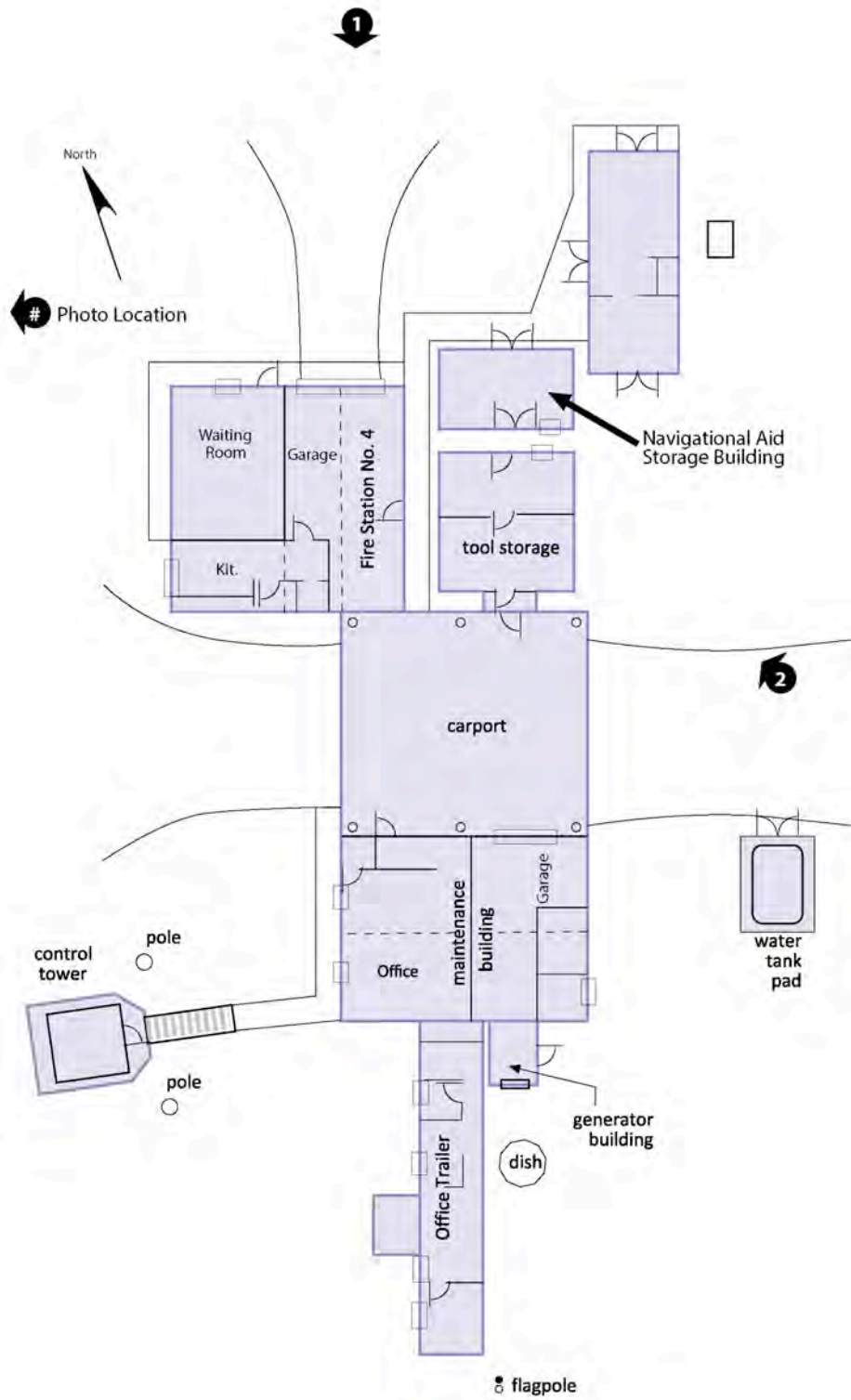
David Diener, Photographer

March 27-29, 2012

NM-28-K-1 VIEW OF NAVAIDS STORAGE BUILDING, CENTER, LOOKING
SOUTHWEST.

NM-28-K-2 VIEW OF NAVAIDS STORAGE BUILDING, CENTER, LOOKING
NORTH.

WHITE SANDS SPACE HARBOR AREA 1, NAVIGATIONAL AID STORAGE BUILDING
HAER No. NM-28-K
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WHITE SANDS SPACE HARBOR AREA 1,
HELICOPTER STAGING AREA

HAER No. NM-28-L

(Space Shuttle Landing Facility Area 1, Helicopter Landing Pad)

White Sands Missile Range

Approximately 4,900 feet northwest of intersection of Runways 17/35
and 23/05

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, HELICOPTER STAGING AREA
(Space Shuttle Landing Facility Area 1, Helicopter Landing Pad)

HAER No. NM-28-L

Location: White Sands Missile Range
Approximately 4,900' northwest of intersection of
Runway 17/35 and Runway 23/05
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: 1988

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Helicopter Staging Area was an essential component
of the White Sands Space Harbor (WSSH) from 1984-2011.
It is considered to have national significance and is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
it achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. Date of Construction

The Helicopter Staging Area was constructed in 1988.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Helicopter Staging Area is a natural surface, gypsum landing pad and staging area for eight helicopters. A natural surface access road connects the single row of landing pads to the adjacent runways. Each landing pad is identified by a black, letter H navigational marker made of asphalt on the gypsum pad.

2. CONDITION OF FABRIC

When documented in March 2012, the Helicopter Staging Area had been abandoned for over six months, but was in fair condition. The staging area was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations..

B. CONSTRUCTION

The Helicopter Staging Area is constructed of natural surface gypsum with landing aid markings made of asphalt.

C. MECHANICAL/OPERATION

The Helicopter Staging Area does not feature any mechanical equipment.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Helicopter Staging Area, however, plans were created around 1988 for construction of the asphalt navigational markings.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. Historical views of the Helicopter Staging Area can be found on pages 16 and 17 of this document. Views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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contain secondary information are archived at NASA's Lyndon B.
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, HELICOPTER STAGING AREA
HAER No. NM-28-L
(Page 13)

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

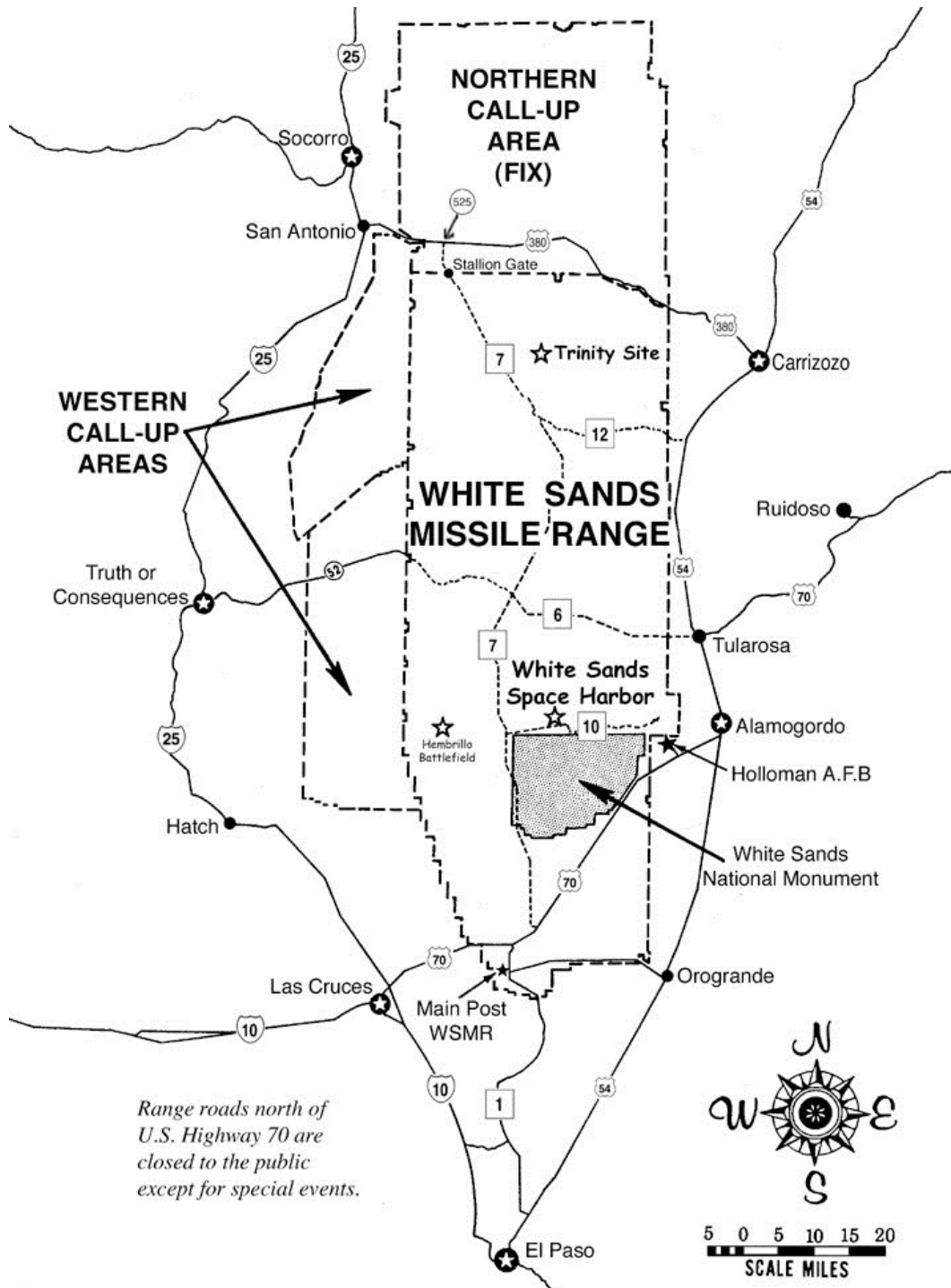


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

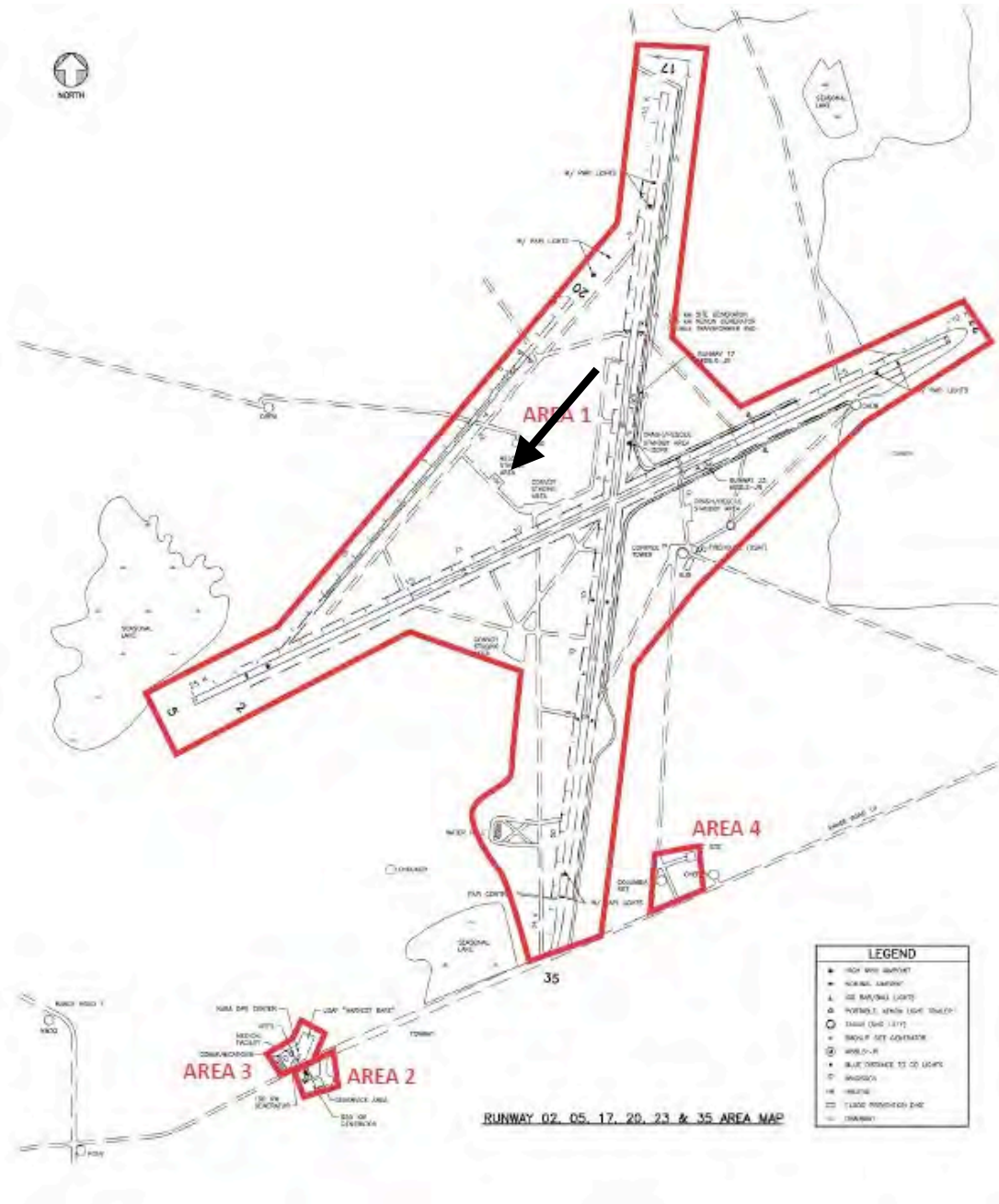


Figure 2. Map of WSSH showing location of Helicopter Staging Area in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3. Aerial view, looking north towards San Andres Mountains, at the Helicopter Staging Area, June 2006 (Source: NASA WSTF).



Figure 4. Aerial view, looking north, of the Helicopter Staging Area, undated (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

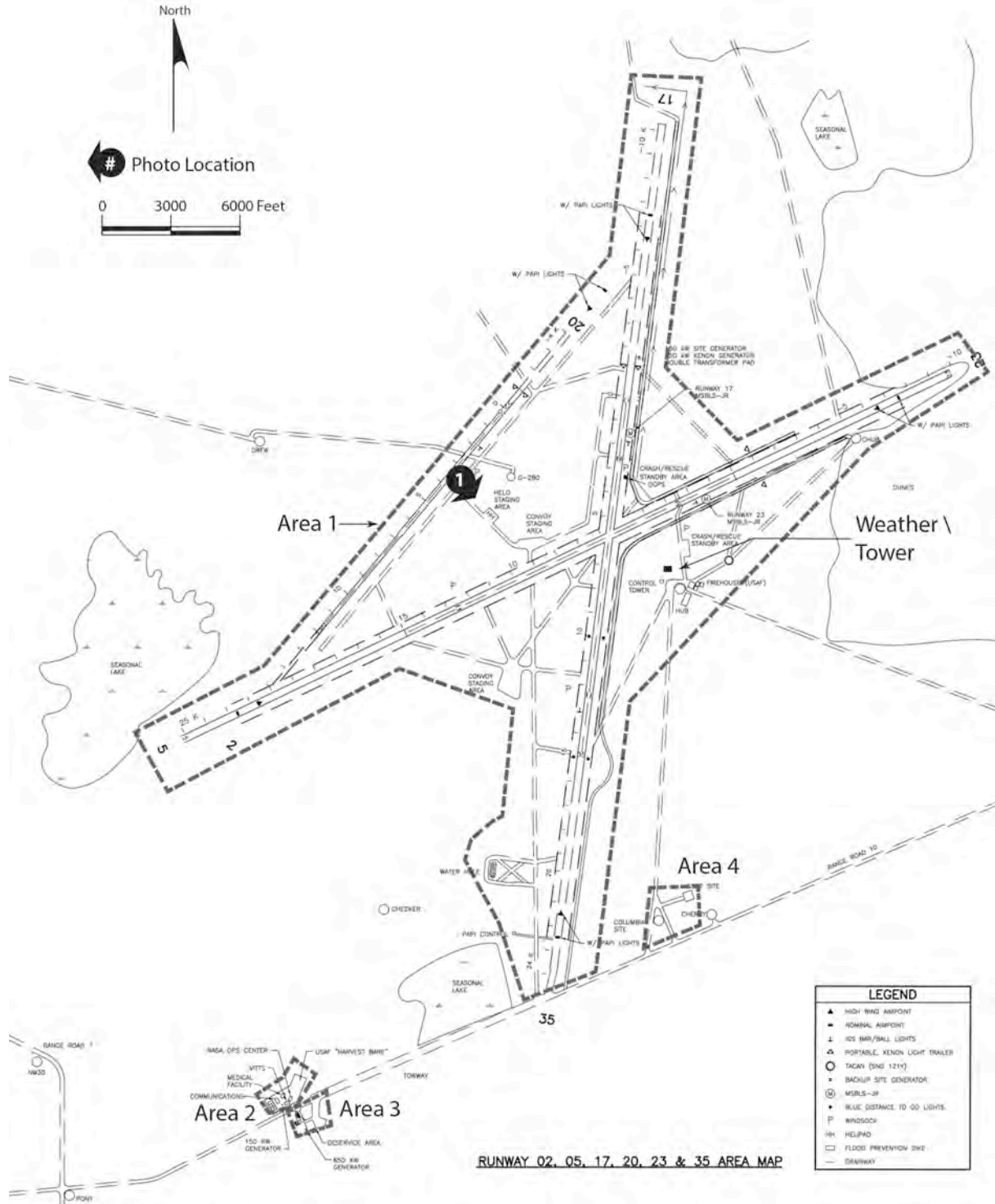
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-L
HELICOPTER STAGING AREA
(Space Shuttle Landing Facility Area 1, Helicopter Landing Pad)
White Sands Missile Range
Approximately 4,900 feet northwest of intersection of Runways 17/35
and 23/05
White Sands vicinity
Doña Ana County
New Mexico

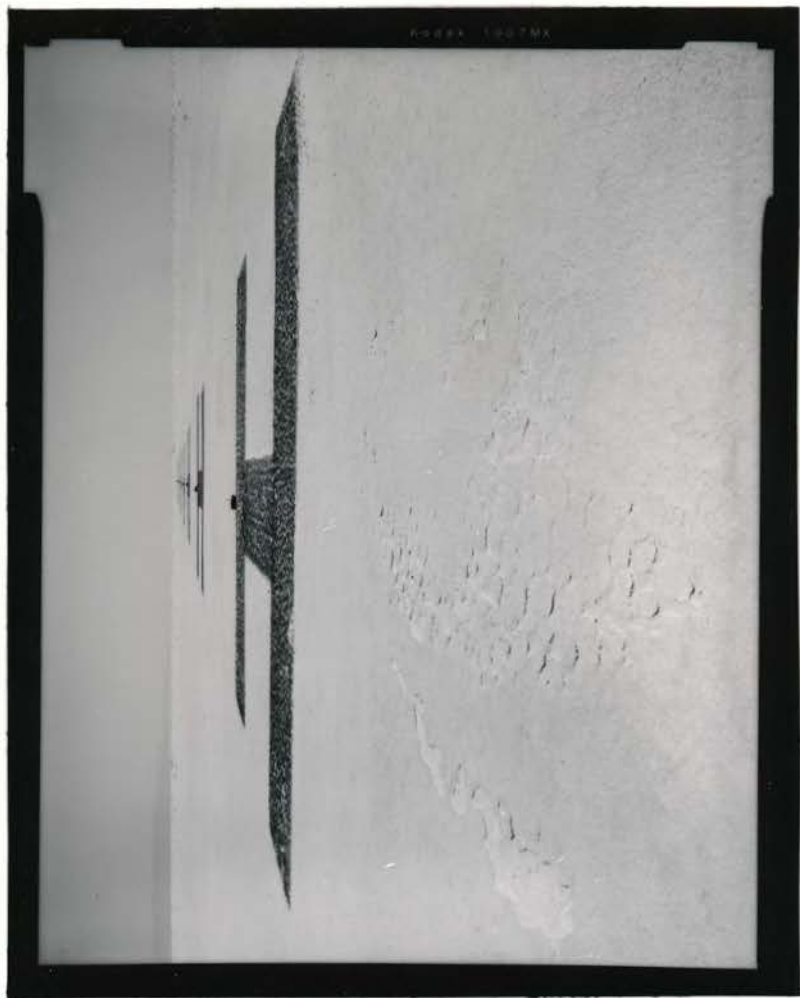
David Diener, Photographer

March 27-29, 2012

NM-28-L-1 VIEW OF HELICOPTER STAGING AREA LOOKING SOUTHEAST FROM
NORTH END WITH ASPHALT "H" MARKING IN FOREGROUND.

WHITE SANDS SPACE HARBOR AREA 1, HELICOPTER STAGING AREA
 HAER No. NM-28-L
 INDEX TO PHOTOGRAPHS
 (Page 2)





WHITE SANDS SPACE HARBOR AREA 1,
PAPI CONTROL BUILDING

HAER No. NM-28-M

(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)

White Sands Missile Range

West side of south end of Runway 17/35

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, PAPI CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)

HAER No. NM-28-M

Location: White Sands Missile Range
West side of south end of Runway 17/35
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Precision Approach Path Indicator Building, or
PAPI Control Building, was an essential component of
the White Sands Space Harbor (WSSH) from 1992-2011.
It is considered to have national significance and is
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for its
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
it achieved significance within the past fifty years,
Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

Circa 1992

2. ENGINEER

Not known

3. BUILDER/CONTRACTOR/SUPPLIER

Not known

4. ORIGINAL PLANS

Not available

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The PAPI Control Building (NASA Inventory #56) is a prefabricated steel unit supported by concrete piers on the ground. A solid metal entrance door is located on the north elevation. The exterior is painted with a red and white checkerboard pattern to enhance visibility on the Alkali Flat.

The PAPI Control Building was used to control the PAPI light arrays located within the overruns at each end of Runway 17/35, the east end of Runway 23/05, and the north end of Runway 20/02. PAPI is a system of lights arranged to provide visual descent guidance information during the orbiter's approach to the runway. The PAPI array is installed at the center of the runway and adjusts to allow for a glide slope of 16 to 21 degrees and is used as the outer glide slope reference. In good visibility conditions, the arrays can be used at ranges up to five miles by day and twenty miles by night.

The original PAPI arrays were replaced ca.2005 with the current PAPI arrays, manufactured by the Barrel Lighting Company in England. Located equidistant, the four individual units are housed in metal light housing assemblies mounted on three metal legs supported by a concrete pad. The housings are painted yellow. Each light unit consists of three high-intensity, 200 watt 6.6 Amp incandescent lamps, anodized aluminum reflectors, red color filters to split the beam, and precision-ground lenses.

2. CONDITION OF FABRIC

When documented in March 2012, the PAPI Control Building had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired

due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The PAPI Control Building is a prefabricated metal building.

C. MECHANICAL/OPERATION

The PAPI Control Building featured electricity to power interior lights and electronic navigational equipment.

PART III. Sources of Information:

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the PAPI Control Building.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. Historical views of the PAPI Control Building and housing assembly can be found on pages 17 and 18 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

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APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

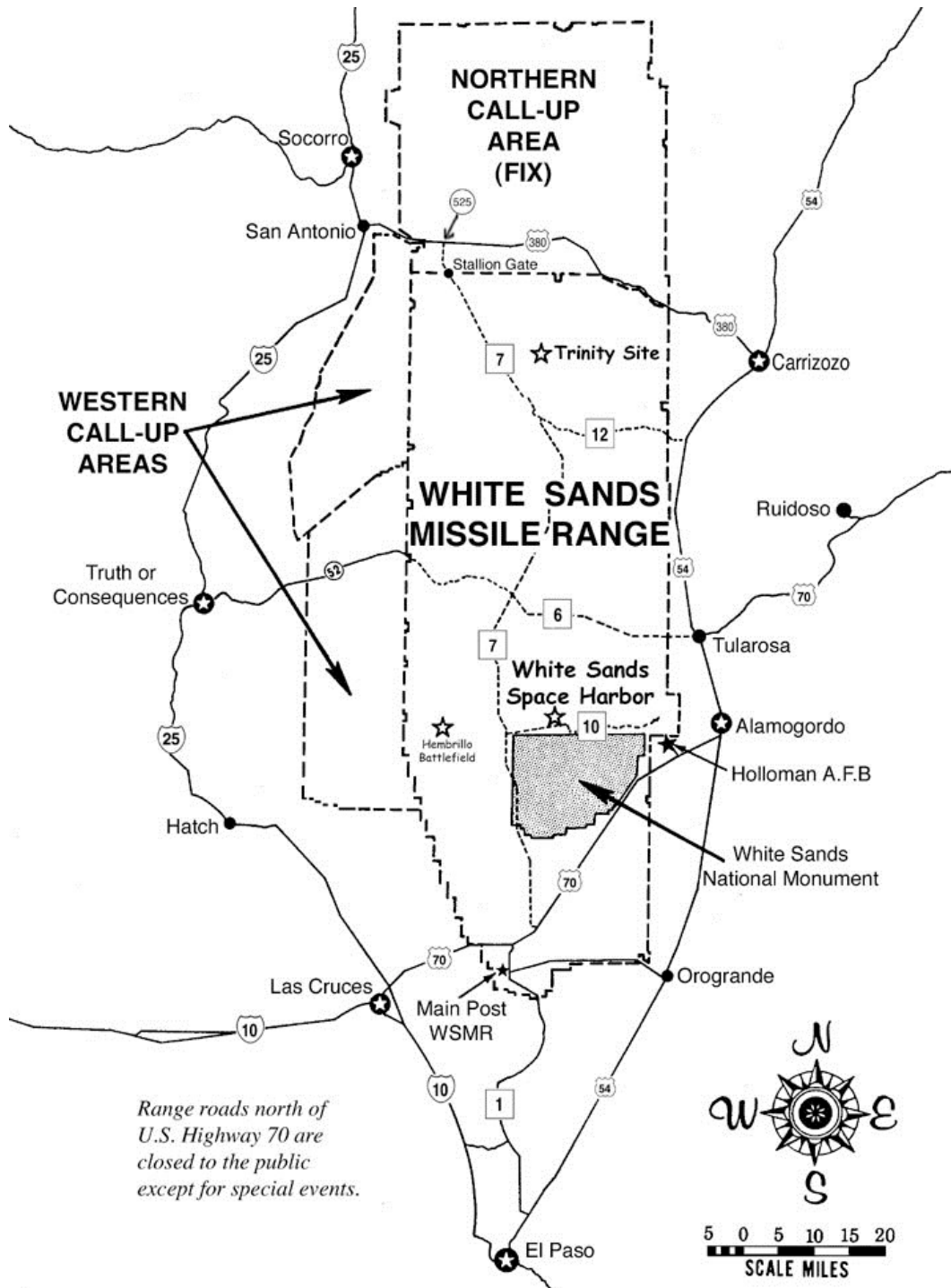


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

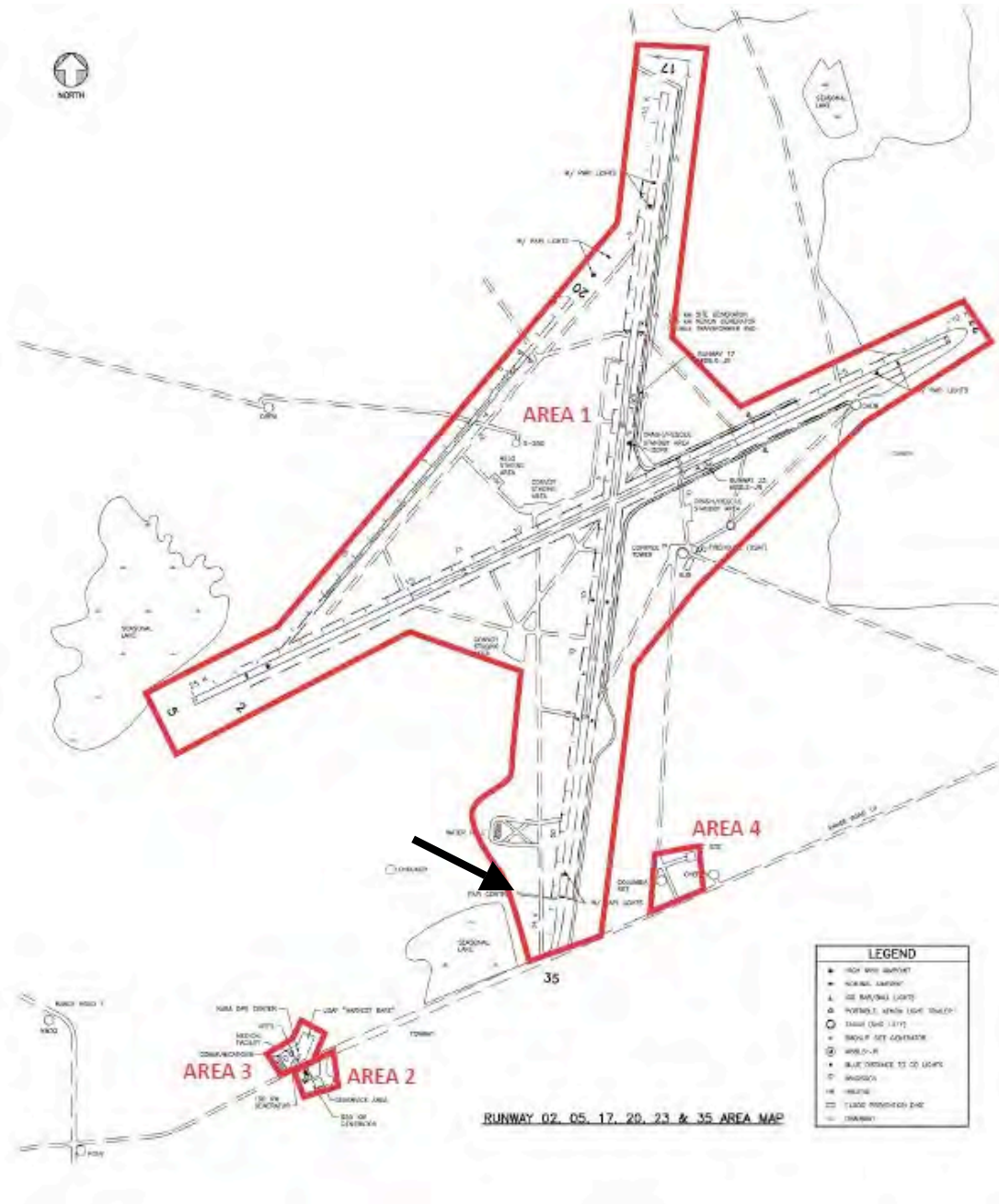


Figure 2. Map of WSSH showing location of the PAPI Control Building in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3A. View of an individual PAPI housing assembly at north end of Runway 23/05, looking west with the San Andres Mountain Range in background, ca.2005 (Source: NASA WSTF).



Figure 3B. View of an original PAPI housing assembly, looking west with San Andres Mountains in background, ca.2005 (Source: NASA WSTF).



Figure 4A. View of the original PAPI Control Building, looking East with Sacramento Mountain Range in background; this repurposed trailer was replaced around 1992 with the current PAPI Control Building, undated (Source: NASA WSTF).



Figure 4B. View of the interior of the original PAPI Control Building, undated (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

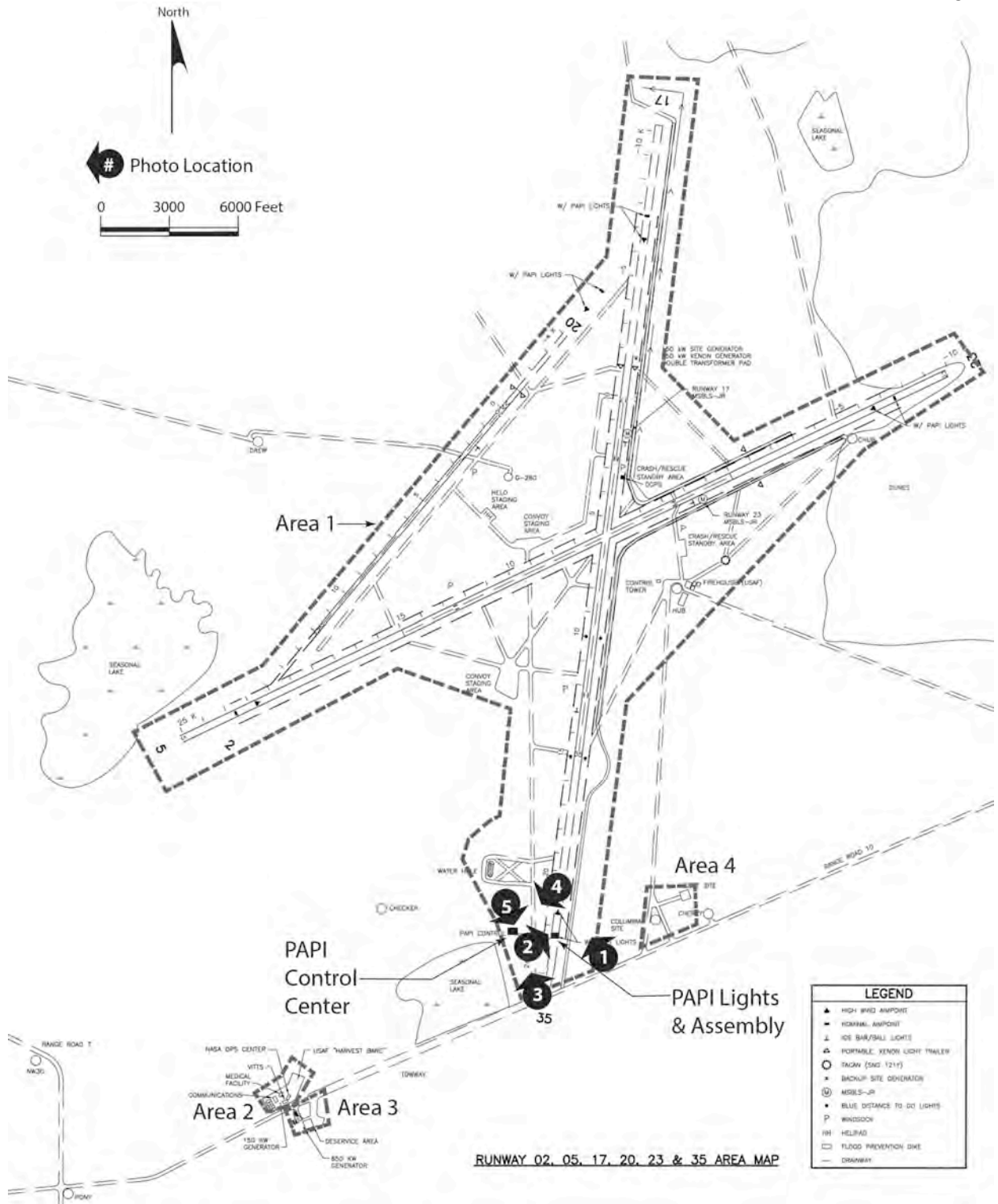
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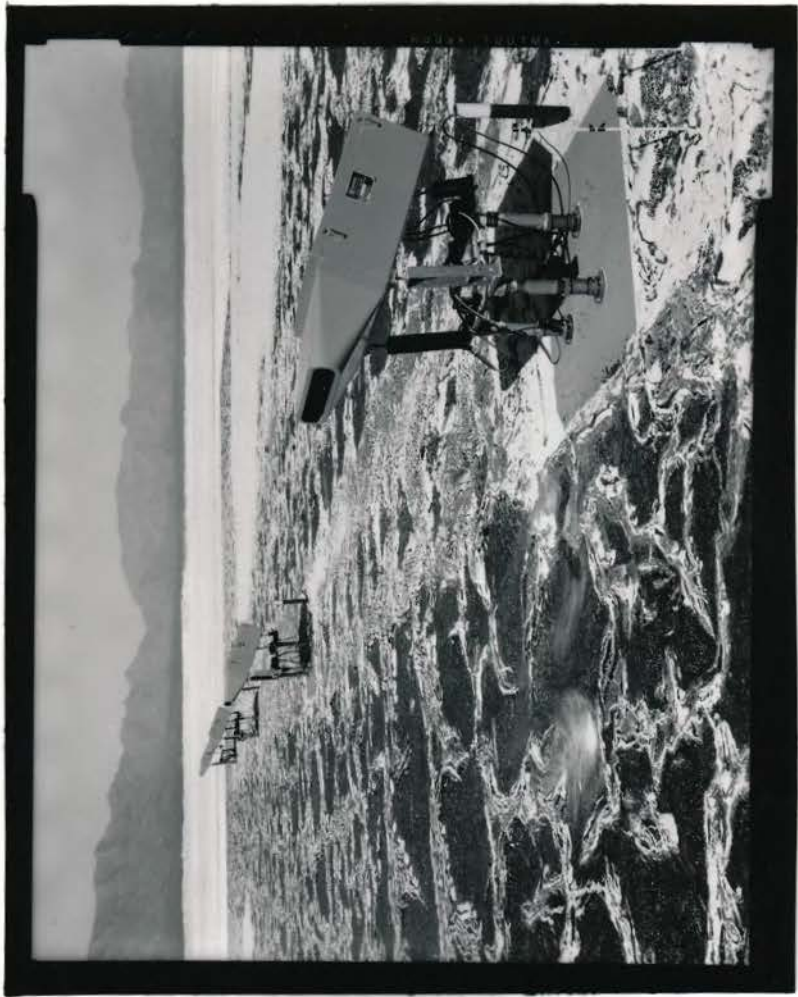
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PAPI CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)
White Sands Missile Range
West side of south end of Runway 17/35
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer March 27-29, 2012

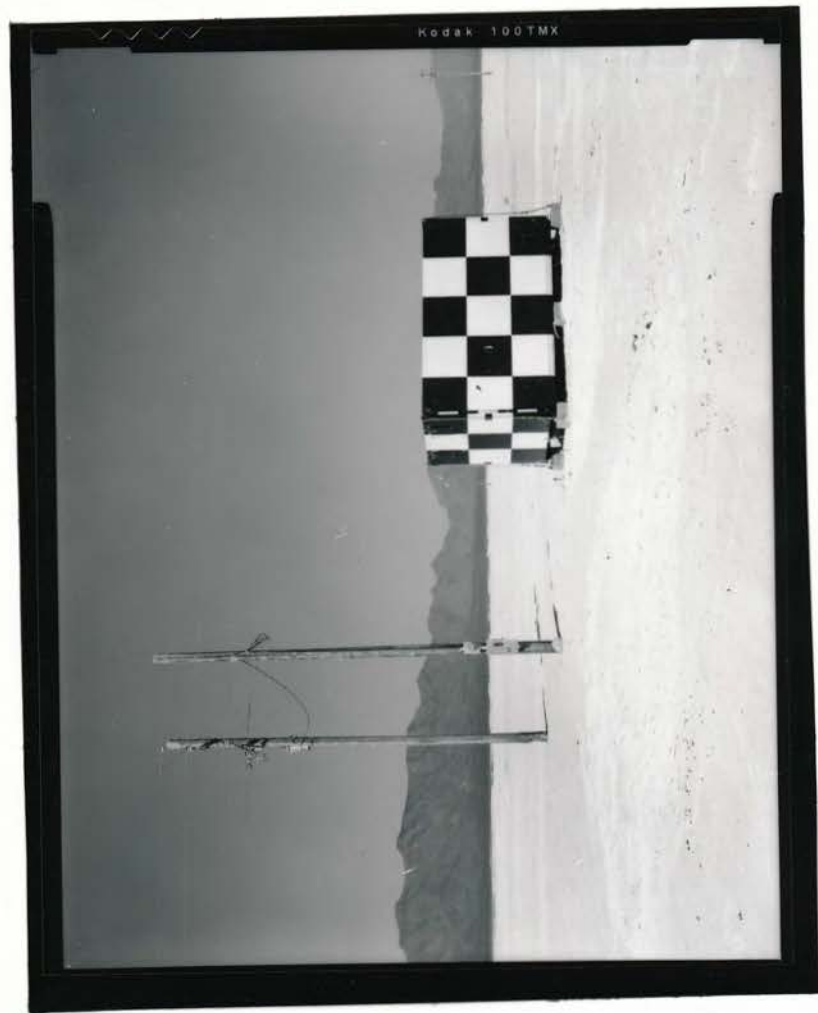
- NM-28-M-1 VIEW OF RUNWAY PAPI LIGHT ARRAY LOOKING NORTHWEST AT
SOUTH END OF RUNWAY 17/35 WITH SAN ANDRES MOUNTAIN
RANGE IN BACKGROUND.
- NM-28-M-2 VIEW OF A TYPICAL PAPI LIGHT ASSEMBLY LOOKING
NORTHWEST AT SOUTH END OF RUNWAY 17/35.
- NM-28-M-3 VIEW OF PAPI CONTROL STATION LOOKING NORTHWEST,
LOCATED AT SOUTHWEST CORNER OF SOUTH END OF
RUNWAY 17/35.
- NM-28-M-4 VIEW OF PAPI CONTROL STATION LOOKING SOUTHWEST,
LOCATED AT SOUTHWEST CORNER OF SOUTH END OF
RUNWAY 17/35.
- NM-28-M-5 VIEW OF INTERIOR OF PAPI CONTROL STATION LOOKING WEST,
LOCATED AT SOUTHWEST CORNER OF SOUTH END OF
RUNWAY 17/35.

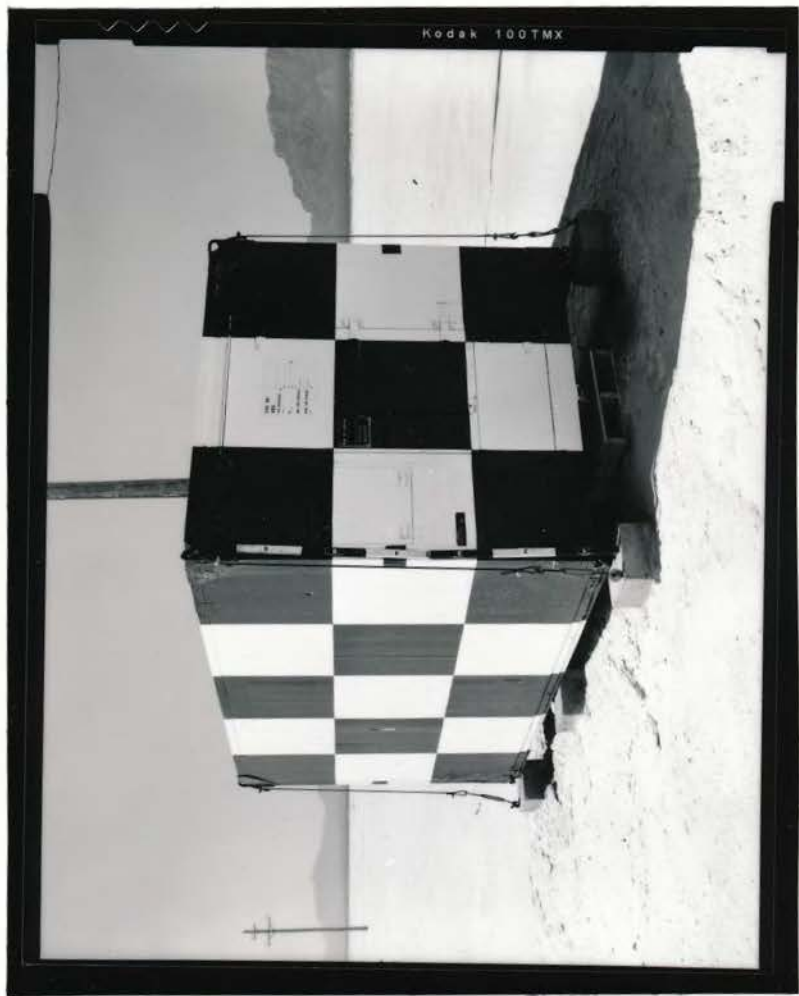
WHITE SANDS SPACE HARBOR AREA 1, PAPI CONTROL BUILDING
 HAER No. NM-28-M
 INDEX TO PHOTOGRAPHS
 PAGE 2













Kodak 100TMX

FLAMMABLES
NO SMOKING

85

8

FLAMMABLES
NO SMOKING

WHITE SANDS SPACE HARBOR AREA 1,

HAER No. NM-28-N

PAPI CONTROL BUILDING

(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)

White Sands Missile Range

East side of south end of Runway 17/35

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, PAPI CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)

HAER NO. NM-28-N

Location: White Sands Missile Range
East side of south end of Runway 17/35
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Precision Approach Path Indicator (PAPI) Control Building was an essential component of the White Sands Space Harbor (WSSH) from 1992-2011. It is considered to have national significance and is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because it achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

Circa 1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Precision Approach Path Indicator (PAPI) Building (NASA Inventory #55) was located on the east side, in a curve in the access road, of Runway 17/35. Supported by a concrete pad, this control building originally featured two prefabricated metal units. The primary unit is no longer extant. A small, locker-type unit housing electrical equipment remains in the southeast corner. This unit is painted with a red and white checkerboard pattern. An electrical generator and transformer are located to the east of the building.

The PAPI Control Building was used to control the PAPI light arrays located within the overruns at each end of Runway 17/35, the east end of Runway 23/05, and the north end of Runway 20/02. PAPI is a system of lights arranged to provide visual descent guidance information during the orbiter's approach to the runway. The PAPI array is installed at the center of the runway and adjusts to allow for a glide slope of 16 to 21 degrees and is used as the outer glide slope reference. In good visibility conditions, the arrays can be used at ranges up to five miles by day and twenty miles by night.

The original PAPI arrays were replaced ca.2005 with the current PAPI arrays, manufactured by the Barrel Lighting Company in England. Located equidistant, the four individual units are housed in metal light housing assemblies mounted on three metal legs supported by a concrete pad. The housings are painted yellow. Each light unit consists of three high-intensity, 200 watt 6.6 Amp incandescent lamps, anodized aluminum reflectors, red color filters to split the beam, and precision-ground lenses.

2. CONDITION OF FABRIC

When documented in March 2012, the Precision Approach Path Indicator (PAPI) Control Building had been abandoned for over six months but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations. The primary prefabricated metal unit had been removed.

B. CONSTRUCTION

The PAPI Control Building featured prefabricated metal buildings on a concrete pad.

C. MECHANICAL/OPERATION

The PAPI Control Building featured electricity to power interior lights and electronic navigational equipment.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the PAPI Control Building.

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

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D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS

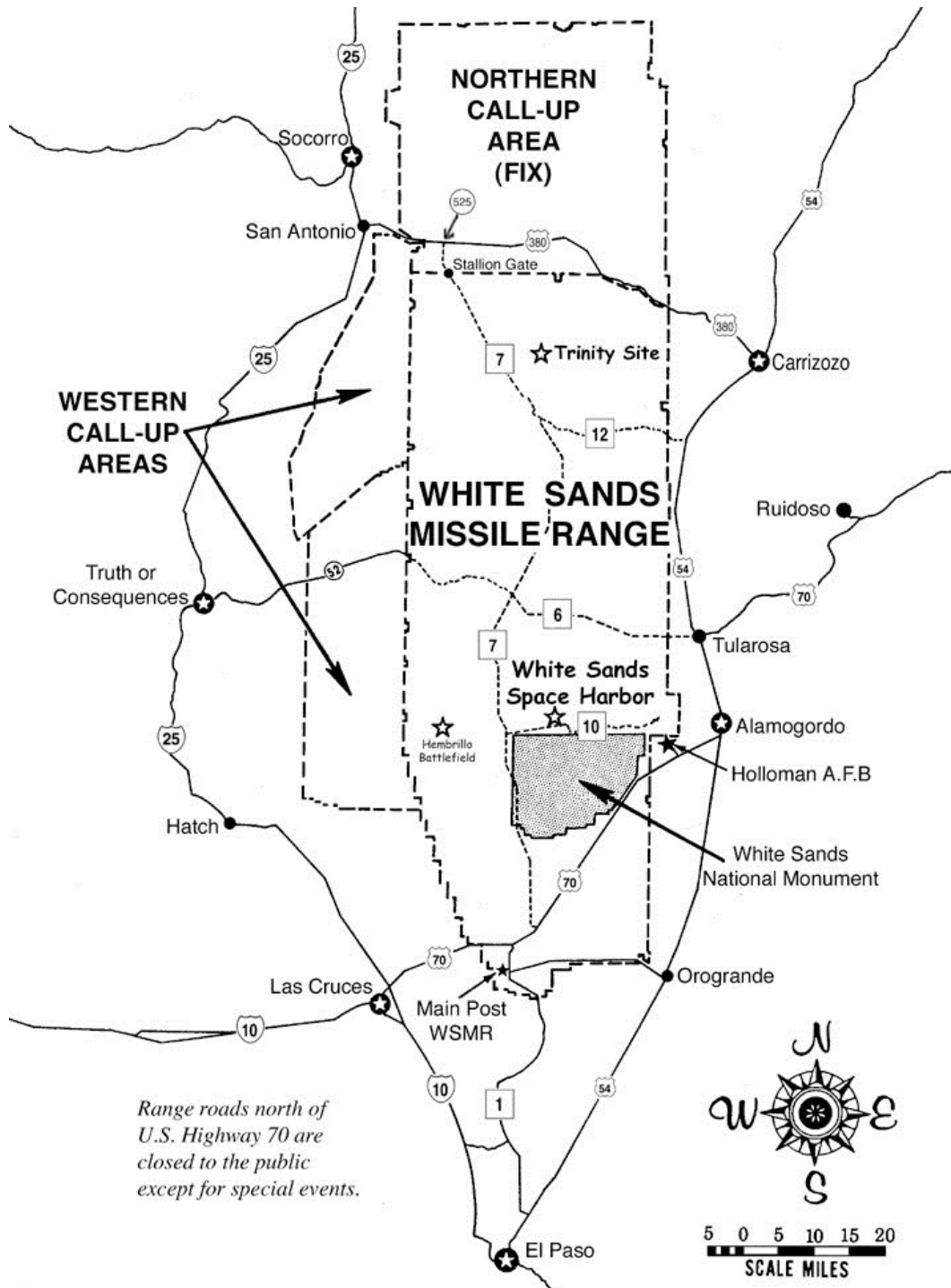


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

HISTORIC AMERICAN ENGINEERING RECORD

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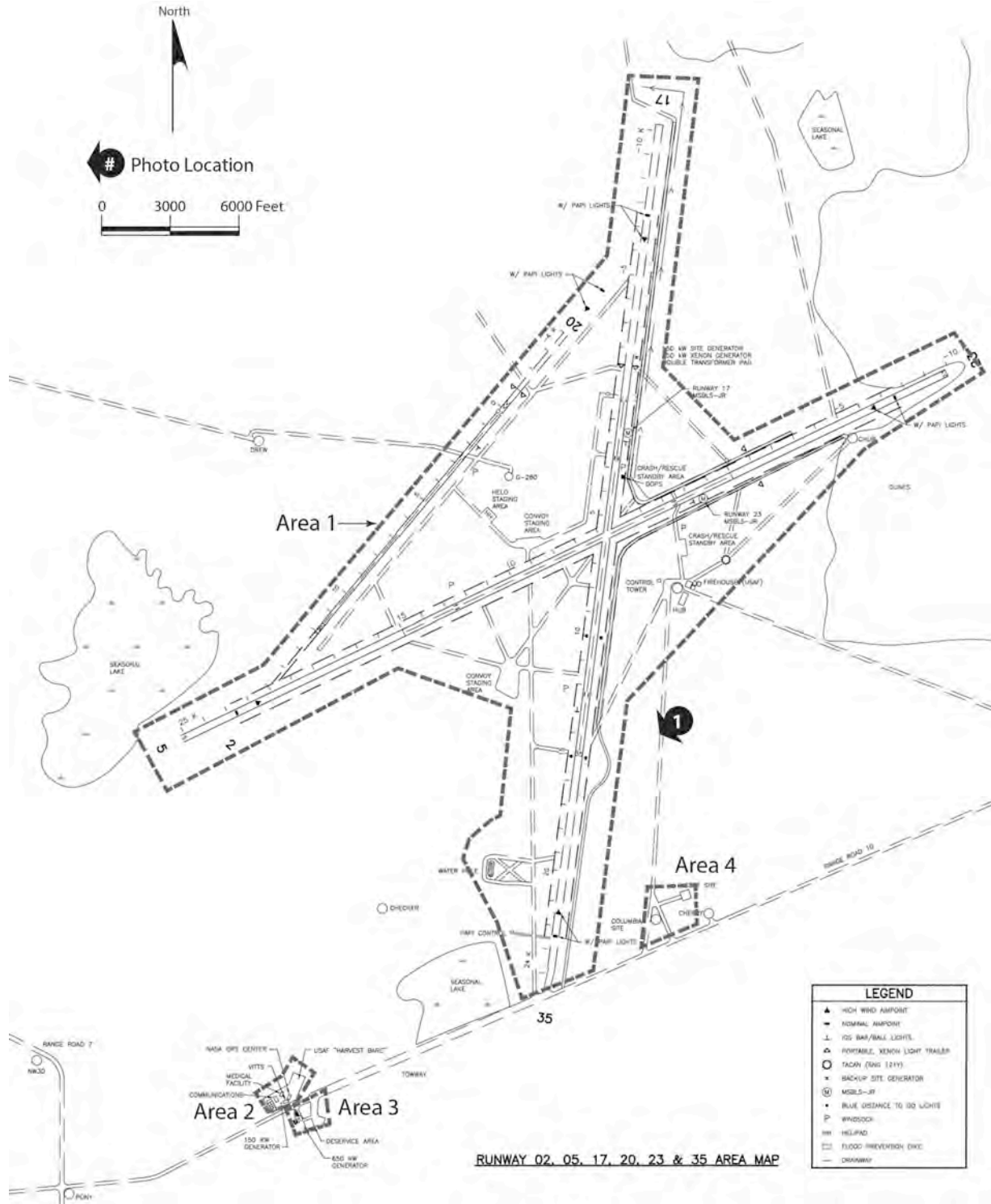
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-N
PAPI CONTROL BUILDING
(Space Shuttle Landing Facility Area 1, Precision Approach Path
Indicator Building)
White Sands Missile Range
East side of south end of Runway 17/35
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

NM-28-N-1 VIEW OF GENERATOR AND PAPI CONTROL STATION LOOKING
WEST, LOCATED ALONG ACCESS ROAD ON EAST SIDE OF
RUNWAY 17/35 AT SOUTH END.

WHITE SANDS SPACE HARBOR AREA 1, PAPI CONTROL BUILDING
 HAER No. NM-28-N
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WHITE SANDS SPACE HARBOR AREA 1,
XENON CONTROL TRAILERS

HAER No. NM-28-0

(Space Shuttle Landing Facility Area 1, Xenon Control Trailers)

White Sands Missile Range

Eastern end of Runway 23/05 (two trailers)

Nothern end of Runway 17/35 (two trailers)

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, XENON CONTROL TRAILERS
(Space Shuttle Landing Facility Area 1, Xenon Control Trailers)

HAER No. NM-28-0

Location: White Sands Missile Range
Eastern end of Runway 23/05 (two trailers)
Northern end of Runway 17/35 (two trailers)
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Xenon Control Trailers were an essential component of the White Sands Space Harbor (WSSH) from 1992-2011. They are considered to have national significance and are eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for their association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because they achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

WHITE SANDS SPACE HARBOR AREA 1, XENON CONTROL TRAILERS

HAER No. NM-28-0

(Page 3)

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Xenon Control Trailers were relocated to WSSH ca.1992.

2. ENGINEERS

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment and portable xenon lighting was removed from 2011-2012. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Twin portable trailers housing xenon lights were located at the north end of Runway 17/35 and the east end of Runway 23/05. Flanking either side of the runway 1,000' into the overrun, these twin units were repurposed semi-trailers that stored xenon navigational lights. Openings were created along the sides to allow the portable xenon lights to be protected from the weather when not in use. Metal stairs painted yellow allowed access to pedestrian entrances. The exteriors exhibited a red and white checkerboard paint scheme, which enhanced their visibility on the Alkali Flat. These semi-trailers were relocated to WSSH and installed around 1992. The portable xenon lights were removed from the trailers from 2011-2012.

High-intensity xenon lights illuminated the touchdown zone to support orbiter landings in darkness since the orbiter had no landing lights of its own. Each light trailer contained three xenon lights capable of producing 24,000,000 candelas. The lights also provided illumination of the reflective side, centerline, and distance-to-go markers. The light trailers were powered by their own generators.

2. CONDITION OF FABRIC

When documented in March 2012, the Xenon Control Trailers had been abandoned for over six months, but were in fair condition. The interior equipment had been removed and the exteriors were showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Xenon Control Trailers were repurposed semi-trailers.

C. MECHANICAL/OPERATION

The Xenon Control Trailers featured electricity to power interior lights and electronic navigational equipment.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Xenon Control Trailers.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. Historical views of the Xenon Control Trailers can be found on pages 17 and 18 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

D. BIBLIOGRAPHY

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PART IV. PROJECT INFORMATION

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NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

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¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, XENON CONTROL TRAILERS
HAER No. NM-28-0
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APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

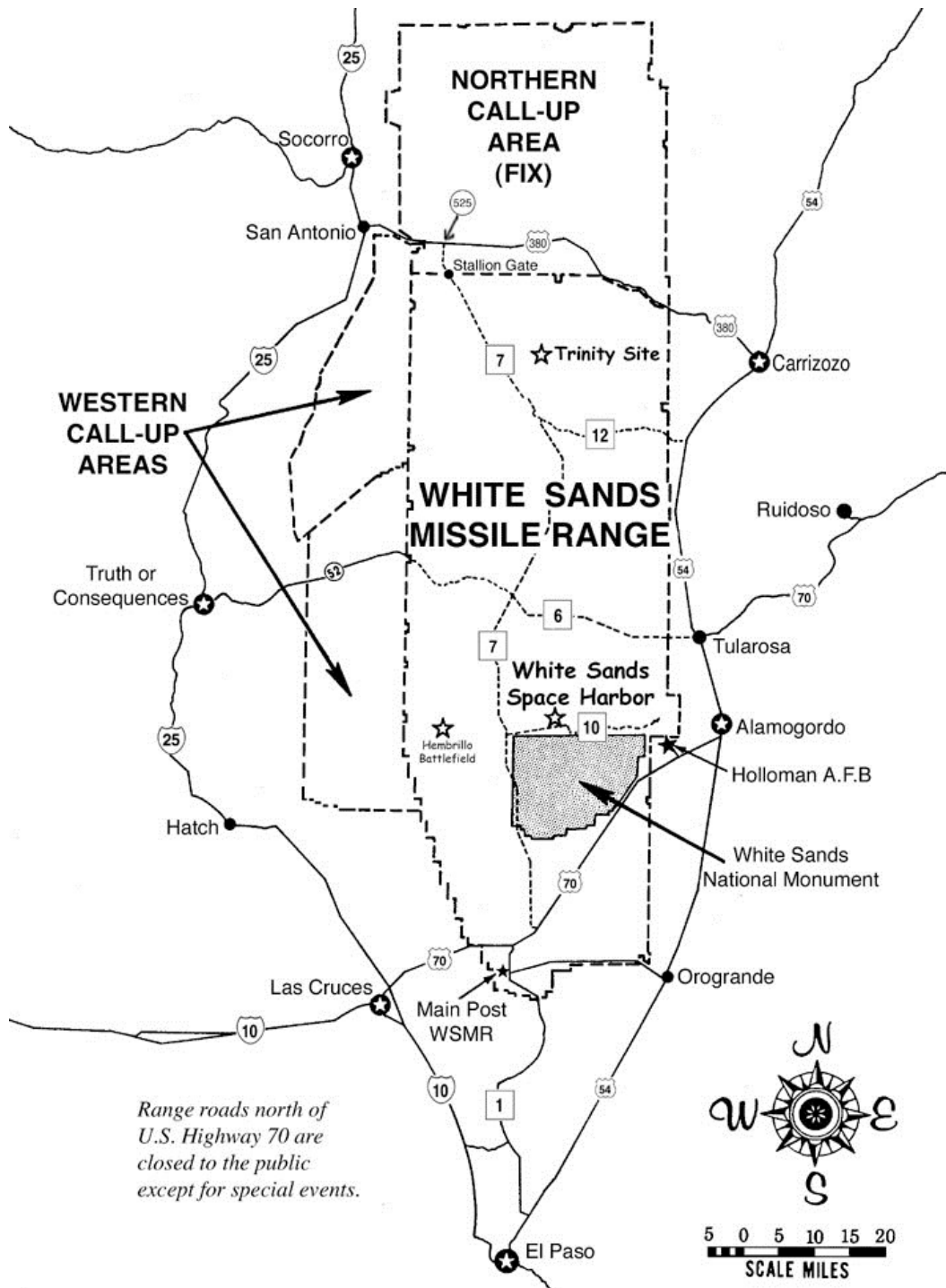


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

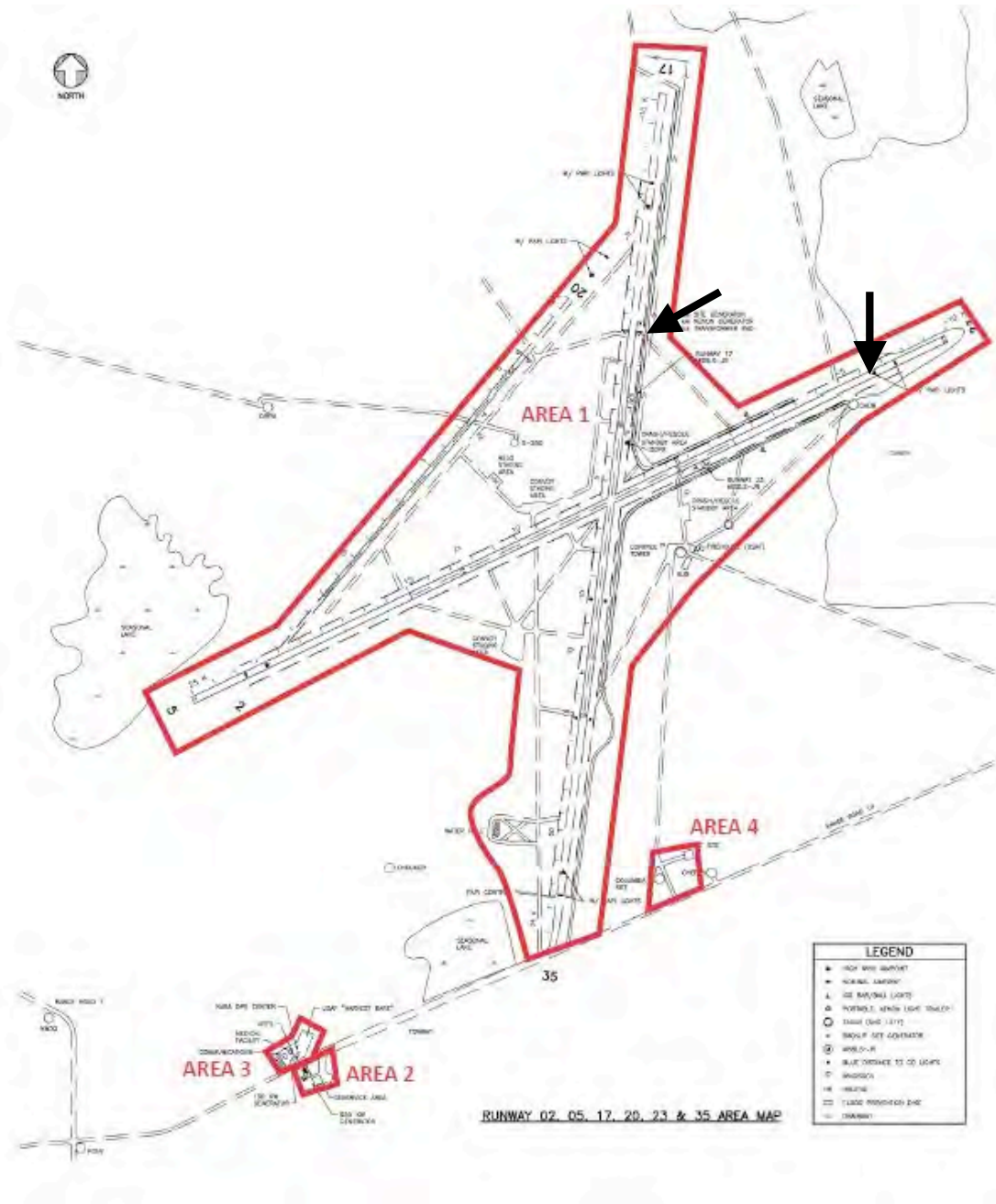


Figure 2. Map of WSSH showing location of the Xenon Control Trailers in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3. View of Xenon Control Trailer, Runway 17/35, looking northwest towards San Andres Mountains, December 2005 (Source: NASA WSTF).



Figure 4. View of Xenon Control Trailer, Runway 17/35, looking west towards San Andres Mountains, showing detached generator and transformer, July 2003 (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-0
XENON CONTROL TRAILERS
(Space Shuttle Landing Facility Area 1, Xenon Control Trailers)
White Sands Missile Range
Eastern end of Runway 23/05 (two trailers)
Northern end of Runway 17/35 (two trailers)
White Sands vicinity
Doña Ana County
New Mexico

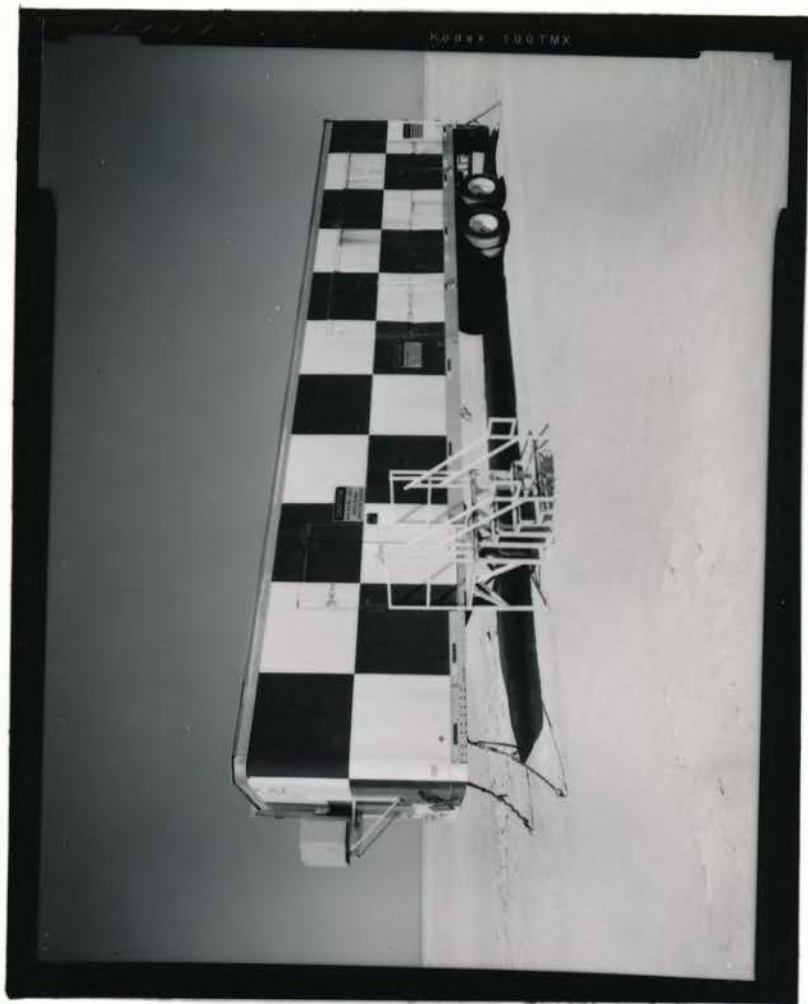
David Diener, Photographer March 27-29, 2012

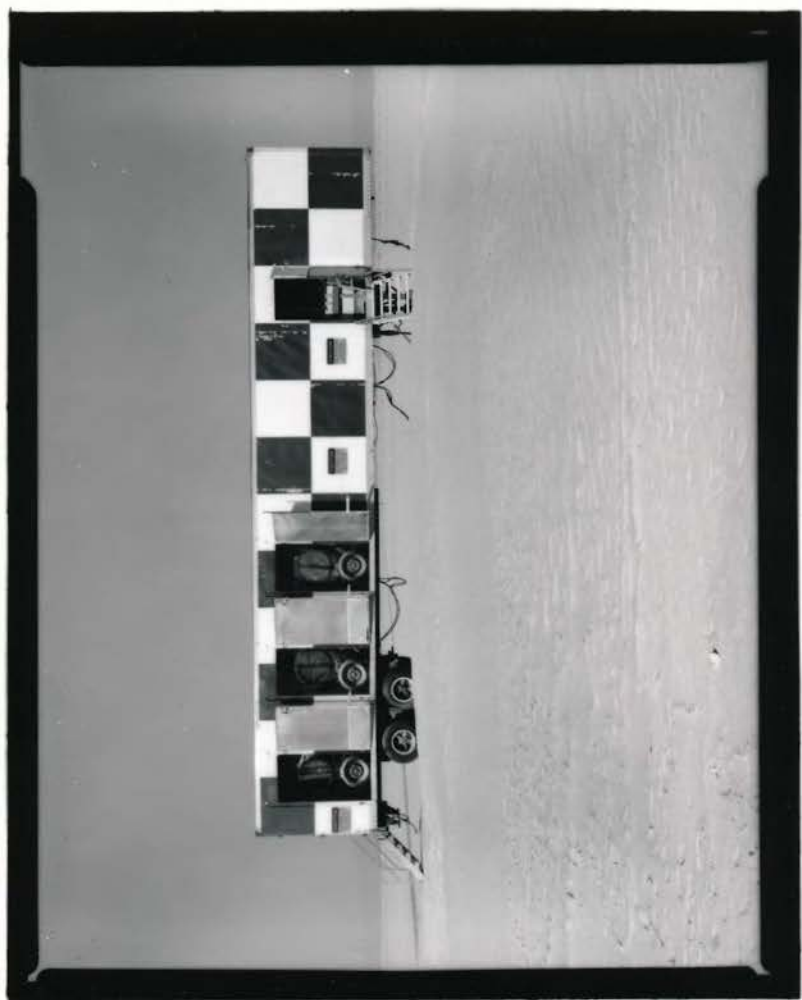
NM-28-0-1 VIEW OF TYPICAL XENON CONTROL TRAILER, LOOKING EAST AT
NORTH END OF RUNWAY 17/35.

NM-28-0-2 VIEW OF TYPICAL XENON CONTROL TRAILER, LOOKING
NORTHEAST AT NORTH END OF RUNWAY 17/35.

NM-28-0-3 VIEW OF TYPICAL XENON CONTROL TRAILER, LOOKING
NORTHEAST AT EAST END OF RUNWAY 23/05.







WHITE SANDS SPACE HARBOR AREA 1,

HAER No. NM-28-P

MICROWAVE SCANNING BEAM LANDING GROUND STATIONS

(Space Shuttle Landing Facility Area 1, Microwave Scanning Beam
Landing Ground Stations)

White Sands Missile Range

1,500' to the south of the north end of Runway 17/35; 1,500' to the
west of the east end of Runway 23/05; and 1,500' southwest of the
northeast end of Runway 20/02.

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1,
MICROWAVE SCANNING BEAM LANDING GROUND STATIONS
(Space Shuttle Landing Facility Area 1, Microwave Scanning Beam
Landing Ground Stations)

HAER No. NM-28-P

Location: White Sands Missile Range
1,500' to the south of the north end of Runway 17/35;
1,500' to the west of the east end of Runway 23/05;
and 1,500' southwest of the northeast end of Runway
20/02.
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Microwave Scanning Beam Landing
Ground Stations were an essential component of the
White Sands Space Harbor (WSSH) from 1992-2011. They
are considered to have national significance and are
eligible for listing in the National Register of
Historic Places (NRHP) under Criterion A for their
association with the NASA Space Shuttle Program (SSP)
with a period of significance of 1976-2011. Because
they achieved significance within the past fifty
years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

WHITE SANDS SPACE HARBOR AREA 1, MICROWAVE SCANNING BEAM LANDING
GROUND STATIONS
HAER No. NM-28-P
(Page 3)

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Microwave Scanning Beam Landing Ground Stations were installed ca.1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

Each of the three runways at WSSH featured a Microwave Scanning Beam Landing Ground Station (NASA Inventory #62-67), which housed the Microwave Scanning Beam Landing System (MSBLS) that guided the Space Shuttle orbiter's final landing approach. Each station contained rectangular, flanking buildings on concrete pads. The stations were located 1,500' to the south of the north end of Runway 17/35; 1,500' to the west of the east end of Runway 23/05; and 1,500' southwest of the northeast end of Runway 20/02.

The MSBLS was a Ku-band precision approach and landing navigational aid that provided slant range, azimuth, and elevation data to the orbiter from approximately 18,000' altitude, 15-nautical miles range, through touchdown. One of the units housed equipment for monitoring elevation and one for azimuth and distance; this information was broadcast by a rapidly oscillating antenna. Equipment onboard the orbiter received the data from the Microwave Scanning Beam Landing Ground Stations and automatically made any needed adjustments to glide slope.

The Microwave Scanning Beam Landing Ground Stations were prefabricated units featuring air conditioning units on the east elevations; metal entrance doors on the south elevations; and metal vents on the north elevations. The exteriors were painted with a red and white checkerboard scheme to enhance visibility on the Alkali Flat. The majority of all the MSBLS equipment was removed in 2011.

One of three Windbirds monitored by the U.S. Army is located southeast of the Microwave Scanning Beam Landing Ground Station on Runway 17/35. Additional Windbirds were located at the south end of Runway 17/35 and the east end of Runway 23/05.

2. CONDITION OF FABRIC

When documented in March 2012, the Microwave Scanning Beam Landing Ground Stations had been abandoned for over six months, but were in fair condition. The interior equipment had been removed and the exteriors were showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Microwave Scanning Beam Landing Ground Stations were prefabricated metal buildings on concrete pads.

C. MECHANICAL/OPERATION

The Microwave Scanning Beam Landing Ground Stations featured electricity to power interior lights, electronic navigational equipment, and wall-mounted Air Conditioning units.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Microwave Scanning Beam Landing Ground Stations.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A 2010 view of a Microwave Scanning Beam Landing Ground Station can be found on page 17 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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WHITE SANDS SPACE HARBOR AREA 1, MICROWAVE SCANNING BEAM LANDING
GROUND STATIONS
HAER No. NM-28-P
(Page 14)

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

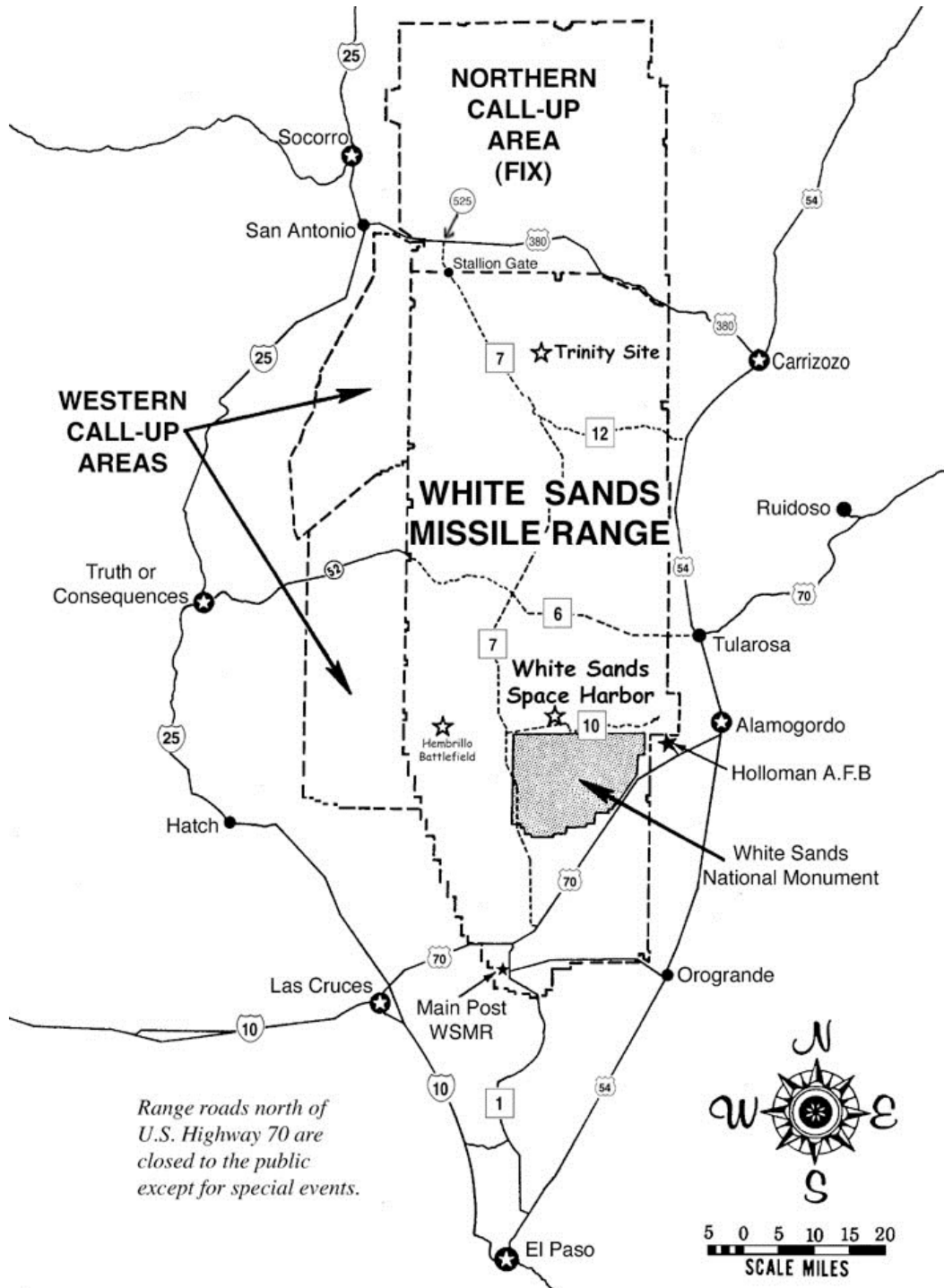


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

WHITE SANDS SPACE HARBOR AREA 1, MICROWAVE SCANNING BEAM LANDING
 GROUND STATIONS
 HAER No. NM-28-P
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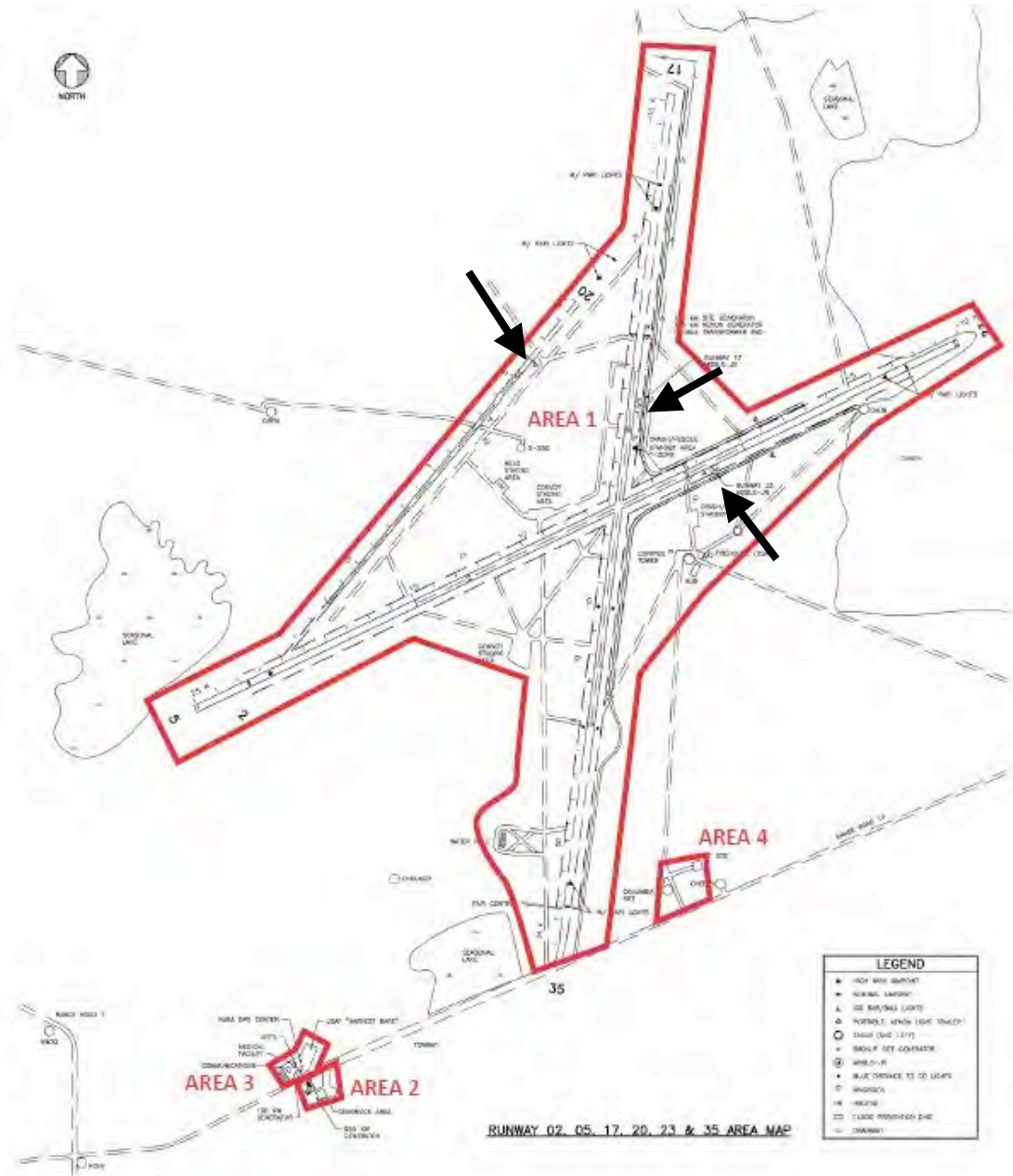


Figure 2. Map of WSSH showing location of the Microwave Scanning Beam Landing Ground Stations in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 3. View of Microwave Scanning Beam Landing System Ground Station and Xenon Light Trailer at north end of Runway 17/35, looking northwest, during training exercise in 2010 (Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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MICROWAVE SCANNING BEAM LANDING GROUND STATIONS
(Space Shuttle Landing Facility Area 1, Microwave Scanning Beam
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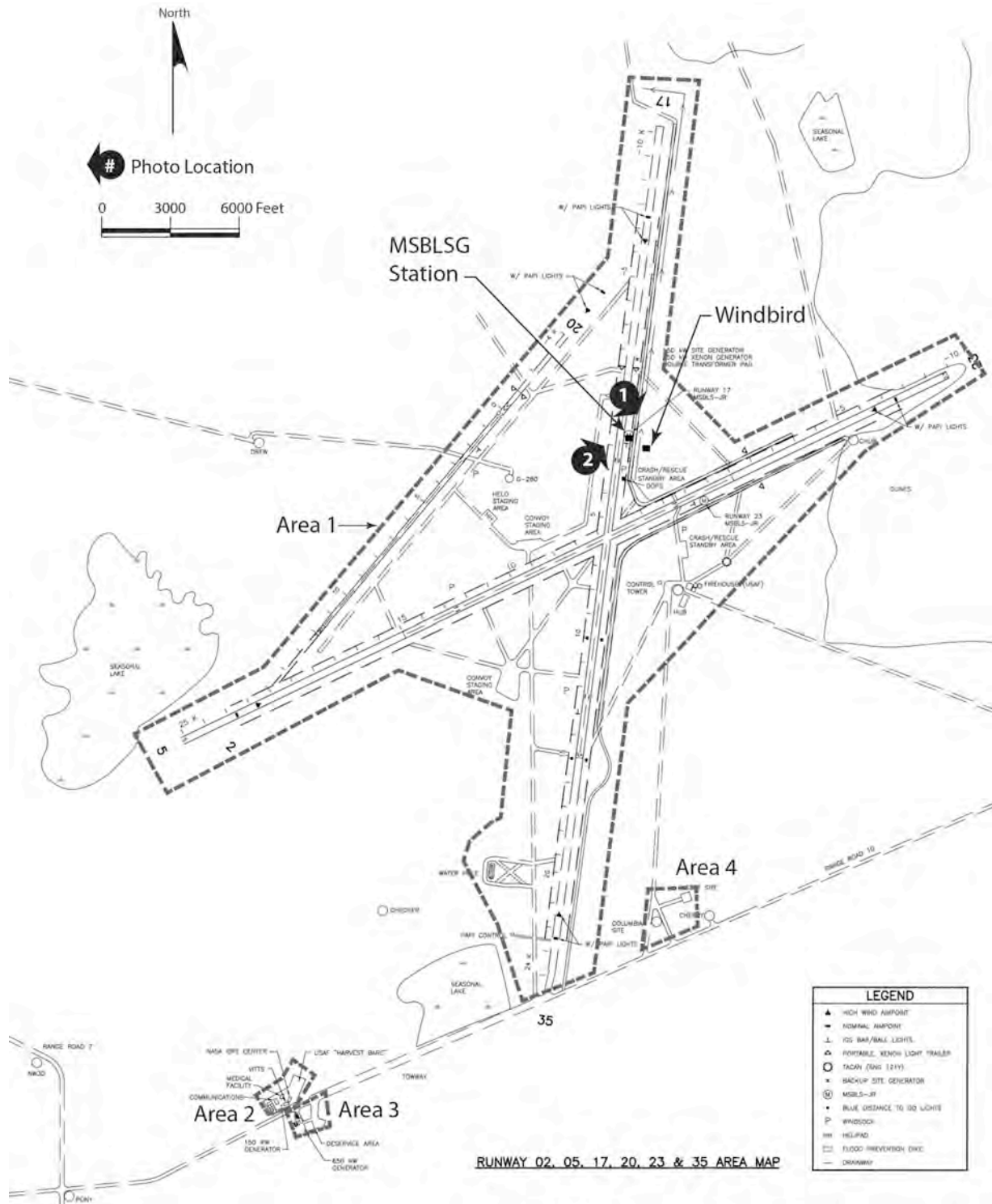
David Diener, Photographer

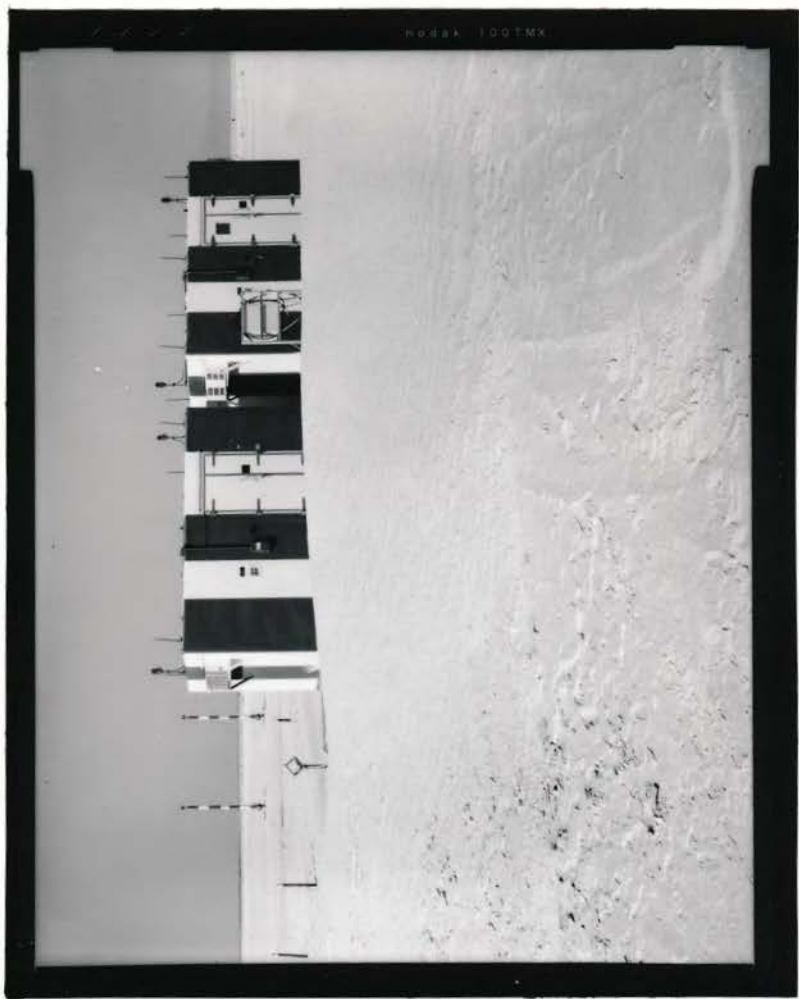
March 27-29, 2012

NM-28-P-1 VIEW OF TYPICAL MICROWAVE SCANNING BEAM LANDING SYSTEM
GROUND STATION, LOOKING NORTH ON EAST SIDE OF
RUNWAY 17/35 APPROXIMATELY 1-MILE NORTH OF THE
INTERSECTION WITH RUNWAY 23/05.

NM-28-P-2 VIEW OF WSMR WINDBIRD AT MICROWAVE SCANNING BEAM
LANDING SYSTEM GROUND STATION, LOOKING SOUTHEAST ON
EAST SIDE OF RUNWAY 17/35 APPROXIMATELY 1-MILE NORTH
OF THE INTERSECTION WITH RUNWAY 23/05.

WHITE SANDS SPACE HARBOR AREA 1, MICROWAVE SCANNING BEAM LANDING
 GROUND STATIONS
 HAER No. NM-28-P
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WHITE SANDS SPACE HARBOR AREA 1,
CRASH/RESCUE STANDBY SUPPORT GPS BUILDINGS

HAER No. NM-28-Q

(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Support
GPS Buildings)

White Sands Missile Range

East side of Runway 17/35, approximately 2,650 feet north of
intersection with Runway 23/05

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY
SUPPORT GPS BUILDINGS

(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Support
GPS Buildings)

HAER No. NM-28-Q

Location: White Sands Missile Range
East side of Runway 17/35, approximately 2,650' north
of intersection with Runway 23/05
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983.

Construction: ca.1992

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Crash/Rescue Standby Support GPS Buildings were an
essential component of the White Sands Space Harbor
(WSSH) from 1992-2011. It is considered to have
national significance and is eligible for listing in
the National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA Space
Shuttle Program (SSP) with a period of significance of
1976-2011. Because it achieved significance within
the past fifty years, Criterion Consideration G also
applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY SUPPORT GPS
BUILDINGS
HAER No. NM-28-Q
(Page 3)

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Crash/Rescue Standby Support GPS Buildings were installed ca.1992.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Crash/Rescue Standby Support GPS Buildings include a rectangular, prefabricated portable steel trailer on a concrete pad, as well as a square, prefabricated metal building. Both were used to store crash/rescue and GPS equipment. A GPS antenna is located in the southwest corner where the two buildings adjoin. Both were installed around 1992. Both featured solid metal doors and featured a red and white checkerboard paint scheme. The facility was vacated in 2011.

2. CONDITION OF FABRIC

When documented in March 2012, the Crash/Rescue Standby Support GPS Buildings had been abandoned for over six months, but were in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Crash/Rescue Standby Support GPS Buildings consisted of two prefabricated metal buildings on concrete pads.

C. MECHANICAL/OPERATION

The Crash/Rescue Standby Support GPS Buildings featured electricity to power interior lights, electronic navigational equipment, and a wall-mounted Air Conditioning unit.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the
Crash/Rescue Standby Support GPS Buildings.

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this
documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011
and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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- Paczynski, Alex S. "NASA Johnson Space Center Facilities Oral History Project: Alex S. Paczynski, Interviewed by Jennifer Ross-Nazzal." Las Cruces, New Mexico, August 10, 2009.
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<http://www.holloman.af.mil/library/factsheets/factsheet.asp?id=4361>, accessed November 17, 2011.
- United States Army. "Final Environmental Impact Statement for Development and Implementation of Range-Wide Mission and Major Capabilities at White Sands Missile Range, New Mexico: Volume 1, 2009. On file at WSMR, White Sands, New Mexico.
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D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY SUPPORT GPS
BUILDINGS
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APPENDIX- LOCATION MAPS

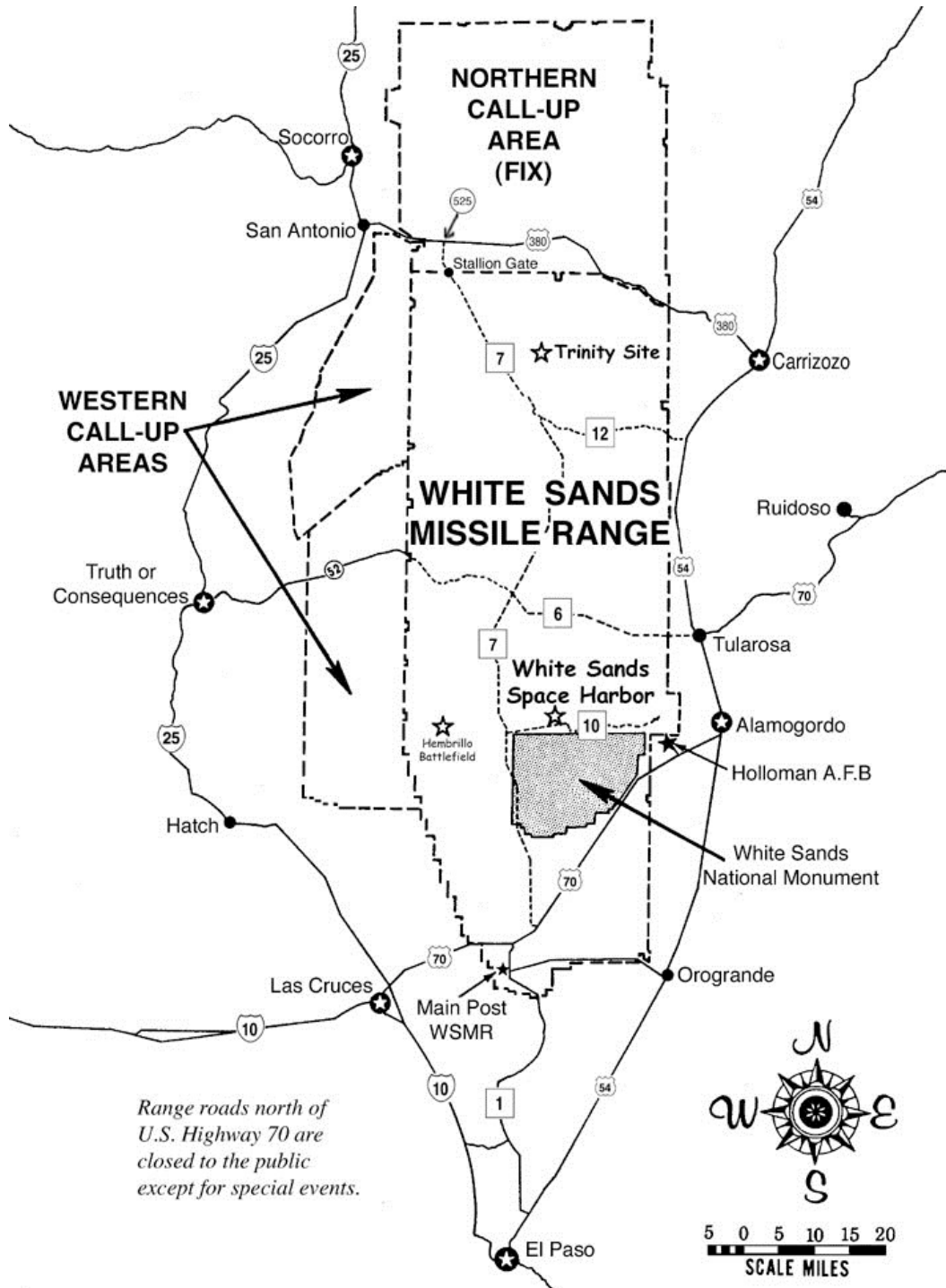


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

HISTORIC AMERICAN ENGINEERING RECORD

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WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-Q
CRASH/RESCUE STANDBY SUPPORT GPS BUILDINGS
(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Support
GPS Buildings)

White Sands Missile Range

East side of Runway 17/35, approximately 2,650 feet north of
intersection with Runway 23/05

White Sands vicinity

Doña Ana County

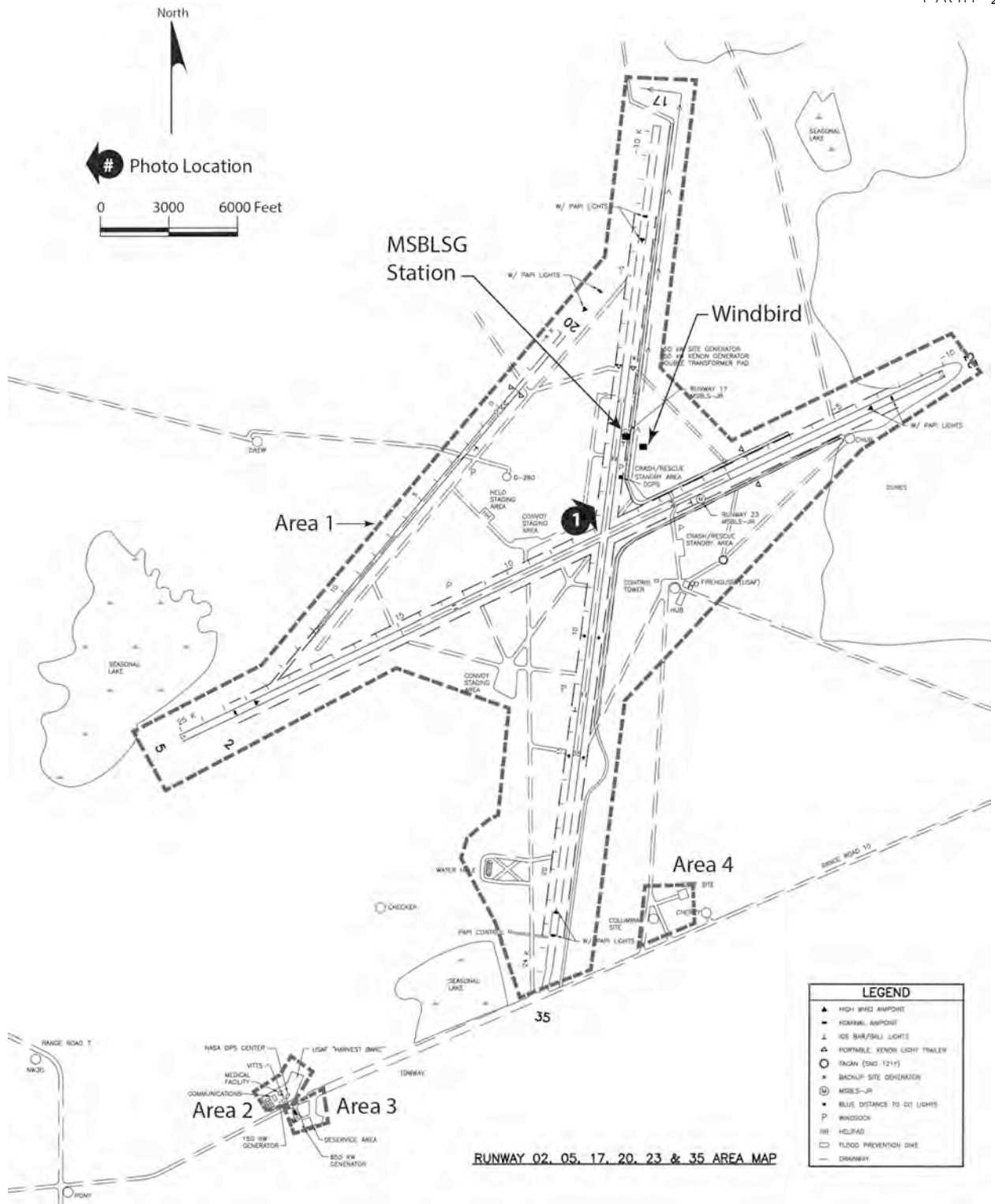
New Mexico

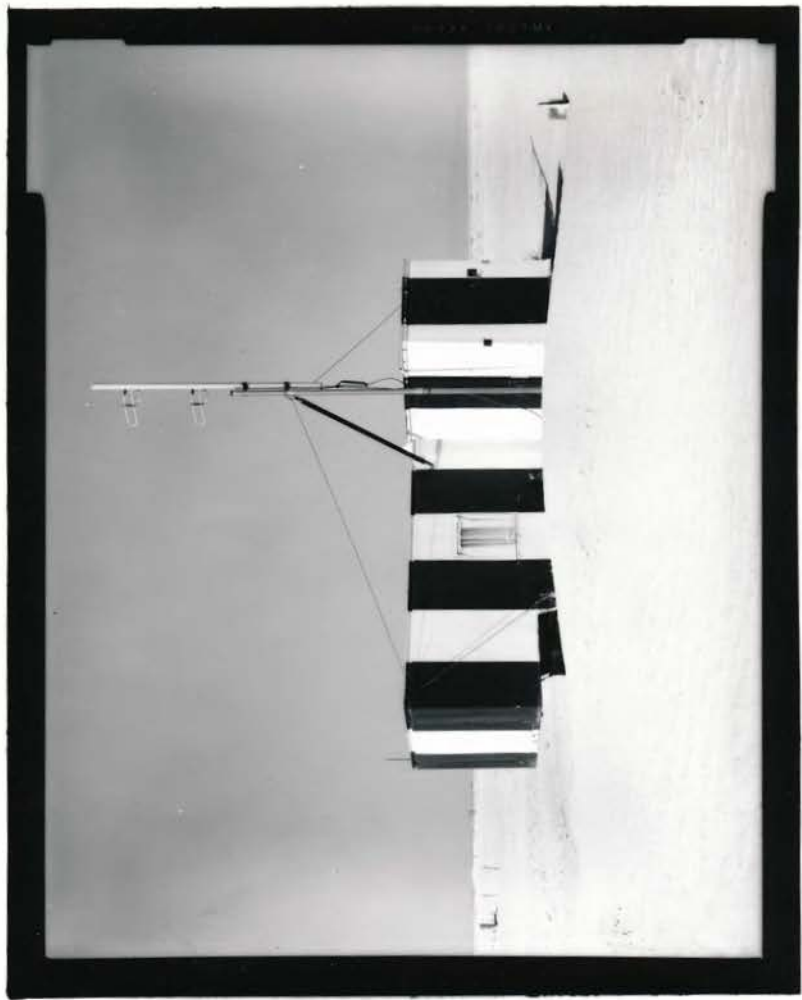
David Diener, Photographer

March 27-29, 2012

NM-28-Q-1 VIEW OF CRASH/RESCUE STANDBY SUPPORT GPS BUILDINGS,
LOOKING NORTHEAST ON EAST SIDE OF RUNWAY 17/35
APPROXIMATELY ½-MILE NORTH OF THE INTERSECTION WITH
RUNWAY 23/05.

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY SUPPORT GPS BUILDINGS
 HAER No. NM-28-Q
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WHITE SANDS SPACE HARBOR AREA 1,
CRASH/RESCUE STANDBY AREA TRAILER

HAER No. NM-28-R

(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Area
Trailer)

White Sands Missile Range

East side of Runway 17/35, adjacent to Crash/Rescue Standby Support
GPS Buildings

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY AREA TRAILER
(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Area
Trailer)

HAER No. NM-28-R

Location: White Sands Missile Range
East side of Runway 17/35, adjacent to Crash/Rescue
Standby Support GPS Facility
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1995

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Crash/Rescue Standby Area Trailer was an essential
component of the White Sands Space Harbor (WSSH) from
1992-2011. It is considered to have national
significance and is eligible for listing in the
National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA Space
Shuttle Program (SSP) with a period of significance of
1976-2011. Because it achieved significance within
the past fifty years, Criterion Consideration G also
applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Crash/Rescue Standby Area Trailer was installed ca.1995.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Crash/Rescue Standby Area Trailer is a rectangular, prefabricated steel portable trailer on a concrete pad used for storing crash/rescue and GPS equipment. The trailer was manufactured by Jackson Mfg., Inc., of Chickasha, Oklahoma. Facing east, the metal hitch is located at the north elevation and a solid pedestrian door on the east elevation. Tinted glass windows are located on the north, east, and west elevations. Generators and electrical transformers housed in detached, prefabricated metal structures are located to the east alongside the access road.

2. CONDITION OF FABRIC

When documented in March 2012, the Crash/Rescue Standby Area Trailer was had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Crash/Rescue Standby Area Trailer is a prefabricated trailer on a concrete pad.

C. MECHANICAL/OPERATION

The Crash/Rescue Standby Area Trailer featured electricity to power interior lights, electronic navigational equipment, and a wall-mounted air conditioning unit.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Crash/Rescue Standby Area Trailer.

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

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D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY AREA TRAILER
HAER No. NM-28-R
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APPENDIX- LOCATION MAPS

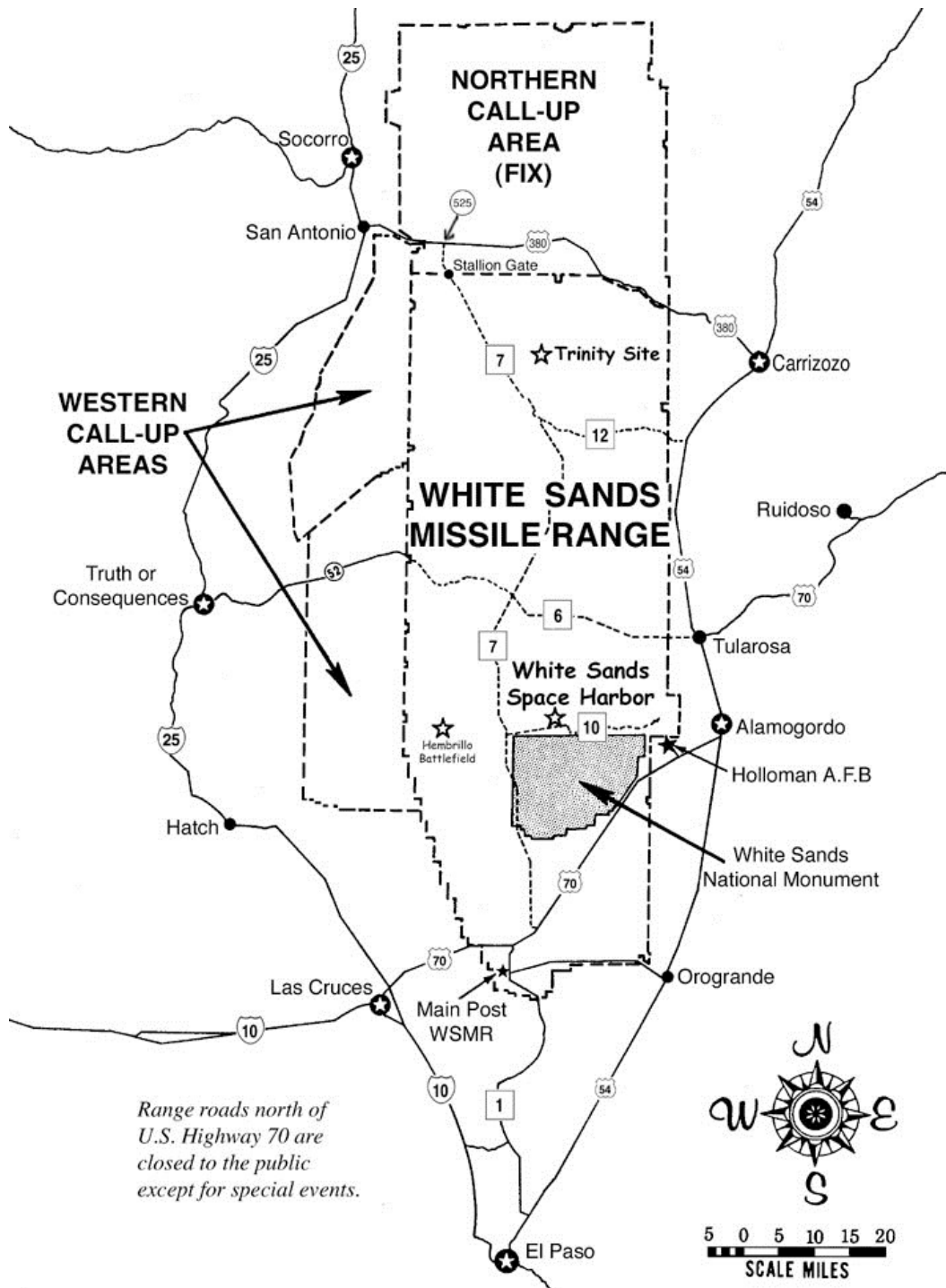


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

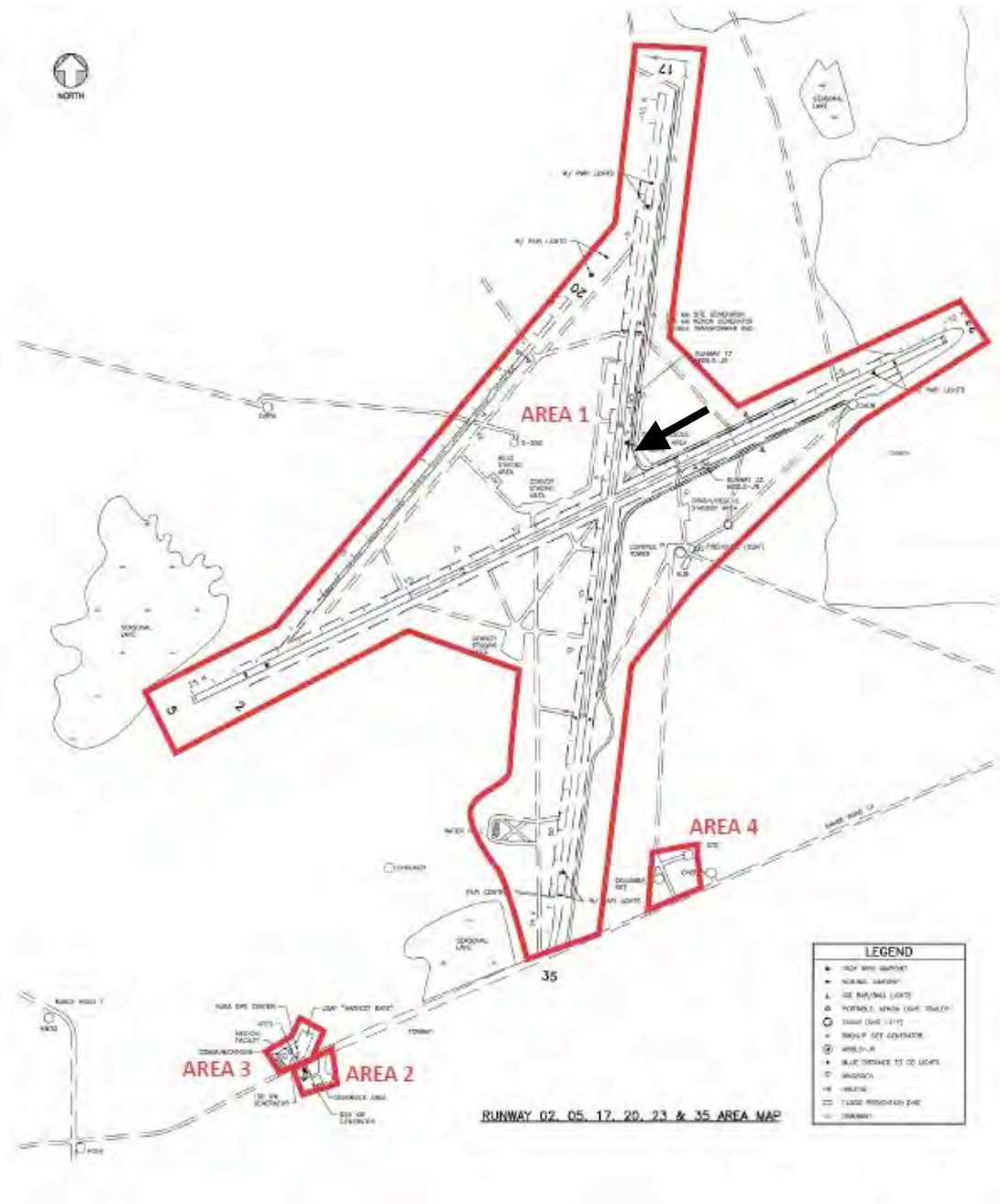


Figure 2. Map of WSSH showing location of the Crash/Rescue Standby Area Trailer in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

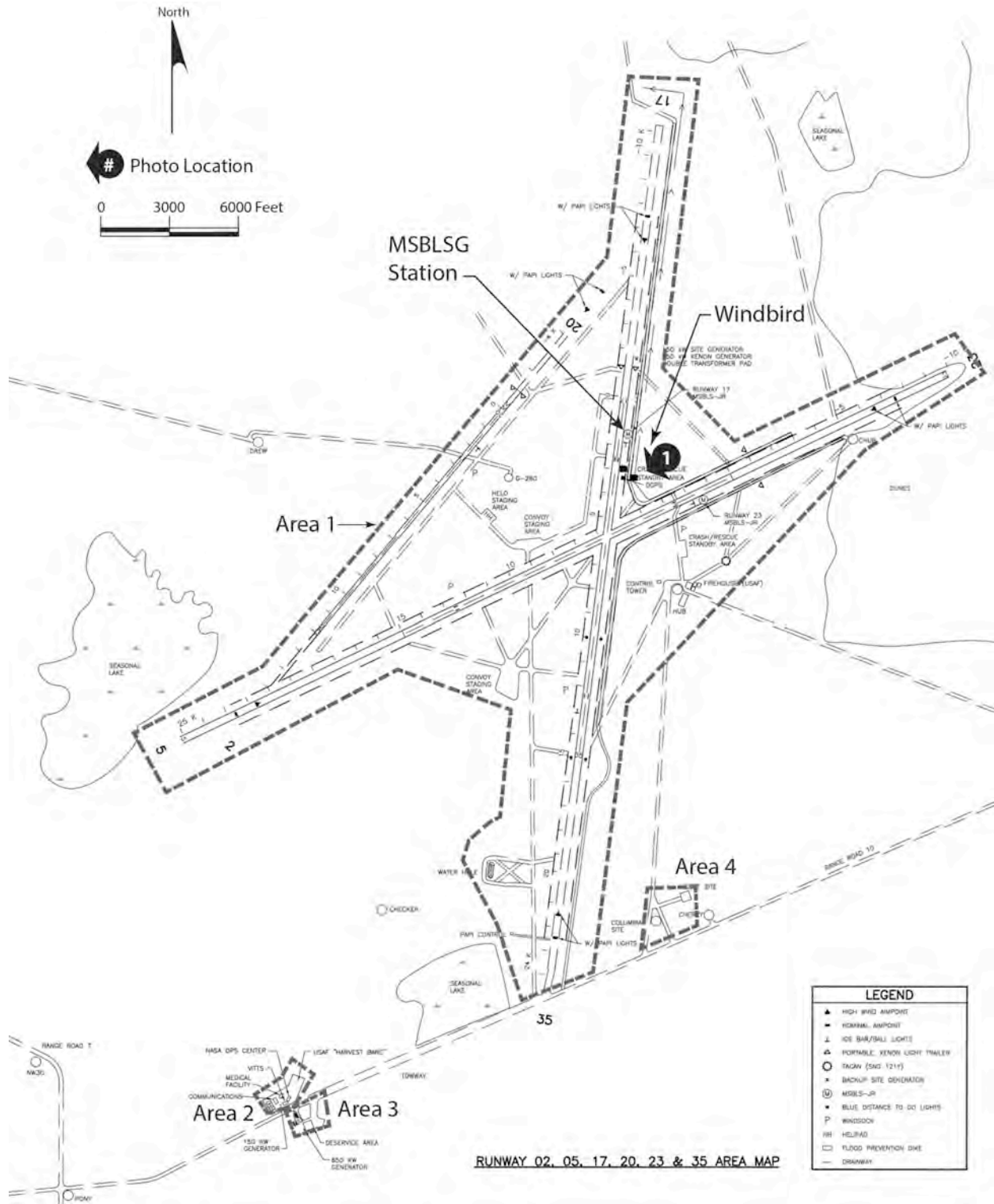
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-R
CRASH/RESCUE STANDBY AREA TRAILER
(Space Shuttle Landing Facility Area 1, Crash/Rescue Standby Area
Trailer)
White Sands Missile Range
East side of Runway 17/35, adjacent to Crash/Rescue Standby Support
GPS Buildings
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

NM-28-R-1 VIEW OF CRASH/RESCUE STANDBY AREA TRAILER AND
GENERATOR, LOOKING SOUTHWEST ON EAST SIDE OF
RUNWAY 17/35 APPROXIMATELY ½-MILE NORTH OF THE
INTERSECTION WITH RUNWAY 23/05.

WHITE SANDS SPACE HARBOR AREA 1, CRASH/RESCUE STANDBY AREA TRAILER
 HAER No. NM-28-R
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WHITE SANDS SPACE HARBOR AREA 1,
TACAN BEACON STATION

HAER No. NM-28-S

(Space Shuttle landing Facility Area 1, TACAN Beacon Station)

White Sands Missile Range

Approximately 2,350' northeast of HUB Maintenance Facility along
access road

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, TACAN BEACON STATION
(Space Shuttle landing Facility Area 1, TACAN Beacon Station)

HAER No. NM-28-S

Location: White Sands Missile Range
Approximately 2,350' northeast of HUB Maintenance
Facility along access road
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: ca.1988

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Tactical Air Navigation (TACAN) Beacon Station was
an essential component of the White Sands Space Harbor
(WSSH) from 1988-2011. It is considered to have
national significance and is eligible for listing in
the National Register of Historic Places (NRHP) under
Criterion A for its association with the NASA Space
Shuttle Program (SSP) with a period of significance of
1976-2011. Because it achieved significance within
the past fifty years, Criterion Consideration G also
applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The TACAN Beacon Station was installed ca.1988.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All electronic equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The TACAN Beacon Station is housed in a prefabricated steel portable trailer located northeast of the HUB Maintenance Facility along an access road leading to the WSMR "Chub" site at the edge of the sand dunes. Installed on a concrete pad around 1988, the exterior of the Basic-Hydro Pneumatic Trailer was covered with spray foam insulation. The trailer was manufactured by Douglas Aircraft Co., Inc., of Santa Monica, California, under contract to the U.S. Air Force.

The trailer housed the Tactical Air Navigation (TACAN) equipment. TACAN is a worldwide air traffic navigation system operated by the Department of Defense and used by civilian and military aircraft. The TACAN signal ranges to 300 nautical miles and was received by the orbiter when it emerged from the reentry blackout period. TACAN ground installations such as this, known as beacons, provided an L-band (1 gigahertz) signal that indicated the range and magnetic bearing angle from the TACAN antenna to the user. The facility was vacated in 2011.

2. CONDITION OF FABRIC

When documented in March 2012, the TACAN Beacon Station had been abandoned for over six months, but was in fair condition. The interior equipment had been removed and the exterior was showing signs of neglect due to the harsh desert environment, which requires that facilities are constantly maintained and repaired due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The TACAN Beacon Station is a prefabricated trailer on a concrete pad.

C. MECHANICAL/OPERATION

The TACAN Beacon Station featured electricity to power interior lights, electronic navigational equipment, and a wall-mounted air conditioning unit.

PART III. Sources of Information:

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the TACAN Beacon Station.

B. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and WSTF Facility Manager (1975-1989), June 2013.

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[http://www.bergen.org/AAST/Projects/Engineering Graphics/ E_G2000/flyingwing/history/jack.htm](http://www.bergen.org/AAST/Projects/Engineering_Graphics/E_G2000/flyingwing/history/jack.htm), accessed November 19, 2011.

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White Sands Missile Range. "White Sands Hall of Fame: Alex Paczynski." Published online, 2000. Website <http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx>, accessed September 19, 2011.

D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

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In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

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¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

WHITE SANDS SPACE HARBOR AREA 1, TACAN BEACON STATION
HAER No. NM-28-S
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APPENDIX- LOCATION MAPS

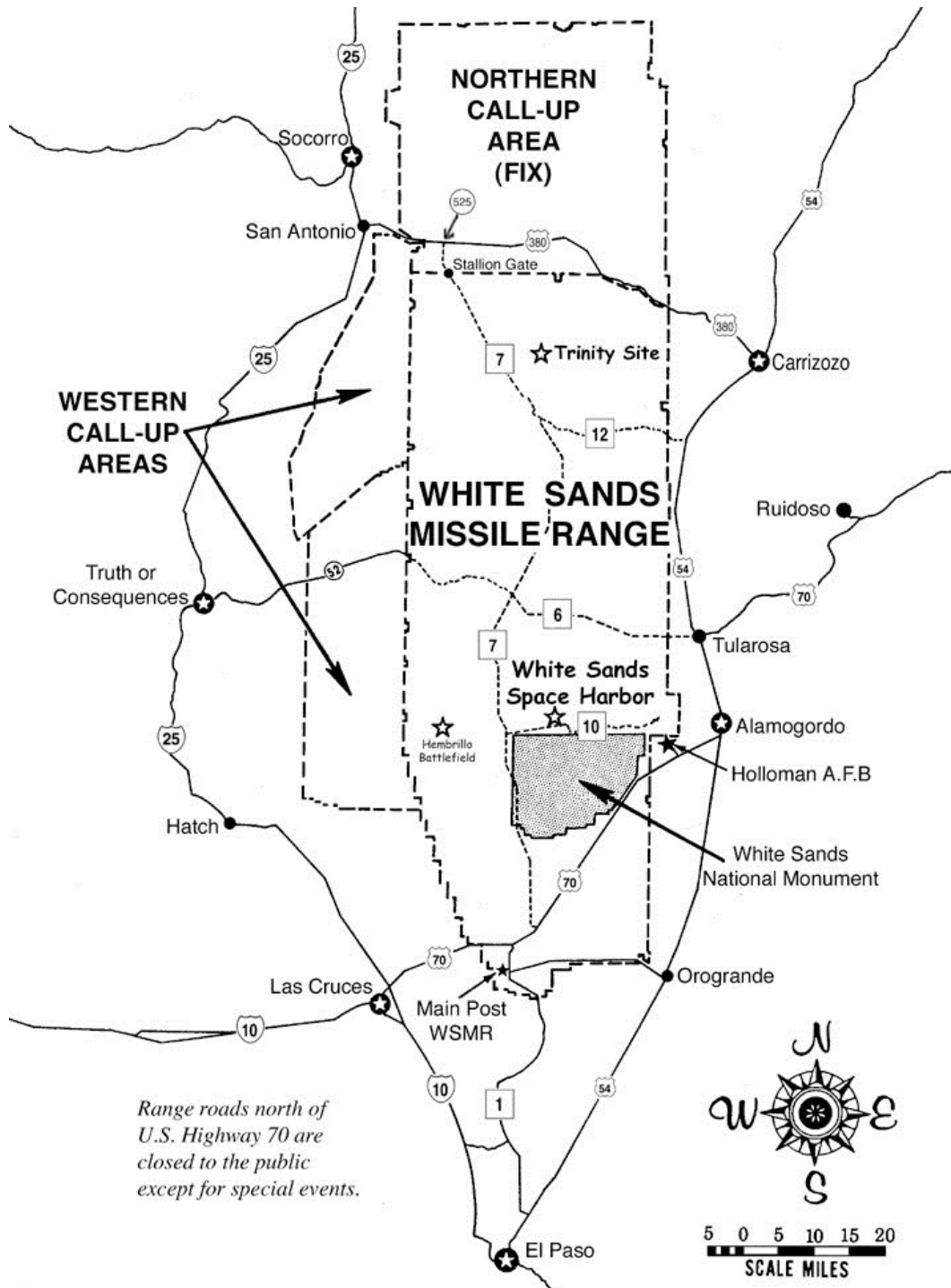


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

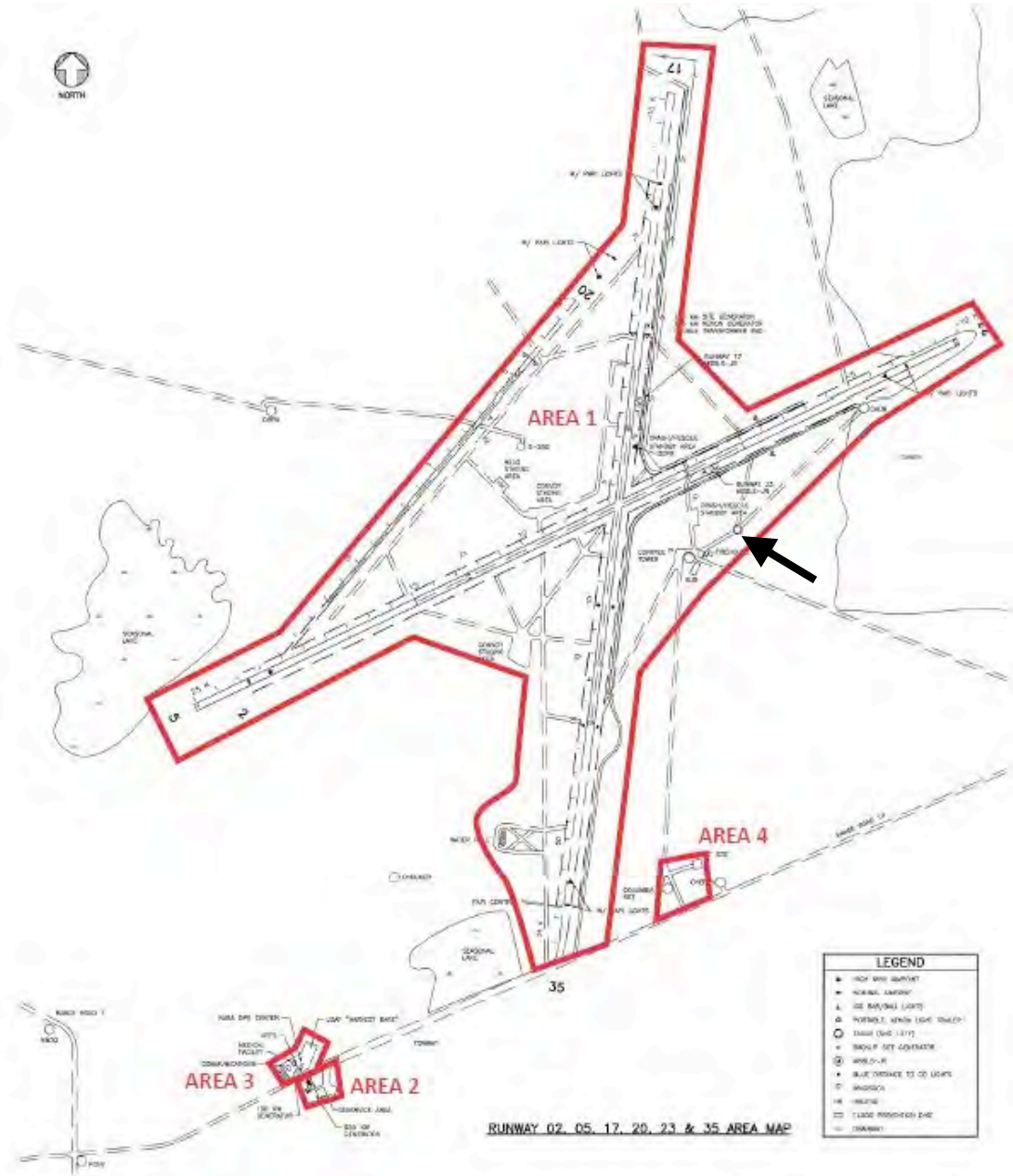


Figure 2. Map of WSSH showing location of the TACAN Beacon Station in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).

HISTORIC AMERICAN ENGINEERING RECORD

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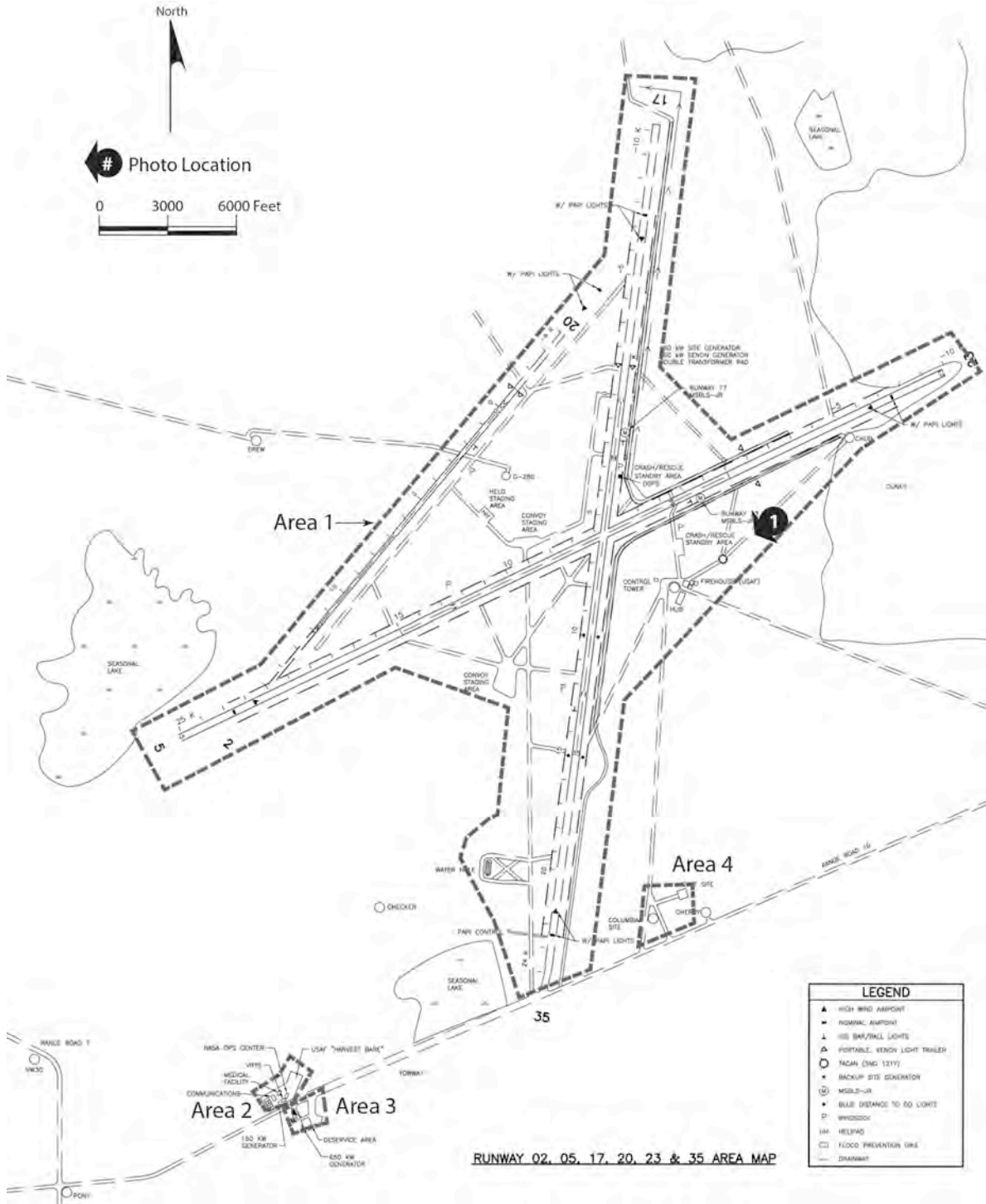
WHITE SANDS SPACE HARBOR AREA 1, HAER No. NM-28-S
TACAN BEACON STATION
(Space Shuttle landing Facility Area 1, TACAN Beacon Station)
White Sands Missile Range
Approximately 2,350' northeast of HUB Maintenance Facility along
access road
White Sands vicinity
Doña Ana County
New Mexico

David Diener, Photographer

March 27-29, 2012

NM-28-S-1 VIEW OF TACAN BEACON STATION, LOOKING SOUTHWEST
TOWARDS THE HUB COMPLEX AND SAN ANDRES MOUNTAIN RANGE.

WHITE SANDS SPACE HARBOR AREA 1, TACAN BEACON STATION
 HAER No. NM-28-S
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WHITE SANDS SPACE HARBOR AREA 1, WATERHOLE

HAER No. NM-28-T

(Space Shuttle Landing Facility Area 1, Waterhole)

White Sands Missile Range

West corner of Runway 17/35, approximately 4,000 feet from Range Road 10

White Sands vicinity

Doña Ana County

New Mexico

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
U.S. Department of the Interior
Intermountain Regional Office
12795 Alameda Parkway
Denver, CO 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1, WATERHOLE
(Space Shuttle Landing Facility Area 1, Waterhole)

HAER No. NM-28-T

Location: White Sands Missile Range
West corner of Runway 17/35, approximately 4,000 feet
from Range Road 10
White Sands vicinity
Doña Ana County
New Mexico

U.S.G.S. 7.5 Minute Las Cruces, New Mexico,
Quadrangle, Universal Transverse Mercator Coordinates
(center of runways): E 32.944408 N 106.41993 Zone 13S,
NAD 1983

Construction: 1988

Architect: Not known

Builder: Not known

Present Owner: Commander, U.S. Army White Sands Missile Range,
New Mexico 88002-5018

Present Use: Vacant

Significance: The Waterhole was a component of the White Sands Space Harbor (WSSH) from 1988-2011. Playing a minor support role at WSSH, this structure is a non-contributing resource within the WSSH Shuttle Landing Facility District, which is eligible for listing in the National Register of Historic Places (NRHP) under Criterion A for its association with the NASA Space Shuttle Program (SSP) with a period of significance of 1976-2011. Because the district achieved significance within the past fifty years, Criterion Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian
New South Associates
118 South 11th Street
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY

1. DATE OF CONSTRUCTION

The Waterhole was constructed in 1988.

2. ENGINEER

Not known.

3. BUILDER/CONTRACTOR/SUPPLIER

Not known.

4. ORIGINAL PLANS

Not available.

5. ALTERATIONS AND ADDITIONS

All mechanical equipment was removed once the facility was vacated in 2011. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. CHARACTER

The Waterhole is located at the southwest corner of the southern end of Runway 17/35. This rectangular structure is a manmade water access facility dug in the gypsum desert floor. The rectangular-shaped hole measures approximately 80-feet by 400-feet. Elevated pumps were located at the southeast corner at the end of an access road. The water was pumped into trucks to be used during the compaction of the gypsum runways.

2. CONDITION OF FABRIC

When documented in March 2012, the Waterhole was inaccessible.

B. CONSTRUCTION

The Waterhole is a manmade water access facility.

C. MECHANICAL/OPERATION

The Waterhole featured a mechanical pumping station powered by portable generators.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

There are no known engineering plans or drawings of the Waterhole.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. Historic views of the Waterhole can be found on pages 16-18 of this document. All views are captioned and dated as available. The other historical data comes from a variety of sources cited in the Bibliography below.

The historic photographs and most of the historical data used in this documentation came from sources within WSTF and WSSH. Other more current imagery was obtained from the online WSTF Media Archive. Many of the original photographs have been donated to the WSMR Museum for digitization and curation. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and
WSTF Facility Manager (1975-1989), June 2013.

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E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and secondary sources. Sources that were not investigated that may contain secondary information are archived at NASA's Lyndon B. Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remain at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.¹

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contains a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle Landing Facility District. To mitigate the adverse effects, NASA

¹ Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army Whites Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 1998: 44-62. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.

APPENDIX- LOCATION MAPS AND HISTORICAL VIEWS

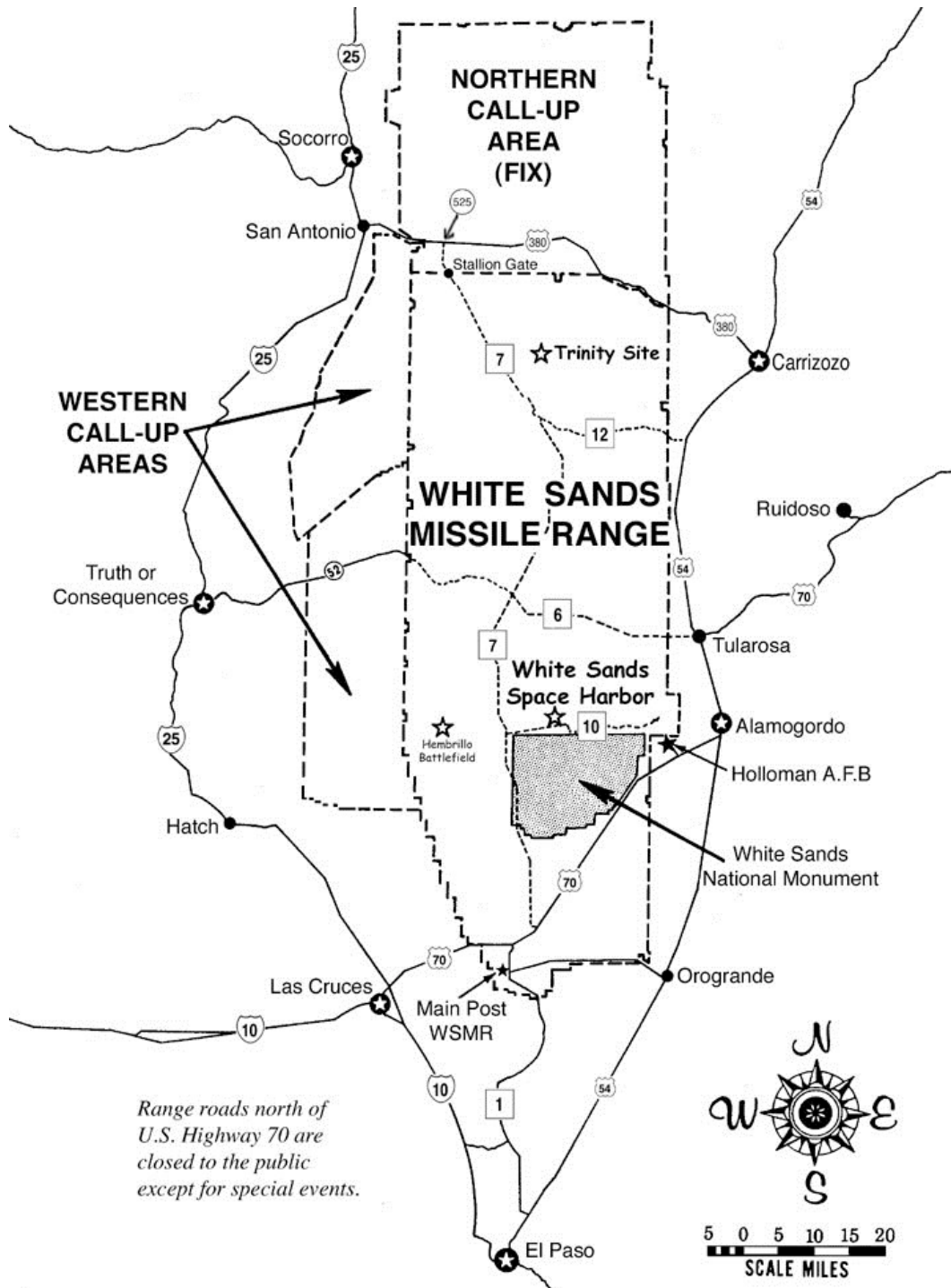


Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

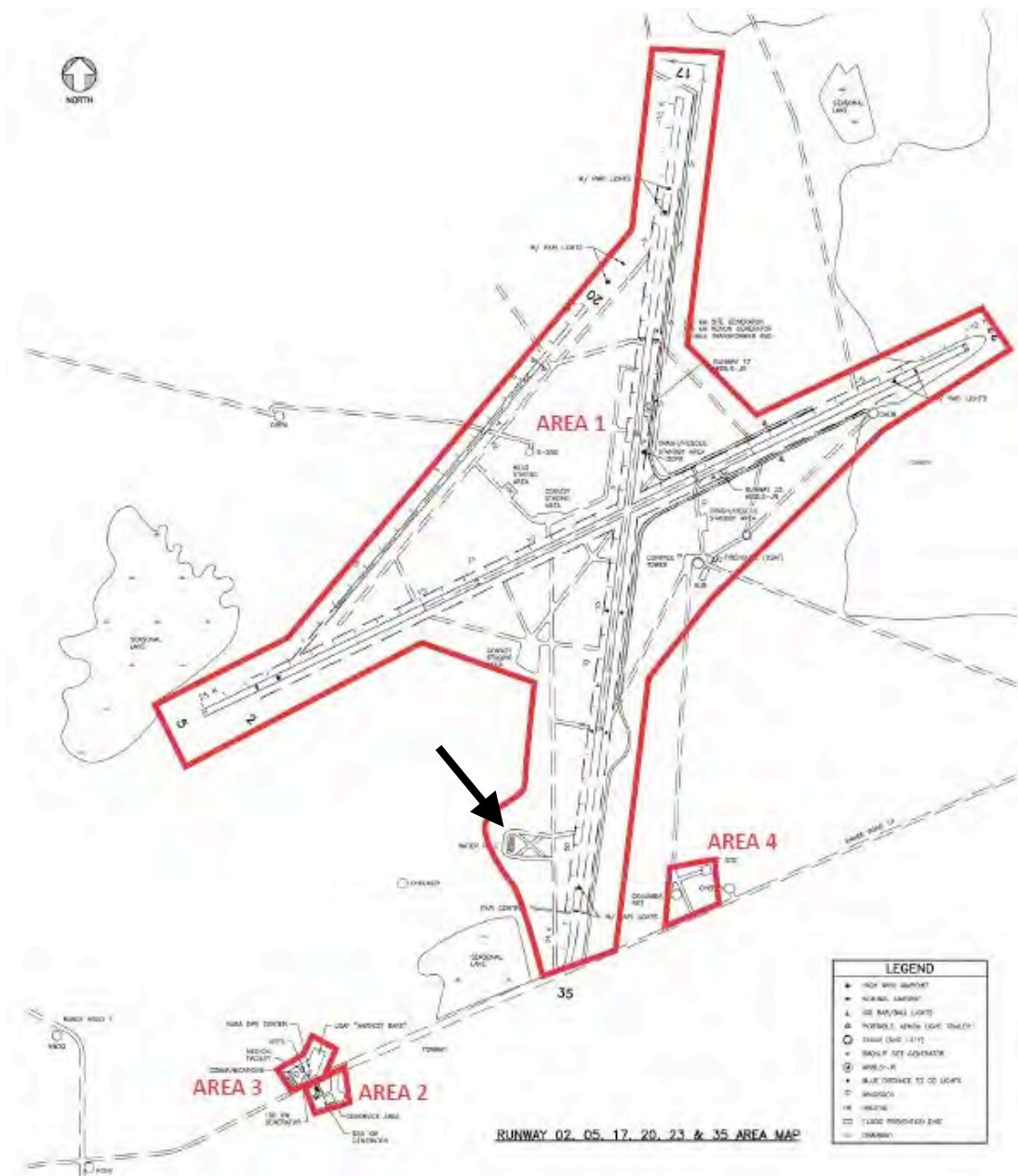


Figure 2. Map of WSSH showing location of the Waterhole in Area 1, which delineates the NRHP boundaries of the WSSH Shuttle Landing Facility District (Base Map Source: NASA WSTF).



Figure 4. Aerial view of the Waterhole (left), looking north, April 2007 (Source: NASA WSTF).



Figure 4. Aerial view of the Waterhole, looking southeast, 2006
(Source: NASA WSTF).



Figure 5. View of mechanical pumping equipment and portable generator at the Waterhole, looking northwest towards San Andres Mountains, February 2006 (Source: NASA WSTF).

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