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Draft Programmatic Agreement for Buildings and Structures at Cold War Era Dedicated Instrumentation Sites: White Sands Missile Range, New Mexico

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White Sands Missile Range, New Mexico

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ABSTRACT

Since 1966, when the National Historic Preservation Act (NHPA) was signed into law, federal agencies have been required to consider their impact to known or potential historic resources under their jurisdiction. As a potentially costly and onerous process for large government installations such as the military, the law allows for procedures known as "program alternatives" which allow federal agencies to streamline the requirements for inventorying and evaluating categories of, or similar resources (in this case, buildings and structures) for their potential as historic resources.

This Capstone project seeks to capture a category of such resources, building and structures at Cold War Era dedicated instrumentation sites on the Ranges of White Sands Missile Range. By creating a historic context in which to identify these resources and put them into historical perspective, as well as identifying close to two hundred of such repetitive resources, a draft Programmatic Agreement was crafted to provide an alternative to the costly effort of individually inventorying and evaluating each property for National Register of Historic Places eligibility.

This project has been approved for public release by Operational Security and Public Affairs, White Sands Missile Range.

CHAPTER 1. INTRODUCTION

I am studying ubiquitous Cold War Era rocket and missile tracking instrumentation buildings and structures at White Sands Missile Range (WSMR) because I want to know the types and history of those facilities constructed specifically for rocket and missile tracking. The purpose is to help my reader understand the range of property types at WSMR that could be covered under a Programmatic Agreement. The problem I am addressing is the need to systematically address the Army's responsibilities under Section 106 of the National Historic Preservation Act (NHPA) for management of the numerous Cold War Era instrumentation building and structure types that dot the over 4,000 square-mile facility without having to individually evaluate them for National Register of Historic Places (NRHP) eligibility.

Located in southern New Mexico, WSMR is the US Army's primary missile test center (Figure 1). During the Cold War, commonly held as the period between 1946 and 1990, the United States Army, Navy, and Air Force were involved with the testing of numerous rocket and missile programs at WSMR in an effort by to remain technologically superior to the Soviet Union in military defense. Originally conceived as a temporary effort to test American-developed rocket and missile programs, it quickly adapted to assembling and launching captured German V2 rockets at the end of WWII. The facility became a permanent installation as post-war tensions rose between the new superpowers. Located in the Tularosa Basin, the 40-mile wide by 100-mile long site was chosen for its ideal characteristics such as remoteness, climate, and flat and open ground bounded by mountain range (Starkweather 1989: 6).

From the beginning, the scientists and engineers knew that all types of data would need to be collected to analyze a multitude of performance and flight characteristic information. Over the next thirty-five years, hundreds of buildings and structures were constructed throughout the 4,000 square-mile land mass to house an array of optical and electronic instrumentation devices designed to capture that data. The majority of these facilities are no longer in use but played an important role in the development of rocket and missile technology.

The purpose of this study is to help my reader understand the range of property types that could be covered under a Programmatic Agreement (PA), to systematically assist in managing these mostly abandoned Cold War Era facilities. This challenge is not unique to WSMR but common to large military installations. As a result of the 1991 Department of Defense (DOD) Defense Appropriation Act, the Legacy Resource Management Program (LRMP) was initiated in part to address the increasing pressure on the DOD to fulfill their obligations under the NHPA for the vast number of resources constructed during the Cold War. LRMP funds initiated momentum nationwide to document the large volume of military resources and the programs that had created them over the previous forty-plus years. Overview studies of Cold War Era instrumentation at missile test ranges include a number of notable efforts undertaken at the adjoining Holloman Air Force Base. By virtue of the shared ranges with WSMR which culminated in the Integrated Range in 1952, numerous Air Force instrumentation facilities were placed on WSMR sites. As such, useful information regarding the development of WSMR missile instrumentation was captured in those studies. Though WSMR initiated a similar documentation effort at the time, no comprehensive analysis or historic context had been undertaken. This study, in part, hopes to remedy this situation and in doing so, assist the Army in their NHPA compliance responsibilities.

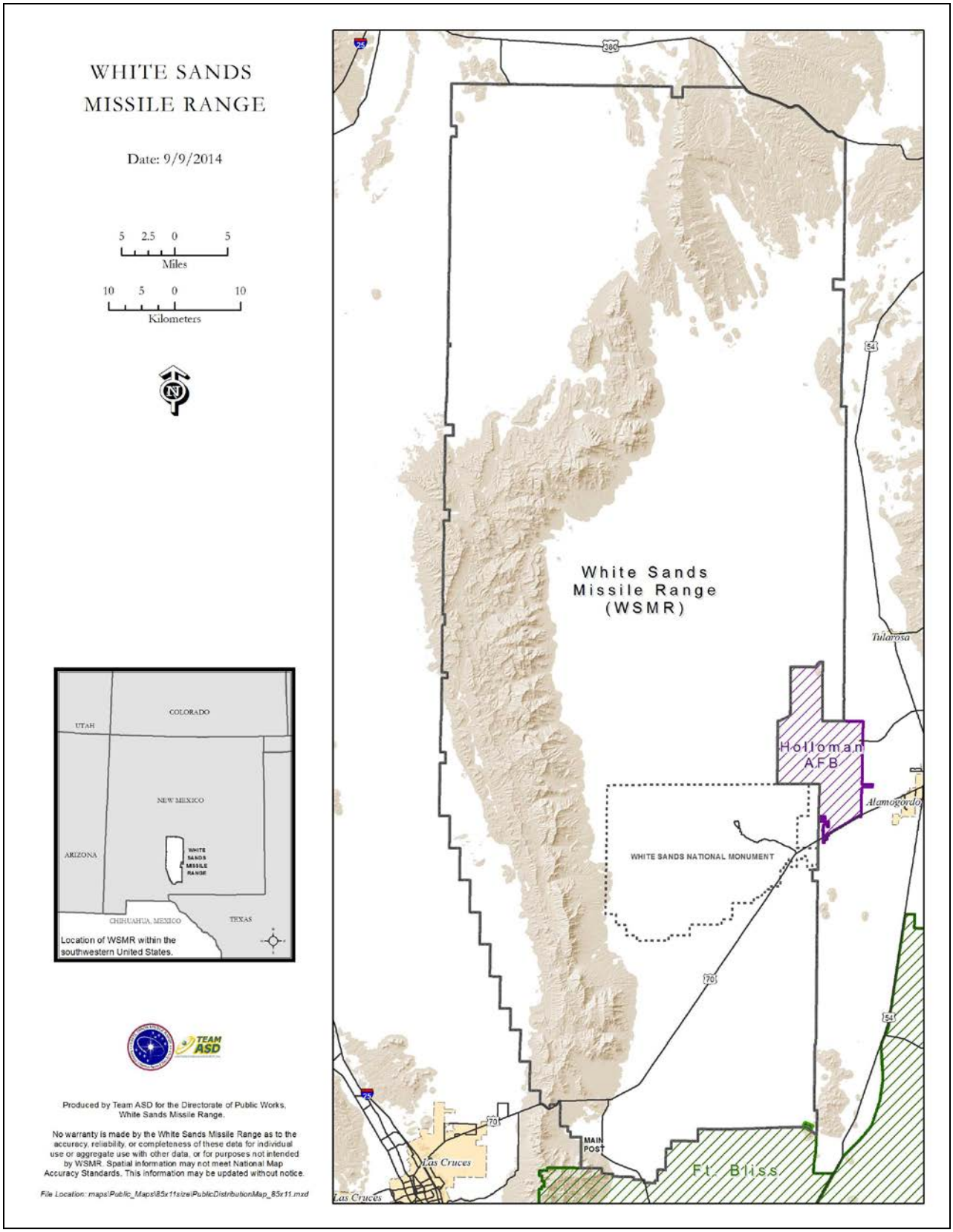

Figure 1. White Sands Missile Range (Directorate of Public Works, White Sands Missile Range)

Programmatic Agreements are designed to streamline the compliance process under Section 106 of the NHPA. By identifying certain classes or types of cultural resources in their care, federal agencies can negotiate legally-binding agreements with the State Historic Preservation Office(r) (SHPO), the Advisory Council on Historic Preservation (ACHP), and other "consulting parties" that may have a stake in assuring the process under law is legitimate and carried out appropriately. The PA allows cultural resource managers to minimize the oftentimes onerous process prescribed by the NHPA and thereby save time and money.

One logical recommendation is determining whether or not the PA is justified. By conducting a quantifying assessment, the agency may determine that the alternative to simply conducting inventory and evaluations on an individual basis may not warrant the effort. In this particular case, in calculating the time and cost to document and evaluate the volume of dedicated instrument site resources at WSMR, one quickly concludes that a PA approach is a far more effective and viable solution. It would likely cost the Army somewhere between $3,000.00 and $7,000.00 to record and properly evaluate each of the dozens of sites for NRHP-eligibility. Even with economy-of-scale based on duplicative entities, the logistics behind such an effort would likely be in the hundreds of thousands of dollars—the SHPO consultation time is also incalculable. Comparatively, the realistic cost for the preparation of the historic context and typology section (Chapter 2) would be in the area of $30,000.00 and would provide a foundation for mitigation, the process by which the agency can meet their obligations through changes or loss to historic properties. The remaining cost would be in the preparation and implementation of the actual legal document.

The PA has become somewhat standardized for Section 106 alternatives, but in crafting this document, an understanding of the component parts is critical to the successful implementation of the agreement. It is important to know which governmental agency is seeking to implement the agreement; the goal(s) sought and justification for the agreement; the key signatories and consulting parties, as well as their roles and responsibilities under the agreement; the specific resource(s) being addressed, their potential historic significance and location; stipulations or remedies for loss of historic resources; the duration and termination of such an agreement; and what terms may be negotiated in lieu of individually assessing each resource. These elements and other supporting documentation, by reference, are all part of the agreement that is drafted, negotiated, and ultimately signed and put into effect.

This analysis is broken into five chapters. The introduction sets the stage for the justification and overall goals of the effort as well as defining the parameters of the resources themselves and their geographic location. Chapter 2 is the literature review, the basis on which the PA is given substance and meaning. That is, the context of the specific resources and their place in time and history. Without this context, the agreement cannot be executed—an understanding of the role they played in Cold War history and specific identification is critical to making the case for their management beyond the normal NHPA Section 106 process. Chapter 3 describes the process in which these types of agreements are crafted. Using the framework described in Chapter 3, Chapter 4 describes the step by step details of each issue that needs to be considered, addressed, and resolved in the PA. Chapter 5 makes recommendations in terms of the feasibility of implementing the PA, if and when it should be done, and the next steps that need to take place.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The history of rocket and missile tracking and measurement pre-dates the Cold War but had its most complete and exhaustive development in that period—WSMR (White Sands Proving Ground (WSPG), prior to May, 1958) was at the forefront of that effort (The Missile1960: 13). Understanding and continually seeking to improve newly emerging guided missile technology required an equally aggressive approach toward collecting and interpreting the often extremely nuanced characteristics of all aspects of missile flight—rockets and missiles move very quickly and often travel long distances. As such, both optical and electronic recording technologies were developed concurrently with missile programs, both critical in providing developers with detailed feedback of the characteristics of test articles in flight. Range instrumentation is often under-represented in the more dramatic and intriguing story of the actual missile programs. However, it played a major role in range development at WSMR and guided missile development elsewhere (Myers, et al 2016: 16). Instrumentation consisted of some basic system types: telemetry receiving stations, radar tracking sites, optical systems, command/destruct equipment, timing systems, communications stations and various types of recording equipment. Borrowing and adapting some equipment from the Germans, using WWII Allied-developed technology, and improvising along the way, these pioneers would ultimately put together the Army's Test and Evaluation Command's (TECOM) "largest and most highly instrumented range" (Gaither 1997:98). Understanding the basics of rocket and missile instrumentation in the Cold War at WSMR will help set the stage for identifying the building and structure types that housed them:

> Range instrumentation measures trajectories and internal performance of test objects, controls the flight of targets and boosters, correlates observations with range time, and processes the data gathered. Instrumentation may be special purpose or general purpose. A single instrument may suffice to gather all the data needed for a specific test, whereas a complex of many instruments may be essential for another. Representative single place instruments are the theodolites, telescopes, cameras, and tracking radars. There are numerous multi-station configurations of electronic control and data processing instruments, as well. The data processing instruments include computers, decommutators [identifies and extracts embedded asynchronous data stream (EADS) words], plotting boards and display devices, communication links, and command control consoles. There are field instruments for reception of telemetry from drones and surveillance; optical instruments for tracking and photography; telecommunications; and timing equipment (US Army 1967: 1).
>
> -Range Instrumentation Layout, White Sands Missile Range, 6 December 1967

WSPG was not the only missile test range that was getting up and running in the mid-to-late 1940s, but they had their challenges in attempting to provide a reliable and comprehensive program to record all aspects of rocket and missile testing. The 1950s and 1960s saw the greatest number of instrumentation sites set up not only for optical instrumentation at WSMR, but a

variety of electronic ones as well. Not everything was constructed in one period and most sites evolved over the decades, with the addition and sometimes removal or reuse of facilities. Some facilities have no architectural or engineering qualities that relate specifically to the instrumentation or support role, while others are literally purpose-designed and built to house specific instrumentation types. Mobile instrumentation is a sub-set of these purpose-built facilities but, in some cases requires basic infrastructure.

This chapter is a record of the extant facilities at dedicated instrumentation sites on WSMR, many of which have long been decommissioned, others that are now devoid of any substantive buildings, objects, or structures. It is not an exhaustive study of the evolution of the individual sites nor does it capture instrumentation at launch areas or larger program areas that incorporate housing and amenities. It is intended to categorize the existing built environment at dedicated instrumentation sites constructed during the Cold War Era. In order to properly categorize these purpose-built facilities it is important to have a basic understanding of the numerous instrumentation types that many of these facilities were constructed to house. WSMR has an extensive collection of instrumentation-related documents, many of which are carefully catalogued and housed due to the efforts of the White Sands Missile Range Museum's all-volunteer Missile Range Historical Foundation.

Section 2.2 provides a brief overview of how instrumentation relates to rocket and missile testing followed by a brief overview of instrumentation types at WSMR with the distinctions in their respective functions. Section 2.3 provides a brief context for the conditions for which instrumentation shelters were conceived at WSMR. Section 2.4 describes specific instruments for which building and structures were constructed followed by typology of the most common Cold War-Era buildings and structures at dedicated instrumentation sites at WSMR. It also includes support buildings that may be common at these sites but did not house an actual tracking instrument. Section 2.5 provides a brief overview of sites dedicated for mobile instrumentation. Lastly, Section 2.6 provides a summary of the findings.

2.2 Fundamentals of Missile Test Range Instrumentation

Army guidance for determining historical significance under the NRHP criteria has categorized Cold War-era missile ranges as belonging to the sub-theme of *Proving Grounds* under the encompassing *Materiel Development* category (Lavin 1998). These facilities do not operate in a vacuum, however, as "the relationship between proving grounds and RDE (*sic*) centers is complimentary and mutually supportive" (Lavin 1998:70). So it is important to make the distinction between an entire military facility dedicated to the mission of testing rockets and missiles and those duplicate facilities within the larger range that contribute to an actual live rocket or missile test.

Missile ranges are discreet entities and, by their potentially catastrophic failures in launch and impact phases, are typically far removed from populated areas. There are only a handful of actual land-based missile test ranges in the US. The largest are WSMR and the Naval Air Weapons Station (NAWS), formerly the Naval Ordnance Test Station, Inyokern (NOTS), at China Lake, California. Containing land masses of approximately two million and one million acres, respectively, these ranges are designed to accommodate safe launches as well as ample impact

areas for modern missile systems which can travel extraordinary distances. There are also missile test sea ranges, such as the Eastern Test Range and the Navy's Point Mugu, where land or ship-based launches occur and fall safely into the ocean. However, the logistics of locating instrumentation sites and the recoveries of launch vehicles and related materials are much more complicated, if not impossible, at these over-water ranges (Thompson 1956: 8). This makes the land-based ranges particularly valuable assets, especially for types of testing that require extensive tracking and data collection.

During and after launch, a test article's flight characteristics are captured through a variety of instruments. Missile range instrumentation consists of two major types: optical and electrical. Optical instrumentation includes tracking telescopes, fixed and tracking motion picture cameras, and cinetheodolites. Cinetheodolites combine a motion picture camera with a theodolite, recording azimuth and elevation data on the film of the test flight.

Electrical instrumentation consists of radar, Doppler Velocity and Position System (DOVAP), Miran[1], velocimeter, telemetry, communications, and range timing (WSMR 1956: ii). Instrumentation radars such as the AN/FPS-16 provide high accuracy measurements of the test article's speed and position in space, and complement other data collection methods during test events. Radars are also critical for maintaining range safety as they allow range control to monitor a missile's trajectory in real time. If the missile begins to move outside its designated flight corridor, it can be shut down remotely to prevent the missile from entering populated areas. Telemetry systems use sensors on-board the test article to relay information regarding its operation to ground recording stations via radio transmission. Typical telemetry data includes measurements of skin temperature, internal pressures, battery levels, fin positions, and timing information (Eckles 2013:156).

Each of these instrumentation devices is carefully synchronized to a central timing station to assure the varied types of data are precisely aligned in time. Similarly, all range instrumentation is integrated into a precisely surveyed spatial grid that covers the range horizontally and vertically. This allows all instrumentation measurements of a test article's flight path to be translated into highly accurate spatial coordinates (Myers, et al 2016: 36).

The destination of a missile after it is launched is a target or an impact area. In the Cold War Era, anti-aircraft missiles targeted surplus planes that were modified into drones and flown remotely. In many cases, the missile's flight was programmed to pass within a close distance of the aerial target without actually impacting it, thus saving the aircraft for another test while still verifying the effectiveness of the missile. Special telescopic optical instrumentation is used to record data on "miss-distance" for this type of testing (Delgado 1981: 703).

All of these efforts are coordinated through communication channels which, like synchronized timing signals, are a critical component of instrumentation. It also is part of the unified system for which infrastructure is required (The Missile: 22).

[1] No reference to Miran could be found in the record drawings.

2.3 Conception and Impetus for Range Instrumentation Shelters at WSPG

In the immediate post-war years, rocket and missile tracking instrumentation was borne of expediency. It would be a number of years before an instrumented range would be designed and constructed, and a decade before it was substantively complete. Certain factors contributed to the development of semi-permanent and permanent shelters. Through trial and error range engineers overcame obstacles and instrumentation shelter types evolved over the decades.

The first captured German-made Askania cinetheodolites were mounted on steel or concrete posts. The earliest were completely exposed to the elements short of a canvas covering; mobile vans provided power and protection for the support equipment (Figure 2). At WSPG, Askanias were sometimes surrounded by wooden fencing to protect them from grazing cattle. Support equipment such as electrical power and equipment storage for the often remote tracking locations, were very basic and improvised (Figure 3).

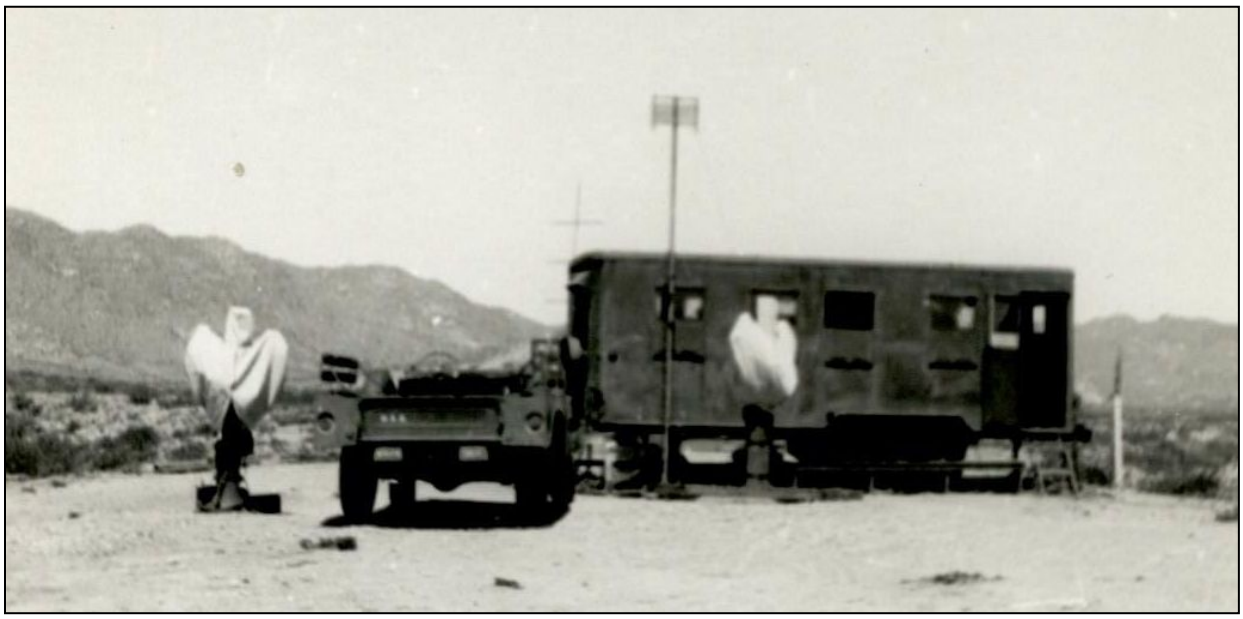

Figure 2. Askania Cinetheodolite Station, 1947 (Gilbert Benner Collection, WSMR Museum Archives)

Figure 3. Askania Cinetheodolite Station, White Sands Proving Ground, ca. 1950 (WSMR Museum Archives)

Initially, radar tracking units were placed on mobile vans, many of which were surplus SCR-584 radar units used as gun directors—cutting-edge technology, but testing of the captured V2 rockets was a priority and no long-range plans had been conceived of for the remote outpost in late 1945 (Figure 4).

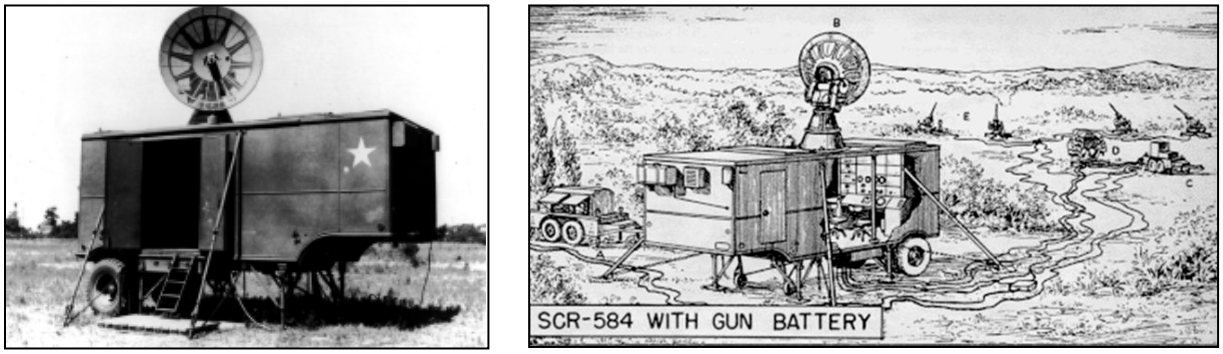

Figure 4. WWII Surplus SCR-584 radar unit, ca. 1945 (images courtesy of www.skylighters.org)

Telemetry was also an ad hoc effort but, by 1949, basic antenna towers were erected—permanent structures were still on the drawing table (Figure 5).

Figure 5. Telemetry Station at WSPG, 1949 (White Sands Museum Archives 06.003.028)

WSPG produced shelters in the mid-to-late 1940s, but these were limited to protecting the instrument while not in use. An extant photo, taken ca.1947, shows how a rudimentary wood-frame "box" served as a protective housing for the cinetheodolite (Figure 6). Another period photo illustrates a boxed base with a fabric tent covering (Figure 7). Again, it appears that the canvas covering on the upper portion only protected the instruments when not in use.

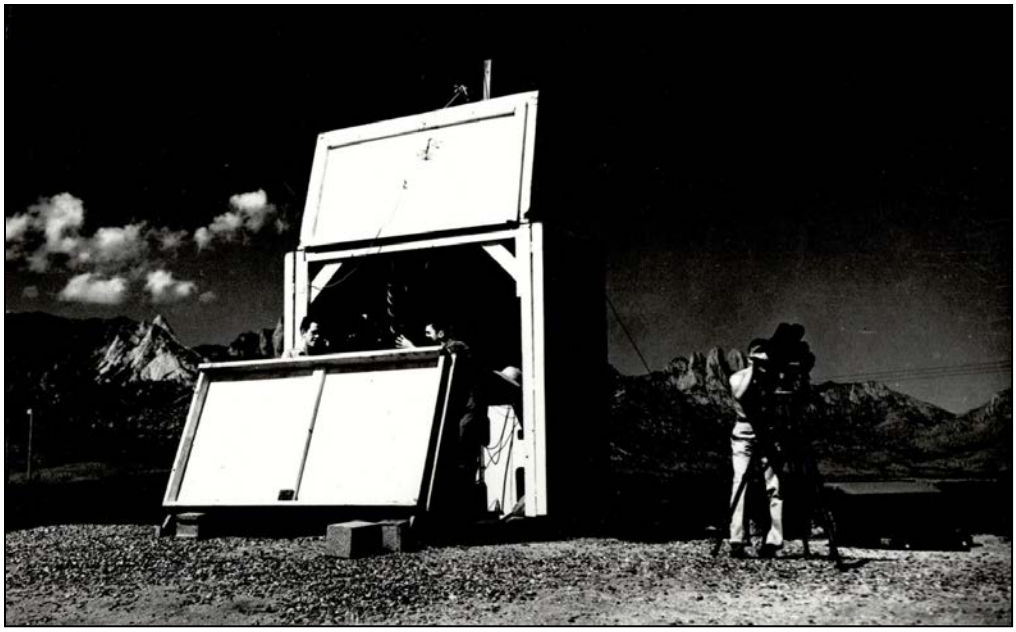

Figure 6. WSPG Cinetheodolite Station, ca. 1947 (Ken Bellinger Collection, WSMR Museum Archives)

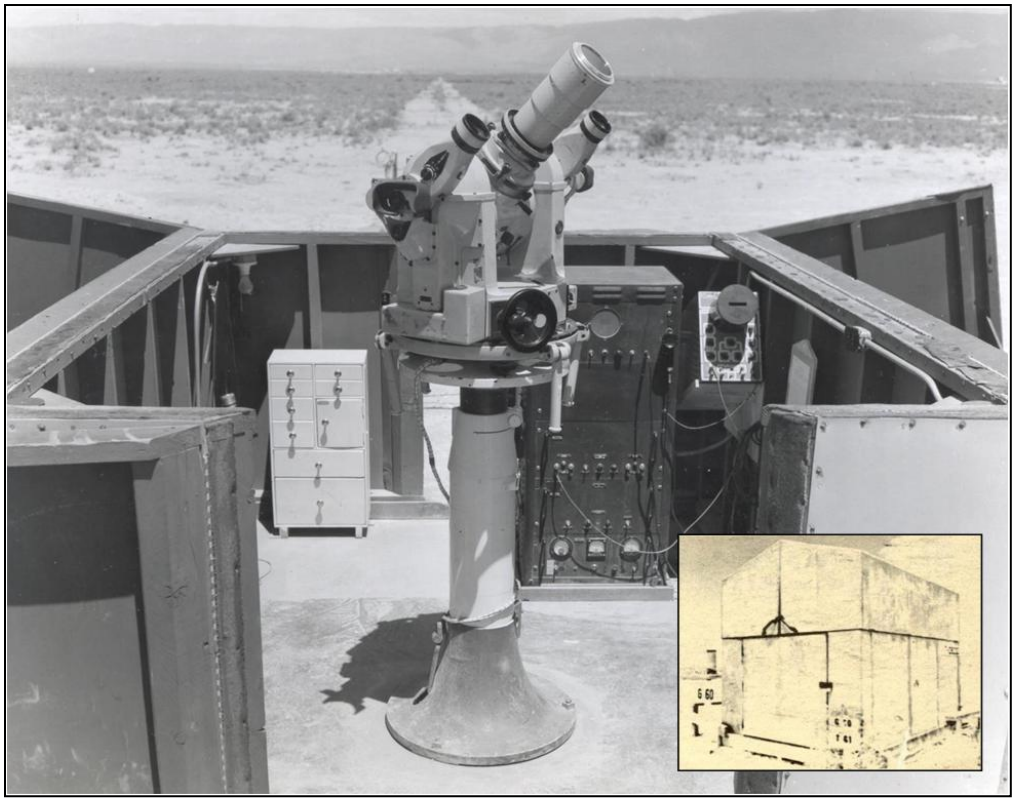

Figure 7. Temporary Fold-down cinetheodolite shelter, WSPG, ca. 1948 (WSMR Museum Archives)

It would be the effects of the climate on optical instruments that provided the primary impetus for the development of instrumentation shelters. Not solely the concern of WSPG, solutions were sought with some collaboration of the Inter-Range Instrumentation Group (IRIG) of which

WSPG was (Astrodome 1950), and continues to be a lead member. The military's two primary inland test ranges, WSMR and NAWS, are located in desert environments where summer temperatures can regularly exceed 100°F. Specific to these desert environments is an optical effect dubbed "atmospheric boil", first described in a post-war article (Riggs et al. 1947). The results of the study revealed that between the hours of 6am and 4pm the heat buildup at ground level creates a shimmering effect that distorts images. Based on a number of reports that emerged in the early 1950s, both ranges were working to resolve the issue, which was to elevate the instruments well above grade. As early as 1949, former German scientist Dr. Ernst A. Steinhoff, working at HAFB, who effectively was developing what would become the WSPG ranges, illustrated the construction of a 35-foot tower on which to mount a cinetheodolite (Steinhoff 1950).

Another factor was the effects on the film used to record test events. Besides the issue of temperature fluctuations causing shrinkage problems and therefore interpretive inaccuracies, low humidity caused the film to be brittle; dimensional stability is a critical factor in reading and interpreting the data on the film. To make matters worse, engineers at WSPG were reporting dust infiltration that was leaving spots on the electrostatically charged film (Pike 1954). Other subtleties affecting performance and accuracy arising from temperature and humidity variations include refraction in the lenses, dimensional instability of plastic components, effects on viscosity of internal lubricants, and longevity of supporting electronic equipment. The critical factor in working towards controlling the environment would be easing the equipment into the extant outside conditions when preparing for use—if not, many of the issues could quickly arise again, particularly condensation and dimensional stability of plastics and film.

At first, little consideration was given for operator comfort while operating the equipment in often remote stations. The relative infancy of the test range and quickly expanding use of instrumentation left operator comfort a secondary consideration. The effects of direct sunlight as the day progressed posed problems for optical recordation at certain angles in addition to creating a somewhat harsh working environment for operators, who often spent the majority of their time simply waiting for a missile or rocket launch (Figure 8). Missile and instrumentation development progressed rapidly through the late 1940s; however, instrumentation shelters took another decade to coalesce into a unified system that served both the instrument and operator.

Electronic tracking and support equipment are the other side of the range instrumentation lineup. Most electronic tracking devices use antennas of one sort or another ranging from simple metal aerials to immense radar "dishes." In and of themselves, these components are usually designed to withstand the effects of weather and do not need to be housed. However, it is the electronic support equipment that requires both protection from the elements and at times, climate stabilization (Figure 9). Every conceivable instrument and support element of range instrumentation relies on electronics. As electrical devices they must be, at the very least, protected from moisture. Like optical instruments, they are expensive and need care. It is for this reason that WSPG and other ranges constructed buildings and structures to protect this equipment.

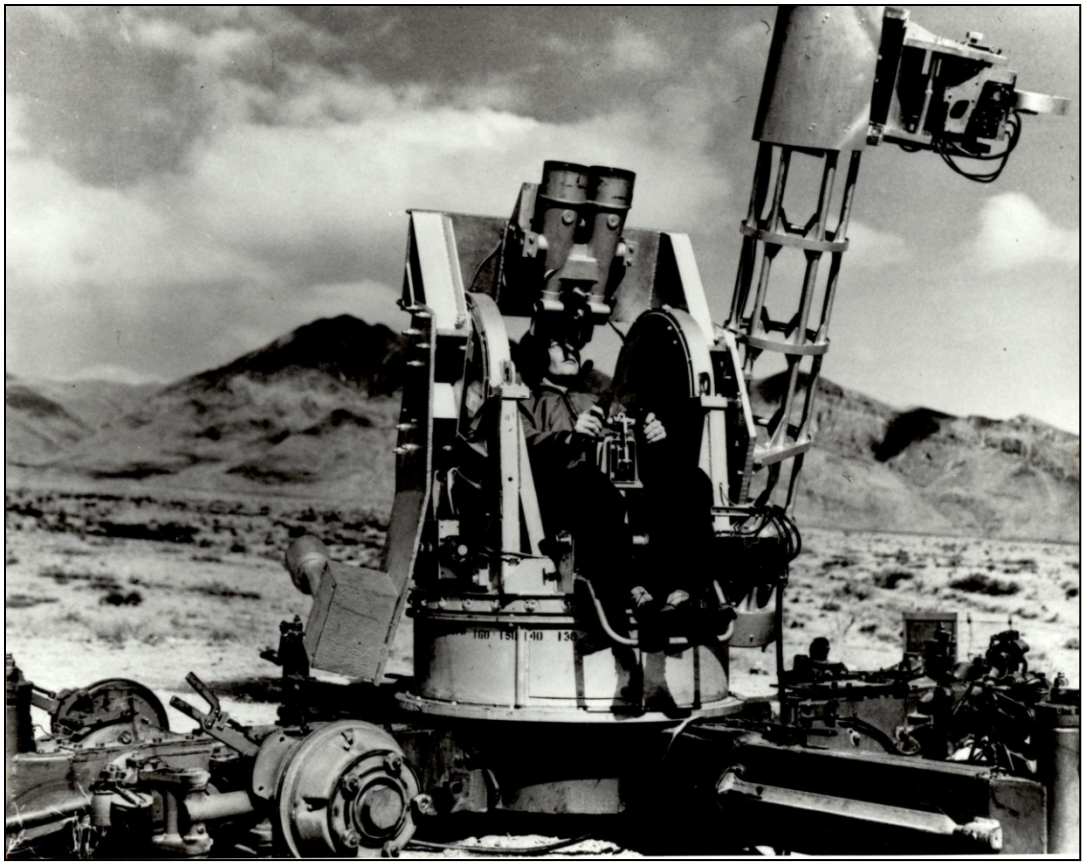

Figure 8. T-2 Tracking Telescope at WSPG, ca. 1949 (Ken Bellinger Collection, WSMR Museum Archives)

Figure 9. Doppler radar dishes with remote electronics at WSPG, 1952 (WSMR Museum Archives)

Beginning in the late 1940s and spurred on by the American involvement in Korea, range engineers were conceiving of and designing a number of purpose-built buildings and structures to house a variety of instrumentation-related equipment (Figure 10). The first effort was put forth in Drawing Sets WS-KK and WS-AT in 1950; WS-KK has been lost and only sub-sets for individual buildings could be located, missing critical elevations for this study. This was the beginning of thirty years of construction efforts in support of dedicated instrumentation sites.

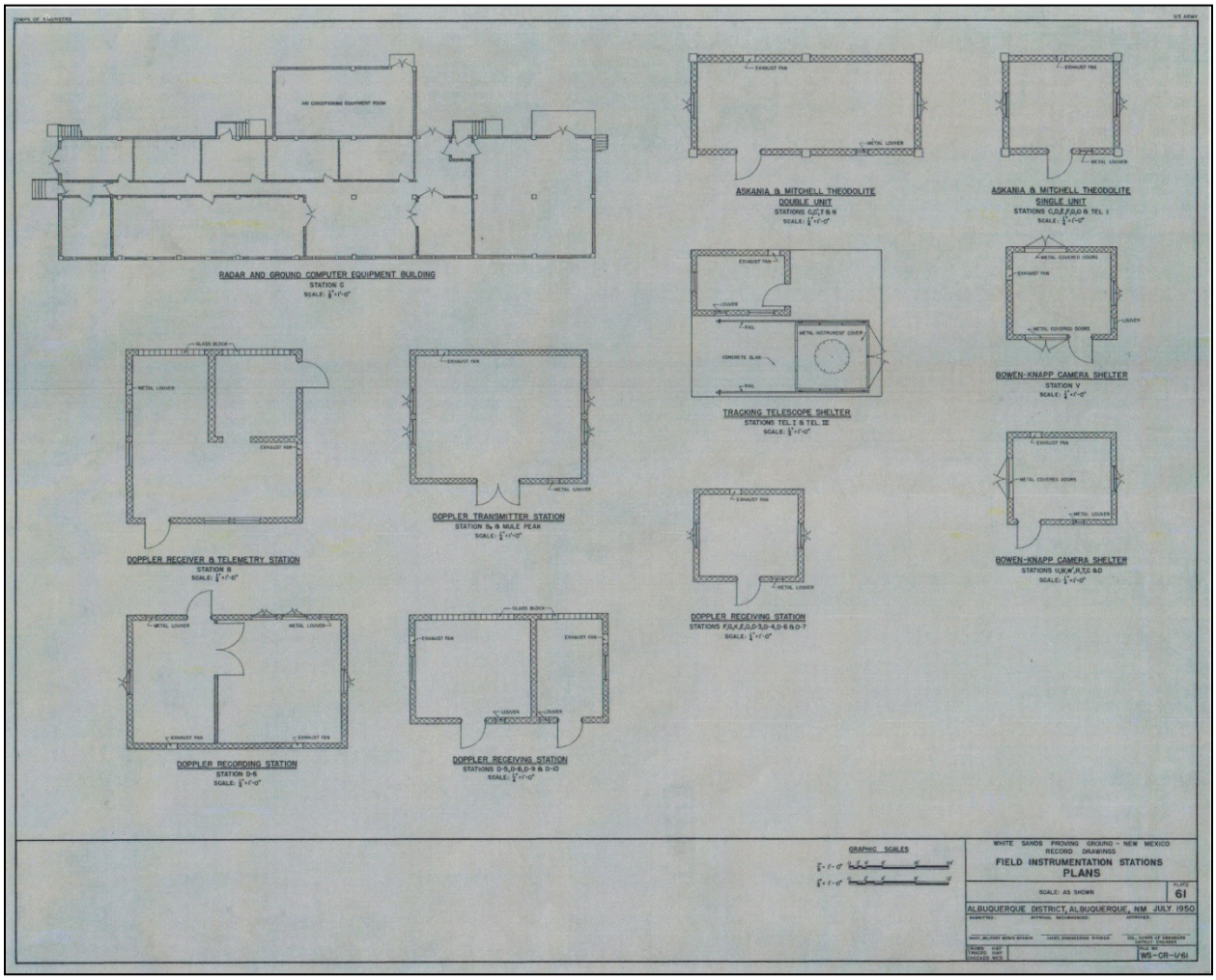

Figure 10. Purpose-built instrumentation buildings and structures at WSMR (Record Drawing Set WS-CR, 1950)

2.4 Cold War Era Building and Structures for Dedicated Instrumentation Sites at WSMR

Support infrastructure for WSMRs Cold War range instrumentation was substantial—entire buildings were utilized for specific instrumentation types. For example, at WSMR's Small Missile Range, banks of purpose-built camera shelters extending out the length of the range housed high-speed motion picture cameras (Myers, et al 2016). High quality instrumentation allows missile ranges to capture the data needed to properly test and evaluate missile systems, and is also essential to maintaining range safety. Eckles (2013:157) relates that for every

significant test at WSMR, about half of the data collection equipment used is dedicated to maintaining missile flight safety.

Permanent buildings dedicated to house instrumentation began with the first generation Askania cinetheodolite shelters and other types of optical and electronic equipment. The following narrative describes instrument types, where applicable—other common dedicated instrument site support buildings such as transmitter buildings and portable shelters did not have instrument types per se. It describes and illustrates the building or structure type for which it was constructed. This includes design data (architect or engineer), period of construction, and drawing set references. The narrative is organized roughly by chronological order within three sets: optical instrumentation, electronic instrumentation, and miscellaneous support buildings and structures. Finally a brief overview of mobile instrumentation sites at WSMR is explored.

2.4.1 Optical Instrumentation

Rocket and missile testing by the Germans during WWII called for more specialized data collection abilities. Designed and manufactured in 1940 and 1941 respectively, the GTK 40 and Kth-41 were the first of their kind metric instrumentation devices (Delgado 1981: 706). Built by Askania Werke A.G. in Berlin, these first generation cinetheodolite units were used at the Peenemünde rocket research center and also found alongside V2 Rocket launch sites in Western Europe. The revolutionary aspect of these first generation cinetheodolites was embedding the data onto film as it happened in real time.

These highly prized instruments were salvaged from Germany and brought to the United States for the exclusive use at military test ranges. The US had attempted to replicate the instrument based on a unit acquired before the war but could not duplicate the precision attained by the Germans. Technicians at White Sands Proving Ground (WSPG) restored, and modified captured Askania[2] cinetheodolites for use on their ranges as early as 1946 (Figure 11); the equipment had been dumped in the Baltic Sea by German scientists to prevent their capture (Kammer 1997). The Navy also modified captured Askania cinetheodolites and put them to immediate use on their ranges (Figure 12).

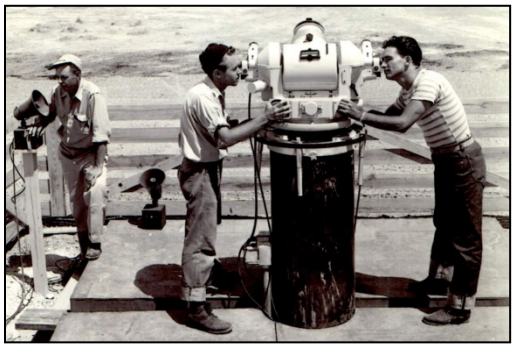

Figure 11. WSMR Askania cinetheodolite, ca. 1947 (WSMR Museum Archives)

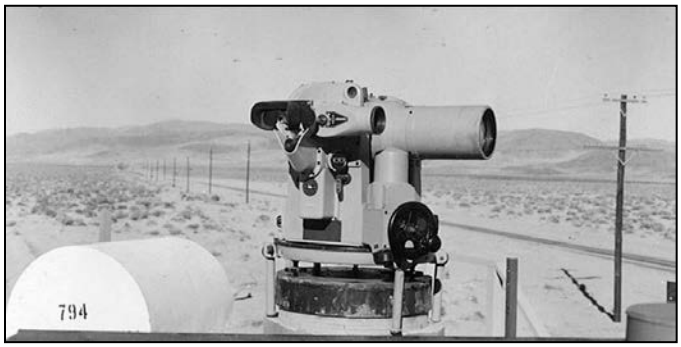

Figure 12. Captured Kth 41 NOTS-modified Askania, NOTS Inyokern, California, ca. 1946 (NAWS TID 307905)

[2] The term 'Askania' has been used to distinguish the German-made Askania cinetheodolite from the copied and modified US military versions. Therefore, in period publications, and here, 'Askania' and 'cinetheodolite' are commonly used interchangeably. Early testing literature sometimes describes the instrument as a 'theodolite'.

WSPG also used the American-made Mitchell type (Figure 13). Known to be less accurate than the German-made Askanias, they were designed primarily for measuring the performance of aircraft, training antiaircraft gunnery crews, and recording positions of antiaircraft bursts (Test Department 1953).

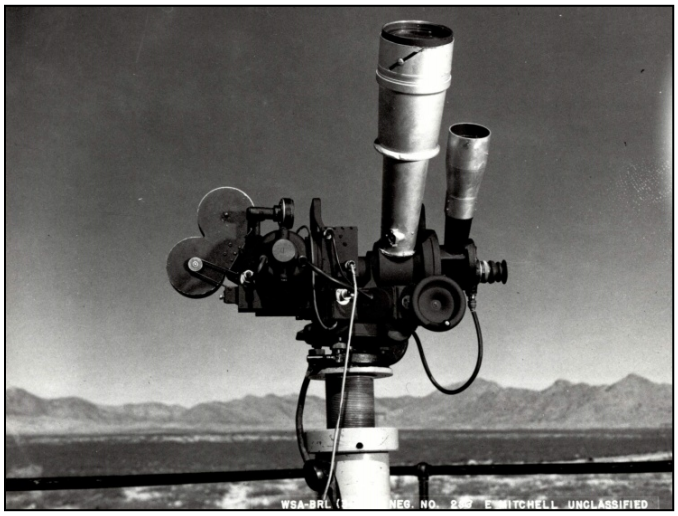

Figure 13. Mitchell cinetheodolite, ca. 1951
(Ken Bellinger Collection, WSMR Museum Archives)

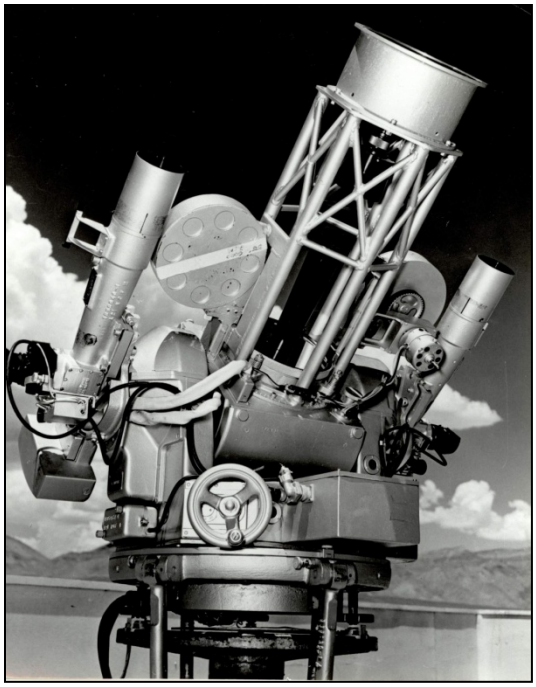

Figure 14. BRL/Mitchell cinetheodolite, ca. 1951
(Ken Bellinger Collection, WSMR Archives)

Subsequent generations of modified Askania cinetheodolites would be introduced into the ranges but all would be modified versions of the captured GTK-40 and Kth-41 units. Even with constant maintenance and modifications, the Askanias would only have a limited lifespan, particularly with constant use. In the early 1950s at WSMR, they would be supplanted by the next generation cinetheodolite, a cooperative effort by the Naval Gun Factory (NGF) under the Navy Bureau of Ordnance and the Ballistic Research Laboratories (BRL) of the Army Ordnance Department (Figure 14). Aptly named the BRL-NGF Cinetheodolite, the improved version featured, among other things, a range of quickly changeable long focal lengths, ideal for the varied test requirements at WSPG (Lipton & Saffard 1953: 33).

By the late 1940s, the climatic effects had become enough of an issue at WSPG for the instrumentation department to seek solutions. From 1950 to 1955 WSPG expanded the range, constructing multiple permanent instrumentation shelters for cinetheodolites erecting concrete frame buildings with concrete block walls set on thick concrete foundations. Designed to retract into the building on hydraulic pedestals when not in use, the design mitigated the other factors plaguing the equipment. These were to be the mainstay for whole generation of cinetheodolite tracking activities. Rectangular or square in plan (generally 12-foot by 14-foot and 18-foot by 28-foot) and one story in height, the buildings feature a flat roof with a tubular steel safety railing around the perimeter (Figures 15 &17). In an early attempt to protect the equipment while not in use, the Army installed hydraulic lifts that allowed the pedestal and Askania cinetheodolite to be

raised through the roof level for use (Figures 16 & 18), and brought back down inside for storage and servicing.

Figure 15. Single cinetheodolite building, ca. 1951 (Ken Bellinger Collection, WSMR Museum Archives)

Figure 16. Cinetheodolite on hydraulic lift, 1955 (WSMR Museum Archives)

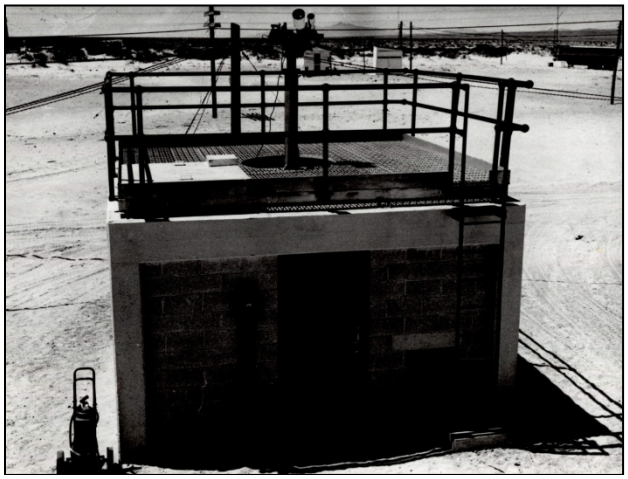

Figure 17. Operator Platform detail (Ken Bellinger Collection, WSMR Museum Archives)

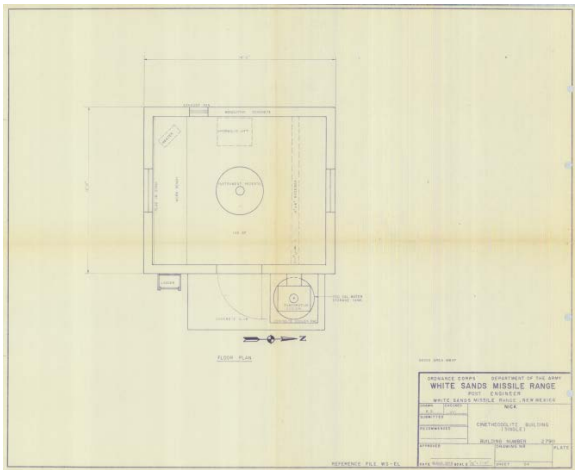

Figure 18. Single cinetheodolite drawing, Nick Site (Drawing Set WS-EL, 1955)

Cinetheodolites are often set up in pairs to determine a more precise position in space (Taylor 1958: 5-6). Further, two or more are required to also determine speed, acceleration, and altitude of a test article (Delgado: 707). As such, WSMR constructed buildings to set them up in pairs. Essentially a two cinetheodolite version of the single cinetheodolite (Figure 19), the details were the same and set up with a pair of hydraulic lift mechanisms (Figures 19 & 20). Figure 19 shows how homey appendages like a door surround were added by operators to humanize the otherwise austere buildings. The umbrella was a harbinger of things to come – protecting the instrument while in use would be the next step in optical instrumentation shelters. Figure 21 illustrates how three cinetheodolites were set up in proximity to one another at C-Station, the instrumentation nerve center for the range.

Figure 19. Double cinetheodolite building, ca. 1951 (WSMR Museum Archives)

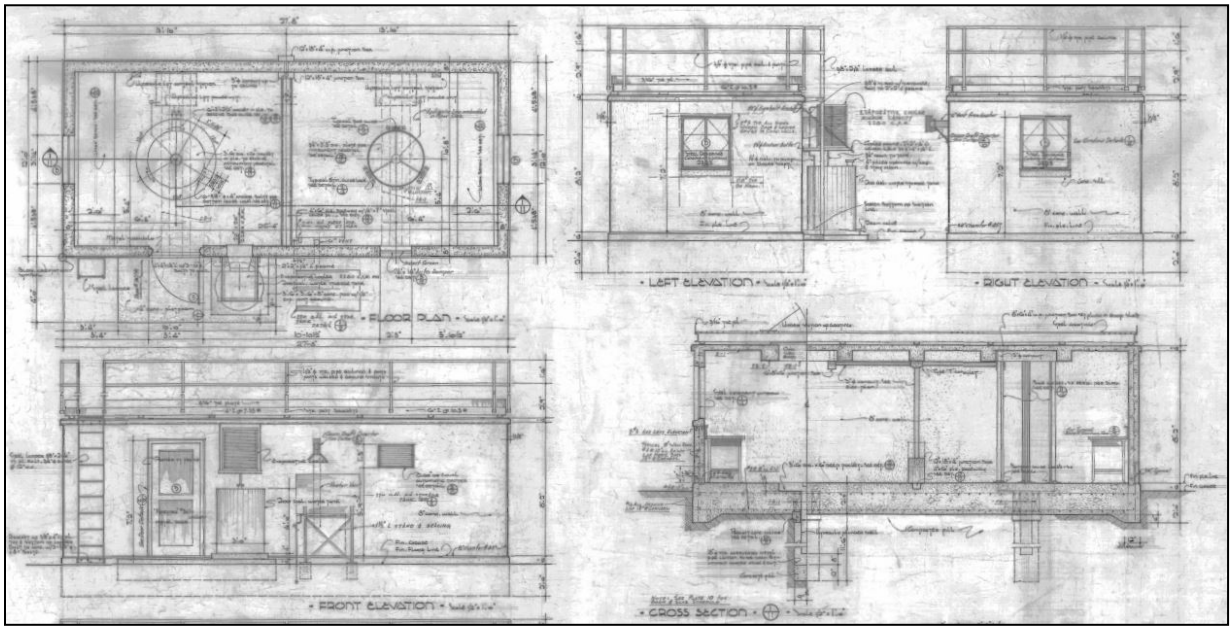

Figure 20. Double cinetheodolite building, 1955 (Drawing Set WS-EL)

Figure 21. C-Station double and single cinetheodolite buildings, ca. 1951 (WSMR Museum Archives)

Tracking telescopes were also given dedicated buildings for protection. As the "T" series tracking telescopes were evolving, they were growing in size as well. Tracking telescopes differ from cinetheodolites in that they do not

The revolutionary T-1, known as "Little Bright Eyes" and follow-on T-2 tracking telescopes were primarily mobile units (Figures 22 & 23). In 1950 purpose-built structures were designed to house the T-1 and the more sophisticated T-3 when not in use (Figures 24 & 25). The comparatively larger T-4 and T-5 series telescopes (Figures 26 & 27) required a substantially larger shelter. In order to protect them from the elements, cleverly designed steel-frame buildings with wheels literally rolled back off a concrete slab assembly with steel tracks to expose the telescopes for use (Figures 28 & 29). It can be seen in the background of Figure 30.

Figure 22. Little Bright Eyes, or T-1, ca. 1947 (WSMR Museum Archives)

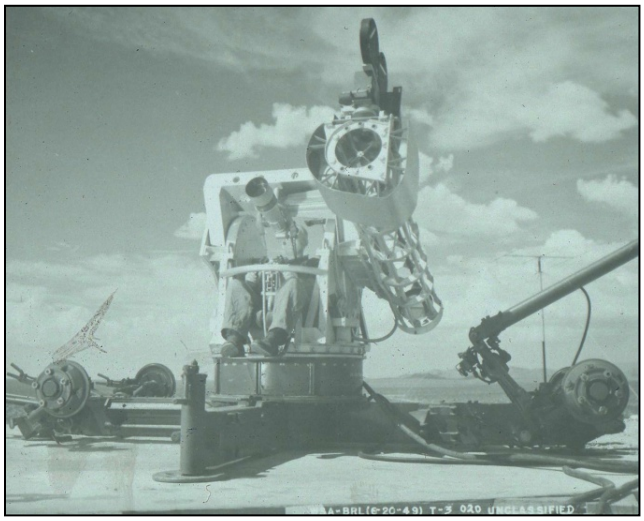

Figure 23. Tracking Telescope T-3, 1949 (WSMR Museum Archives)

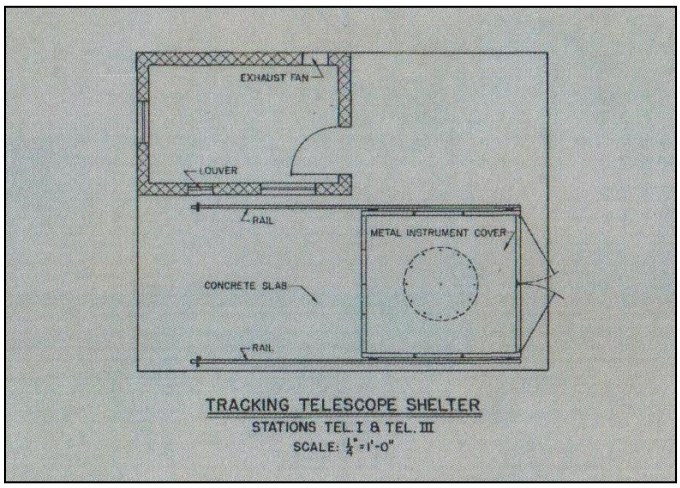

Figure 24. Tracking telescope support with moveable shelter, 1950 (Drawing Set WS-CR)

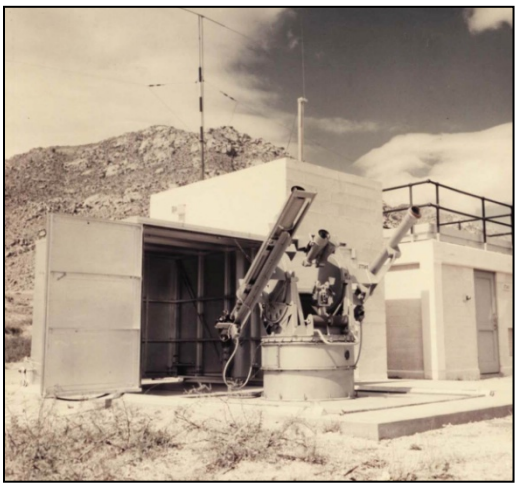

Figure 25. Permanent Telescope T-1 at T-1 Site ca.1952 (WSMR Museum Archives)

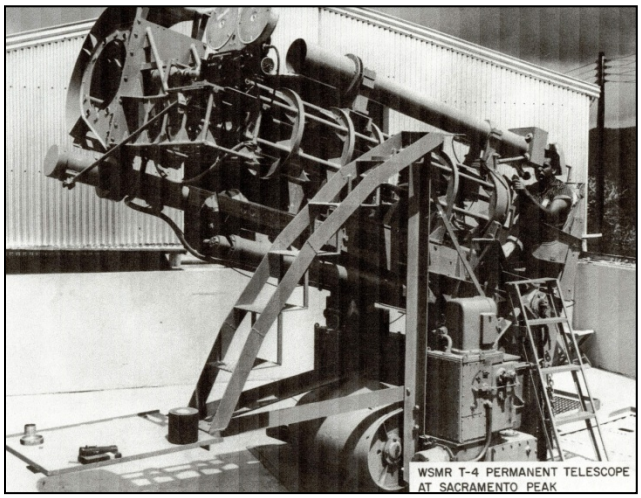

Figure 26. T-4 Tracking telescope, ca 1955 (Bellinger Collection, WSMR Museum Archives)

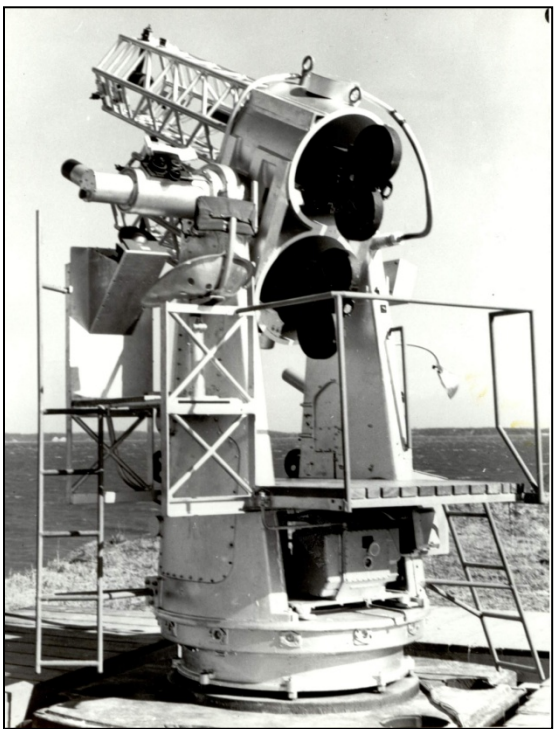

Figure 27. T-5 Tracking telescope, ca 1955 (Bellinger Collection, WSMR Museum Archives)

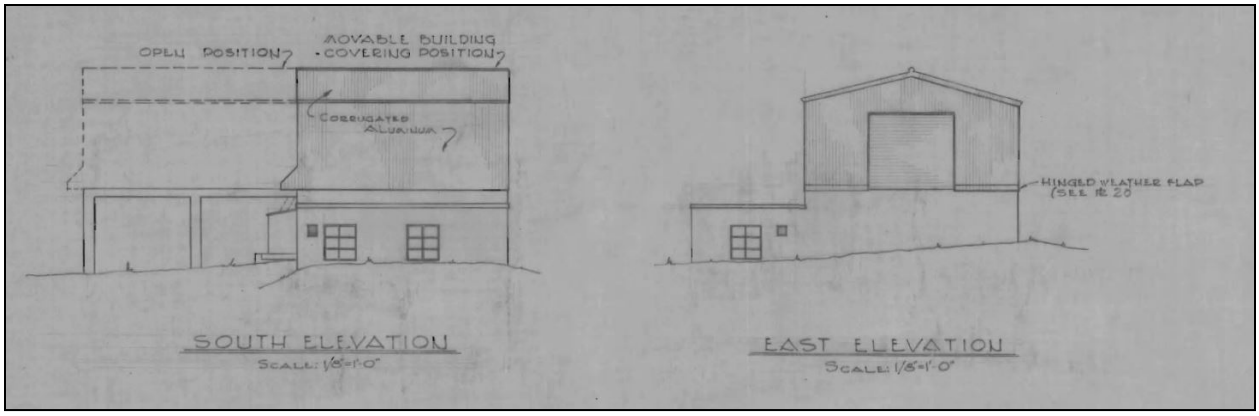

Figure 28. Tracking telescope Shelter elevations (Drawing Set WS-AT, 1950)

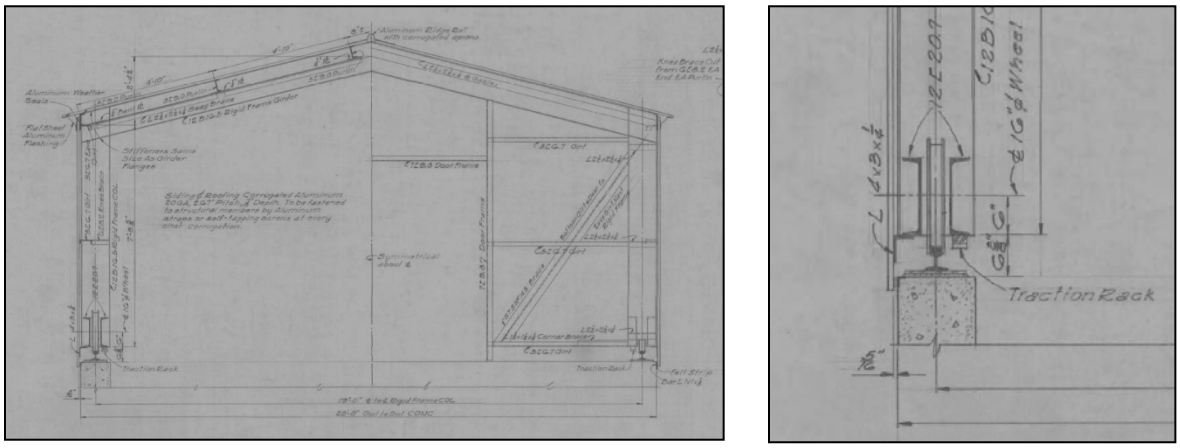

Figure 29. Cross-section of moveable shelter with wheel and track detail (Drawing Set WS-AT, 1950)

Figure 30. T-4 Tracking telescope, ca 1955 (WSMR Museum Archives)

One of the last permanent shelter types designed for optical instrumentation was a smaller version of the T-series shelters. This configuration used a simple, aluminum-panel clad box-like structure that rolled on steel track and featured a garage door-type door (Figures 31 & 32).

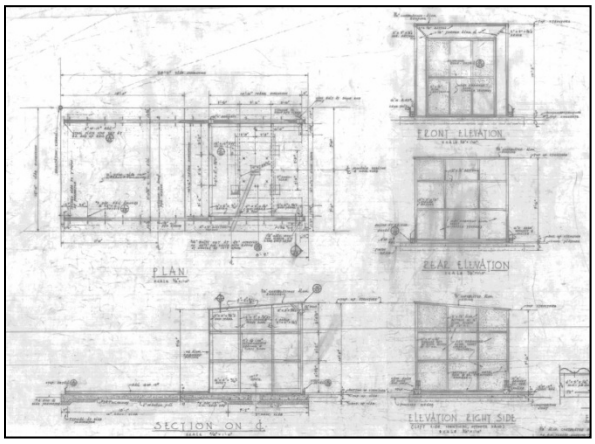

Figure 31. Instrumentation Shelter, 1955 (Drawing Set WS-EM)

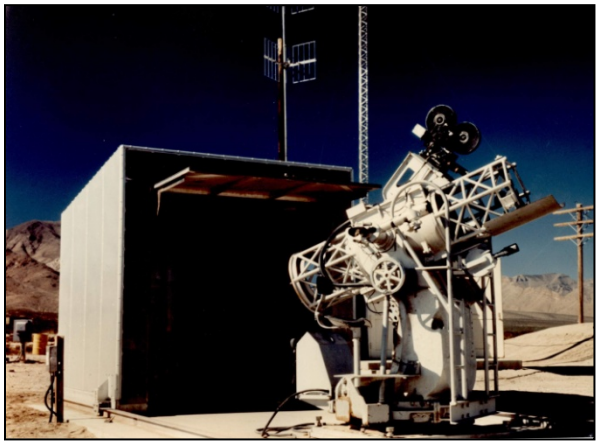

Figure 32. Shelter with IGOR at WSMR, ca. 1957

Other first generation, permanent optical instrumentation buildings were constructed for ballistic cameras, and the Bowen-Knapp high-speed camera. Ballistic cameras are fixed (as opposed to "surveillance" or moveable), but have wide field of vision in order to track a rocket or missile launch with a single, very long exposure (Figure 33). This is typically done at night where the rocket exhaust can easily be seen against the night sky—the secondary benefit of night exposures is the ability to use the stars to determine precise position. Figure 34 illustrates the first generation purpose-built ballistic camera shelter.

Figure 33. Wild BC-4 Ballistic camera on display at WSMR Museum (photo by the author)

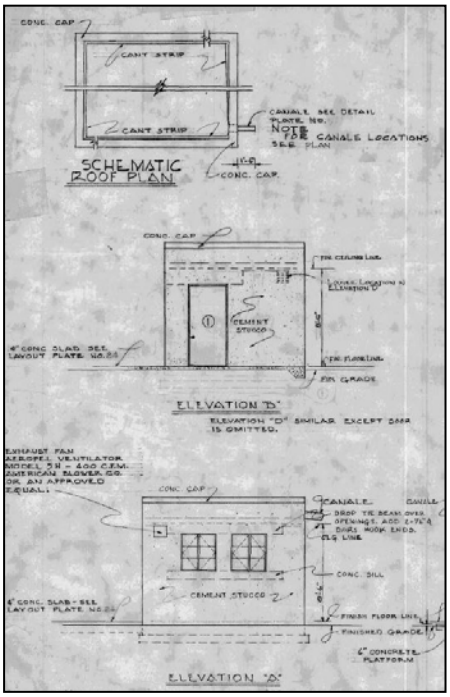

Figure 34. Ballistic Camera Building (Drawing Set WS-BF, 1950)

The Bowen-Knapp high-speed camera was the workhorse for rocket and missile testing before digital video became available (Figure 35). Dr. Ira "Ike" Bowen, a member of the National Academy of Science and a California Institute of Technology (Caltech) researcher, developed the optical technology for the Navy at NOTS that would result in the high-speed camera type that would bear his name. While Bowen is most famous for his founding of the Mount Palomar Observatory, the Bowen-Knapp camera, widely referred to as an "acceleration camera," became the military standard in high-speed photography for missile and rocket testing (Bowen 1968). Bowen also developed rocket-mounted cameras known as "solar yaw" cameras that were designed to use light to expose the film as the vehicle body was turning in flight. This enabled engineers to collect a complete data set for the vehicles' overall position (Esser and Treviño 2014: 19).

The Bowen-Knapp camera had three types of first generation shelters at WSMR. The first was a universal "camera building" with metal doors on one elevation (Figure 36) with a support building (Figure 37) The second was designed for the Small Missile Range in which two rows were set up along the flight line facing each other in order to capture initial flight characteristics (Figure 38). The third version was added later and both are common at the launch complexes (Figure 39).

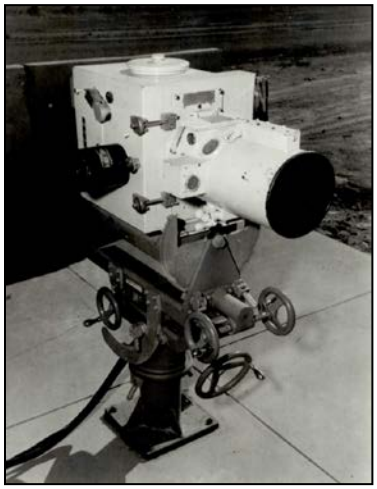

Figure 35. Bowen-Knapp Camera, ca. 1950 (WSMR Museum Archives)

Figure 36. Camera Building, Tare Site, 2016

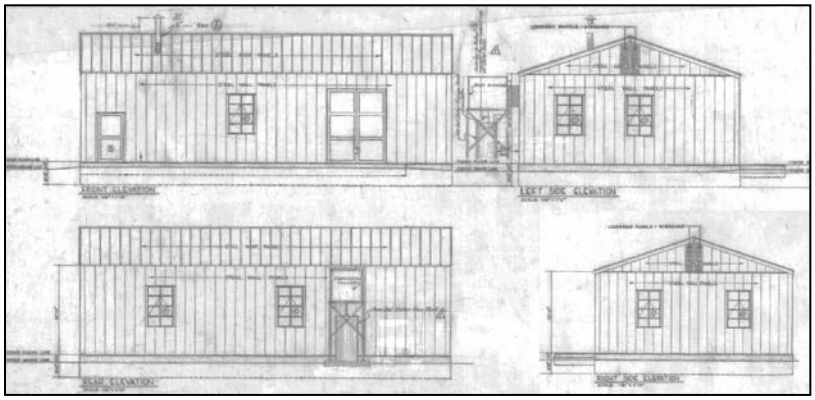

Figure 37. Bowen-Knapp Instrumentation shelter (Drawing Set WS-EM, 1955)

Figure 38. Bowen-Knapp Camera shelter, Small Missile Range, 2015 (see Figure 36)

Figure 39. Bowen-Knapp Camera shelter, Small Missile Range, 2015

In the first generation, numerous support buildings were designed to house electronic equipment and, while purely utilitarian, were designated specifically for the instrument in use. These prefabricated buildings were specified in numerous sizes and configurations—some were placed on steel "skids" which made them mobile but all were considered real property. The type is consistent and most likely manufactured by the ARMCO Company based on the style and materials, though they are lacking in manufacturer tags. This building type would follow into the second generation of instrument shelters but not included in architectural drawings. This is the first reference to optical instrumentation support buildings and is used here to be consistent with optical instrumentation typology (Figures 37 & 41).

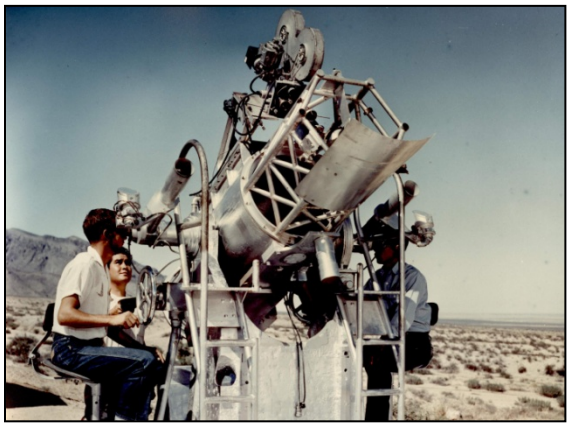

Figure 40. IGOR at WSMR, ca. 1955 (Bellinger Collection, WSMR Museum Archives)

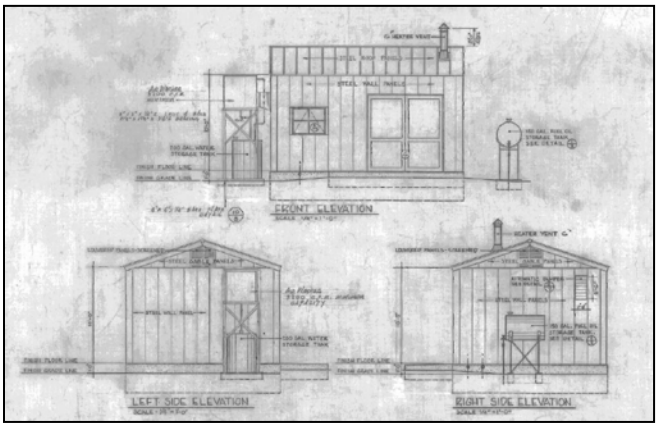

Figure 41. IGOR Building (Drawing Set WS-EL, 1955)

The next generation of tracking telescopes was the Intercept Ground Optical Recorder, or IGOR (Figures 32 & 41). Often confused with a cinetheodolite, the combination of telescope and cameras was designed by the Aberdeen Proving Ground specifically for WSPG (Delgado: 703); its specialty was determining miss-distance. The first five were put to use as early as 1951 but were mounted on trailers (Joe Gold, personal communication 2016). A number of improvements and upgrades over the coming years would result in numerous models including the Modified Intercept Ground Optical Recorder, or MIGOR (Figure 42), Intercept Target Optical Recorder

(ITOR), the Perkin-Elmer Recording Optical Tracking Instrument, known as ROTI (Figure 43), Ground Optical Recorder for Intercept Detection (GORID) (Figure 44), the Terminal Tracking Telescope (TETRA), and the later Cold War Era, Distant Object Attitude Measuring System, or DOAMS (Figure 45).

Figure 42. MIGOR at WSMR, ca. 1957
(Bellinger Collection WSMR Museum Archives)

Figure 43. ROTI 1 at Salinas Peak, WSMR, ca. 1965
(Bellinger Collection WSMR Museum Archives)

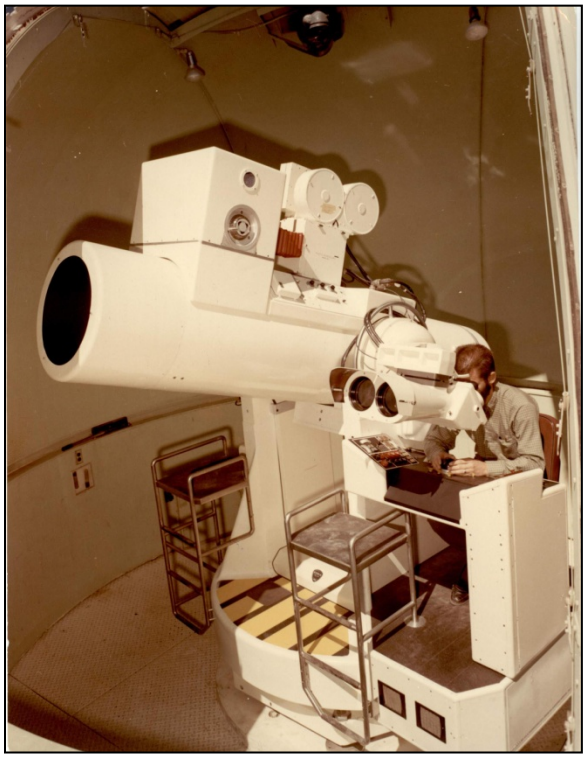

Figure 44. GORID at WSMR
(Bellinger Collection, WSMR Museum Archives)

Figure 45. DOAMS at WSMR
(Bellinger Collection, WSMR Museum Archives)

The Contraves Electro Optical Tracking System (EOTS) was introduced in 1952 at the Long Range Proving Ground, commonly known as the Eastern Range on the Florida coast (Figure 46). The Swiss-made cinetheodolite quickly emerged as the predominant metric missile tracking instrument (Delgado: 706) (Figure 47). The EOTS-series Contraves cinetheodolites would be introduced to WSMR in 1962, housed primarily in "astrodomes," the next generation of optical instrumentation shelters (Wind and Sand 1962: 1, 8).

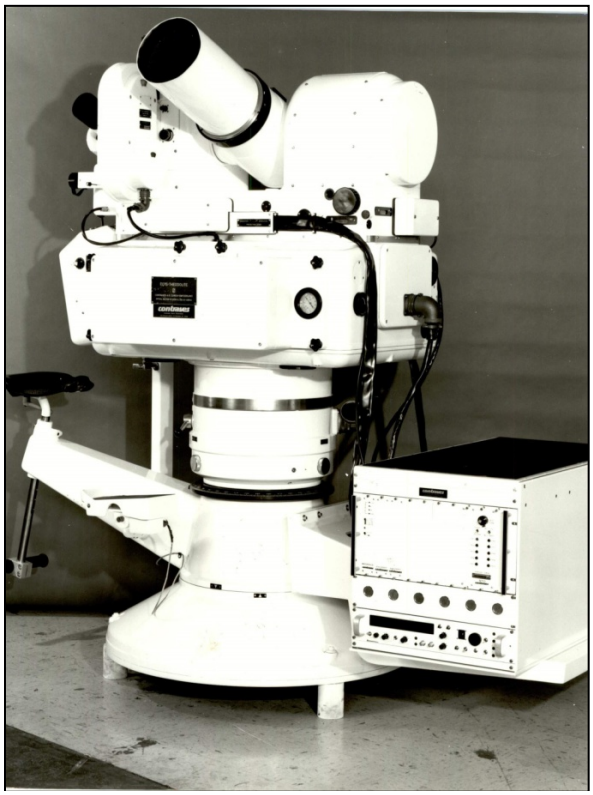

Figure 46. Contraves EOTS C/F
(Bellinger Collection, WSMR Museum Archives)

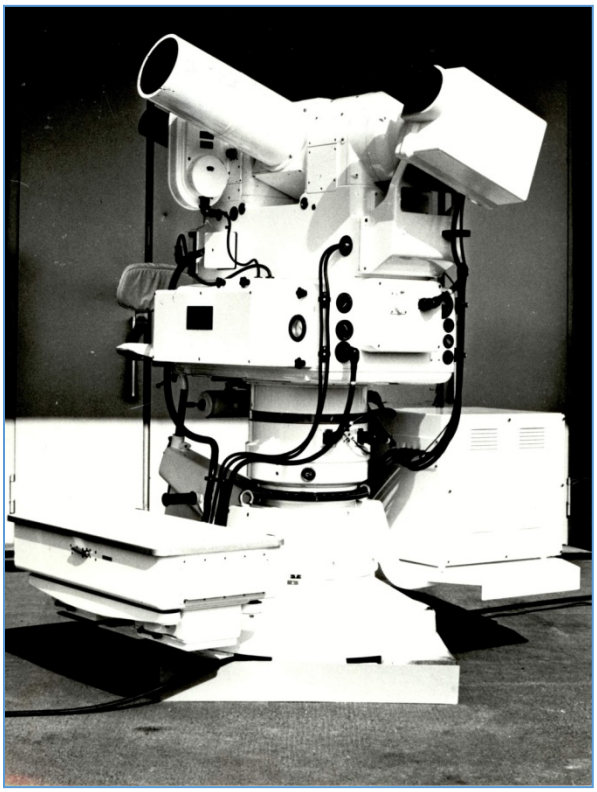

Figure 47. Contraves EOTS F with TV tracker
(Bellinger Collection, WSMR Museum Archives)

In the late 1950s and early 1960s, the second generation of permanent construction for instrumentation, particularly, optical instrumentation was driven by a desire to secure better quality devices, expand the number of tracking sites, and all the while keep costs down. This was achieved by major efforts to begin simplifying construction in the late 1950s, efforts that would continue through the 1970s. The most significant contribution was the development of the miniaturized astronomical observatory, known as the astrodome (James Sommer, personal communication 2015). This versatile device would carry the range's optical instrumentation through the remainder of the Cold War Era and into the 1990s at which point most of the permanent instrumentation structures would be phased out and left vacant—only a few have instruments remaining.

To address the multitude of issues plaguing the cinetheodolites, NOTS began development and design for the "astrodome type" shelter in September, 1953. Specifications were provided to Coleman Engineering of Los Angeles who produced a prototype by May of 1954 (DiPol 1957: 2). The specifications took into consideration all conceivable factors: current and planned

weapons programs to assure the dome would rotate quickly enough when tracking as well as the dimensions of a cinetheodolite, its optics, and a single operator. Out of these factors came a four foot tall cylindrical steel base, 10 feet in diameter, the dimension that would differentiate all future astrodomes, on which was placed a fiberglass dome that was designed to freely rotate. Synchronized with the movement of the cinetheodolite, the dome rotates according to operator input which exposes the optical lens to the sky through a 50-inch opening that extends slightly beyond the apex of the dome; in essence, the dome, instrument, and operator all rotated as a unit. Performance specifications required that the dome be able to accelerate and rotate at prescribed rates. The dome is driven by a combination electric/hydraulic drive system that consists of a wrap-around, gear-driven chain moving the entire dome on rollers (Figure 48). When not in use the entire dome is lifted off the rollers and sealed from the elements with a neoprene gasket on a flange at the top of the base (DiPol 1957: 3-4).

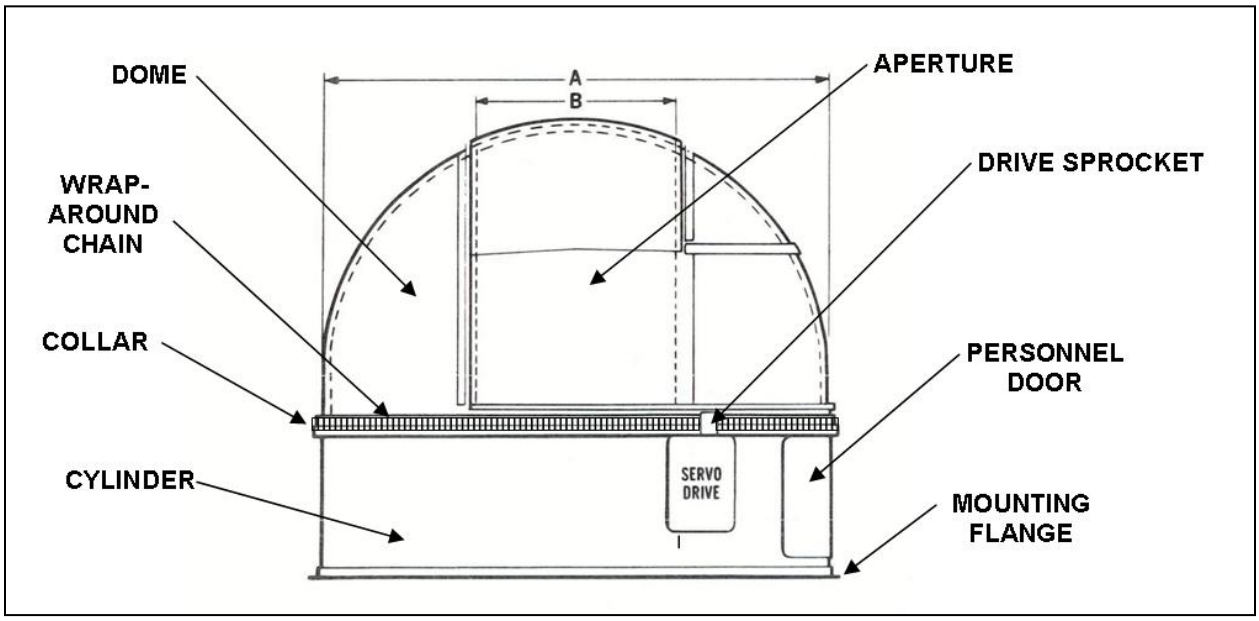

Figure 48. Astrodome Schematic (From a sales pamphlet produced by MFG West, Victorville, California)

The success of the 10-foot diameter astrodome for protecting Askania cinetheodolites combined with the inter-range collaboration under the IRIG's Optical Systems Working Group (OSWG) created an impetus for providing shelters for other types of optical instrumentation. Parabam, with its track record for quality and innovation offered an increasing range of sizes with an option for individualized features that could be chosen for each unit. This included fixed or rotating domes with equipment such as air-conditioning and heat, as well as motorized apertures (James Sommer, personal communication 2015).

As a "type", the Parabam astrodome does not vary greatly. Sales literature illustrates how, into the 1980s, the company offered a variety of sizes including 9-foot, 10-foot, 12-foot, 14-foot and, 16-foot units with some offering different sized apertures—other than the size differential and dome drive units the shelter itself does not vary greatly, regardless of the manufacturer. Dome rotation rates were also specified to assure compatibility with particular instruments. Parabam outdistanced its competitors and kept the lead with innovations such as placing a honeycomb cardboard between two fiberglass panels on the dome for structural stability, ultimately replacing

all steel elements with fiberglass, and transitioning the electric/hydraulic dome drive to a fully electric version (Figure 49). Such was Parabam's dominance of the market that the company was awarded service contracts with most of the test ranges, including WSMR (James Sommer, personal communication 2015). A few other manufacturers units were purchased such as Houston Fearless and Trio-Tech, but little has been ascertained regarding their manufacturers (Figure 50).

Figure 49. MIGOR in Parabam Astrodome, 1962 (Bellinger Collection, WSMR Museum Archives)

Figure 50. Houston-Fearless astrodome, at WSMR former Talos Defense Unit, 2015

Extant design drawings at WSMR illustrate the locations and for what purpose each astrodome was to be used. This optical instrumentation effort began with an order for as many as twenty-five, 10 and 16 foot astrodome units (James Sommer, personal communication 2015). The drawings indicate that most of the units, regardless of size, were fitted with the electric/hydraulic dome drive system that moved with operator and instrument. The only exception was the 10-foot units fitted with the BC-4 Ballistic Cameras and ribbon frame cameras as both instruments are stationary.

For this preliminary order, Parabam assigned model numbers to each cylinder and dome individually.[3] The "C" designation is for the cylinders and "D" for domes; model numbers for 10-foot units end in "2", while 16-foot units are designated "3". For example, 10-foot astrodomes consist of Models C-2 and D-2, while 16-foot units are Models C-3 and D-3. Astrodomes installed with drive unit also have an accompanying hydraulic power unit. In 10-foot domes they are identified as Model "DU-2" (drive unit) and "PU-2" (Power unit). For 16-foot astrodomes, the nomenclature is the same; the "2" is simply replaced with a "3".

[3] Later models do not necessarily follow this pattern. On-sire recordation will be necessary to determine alternate patterns of assigning model numbers.

Despite any confusion regarding models numbers, Parabam manufacturer serial numbers are identical for each component of an assembled astrodome. For this first group of astrodomes, the serial numbers run sequentially from 6 to 27. No serial numbers were notated for the newly-developed Recording Optical Tracking Instrument (R.O.T.I.) sites. It has been suggested that serial numbers 1-5, astrodomes, were delivered to Naval Air Missile Test Center (NAMTC) at Point Mugu, California (James Sommer, personal communication 2015).

In 1958, the first astrodome-fitted construction was designed at WSMR. For the five instrument types, different construction types were specified. Assemblies with 10-foot astrodomes fitted with cinetheodolites, ribbon frame cameras, and ballistic cameras were placed on stand-alone concrete pads, some on eight or ten-foot earthen mounds to counteract atmospheric boil (Figures 51 & 52). An important distinction lies in the construction beneath the shelter domes and may help ascertain what instrument type may have been originally fitted, should site records not be available. 16-foot astrodomes fitted with tracking telescopes were placed on stand-alone concrete pads, some on eight or ten-foot mounds. For the R.O.T.I. instruments, a special below-grade, reinforced concrete "pit" was developed (Figure 53).

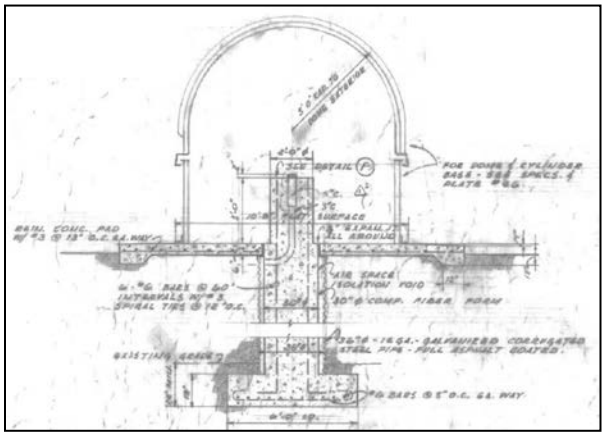

Figure 51. Cinetheodolite pad with 10-foot astrodome, 1958 (WSMR Drawing set WS-HK)

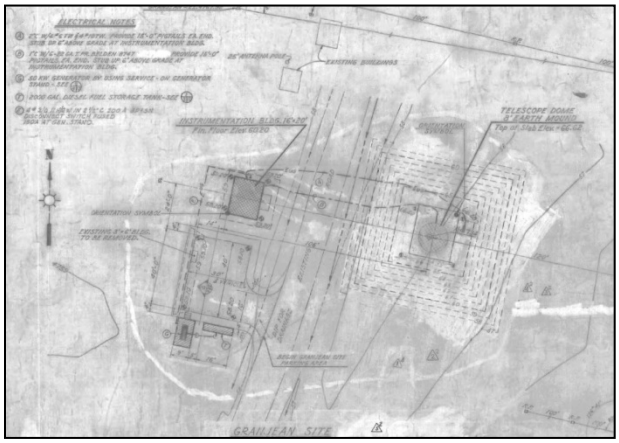

Figure 52. Raised earthen mound at Granjean Site, 1958 (WMR Drawing set WS-HK)

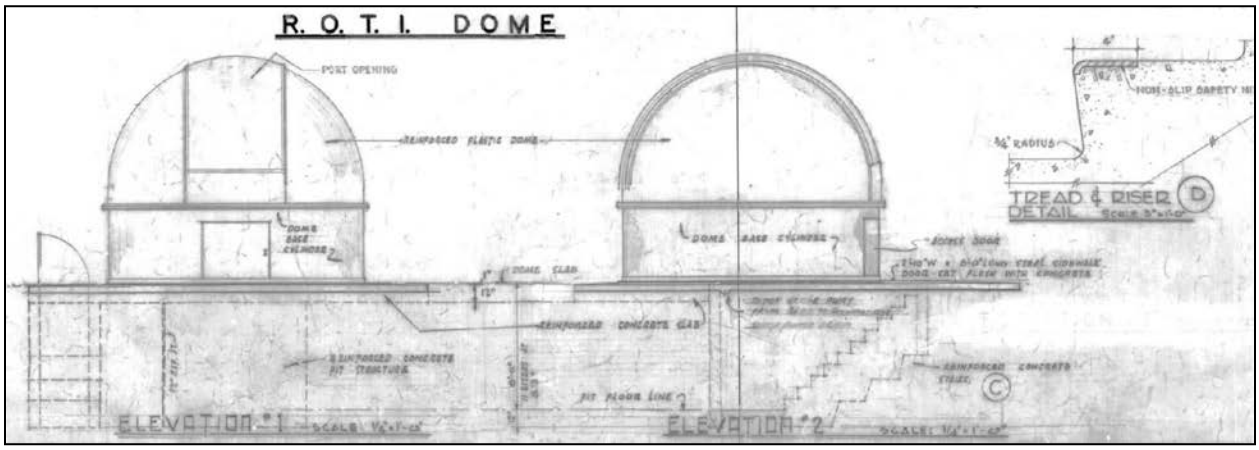

Figure 53. ROTI Dome, 1958 (WMR Drawing set WS-HK)

The only time an astrodome was fitted to a first generation building was the design for the BC-4 ballistic camera (Figure 54). Only a year later another round of instrumentation was installed and sites were expanded; 16 sites were fitted with Parabam-manufactured astrodomes. Included in this second order was an unusual new type of shelter designed for the ballistic camera. The shelter featured a standard 10-foot cylindrical base on which an elongated "bread box-type" shell with wide aperture was mounted (Figures 55 & 56).

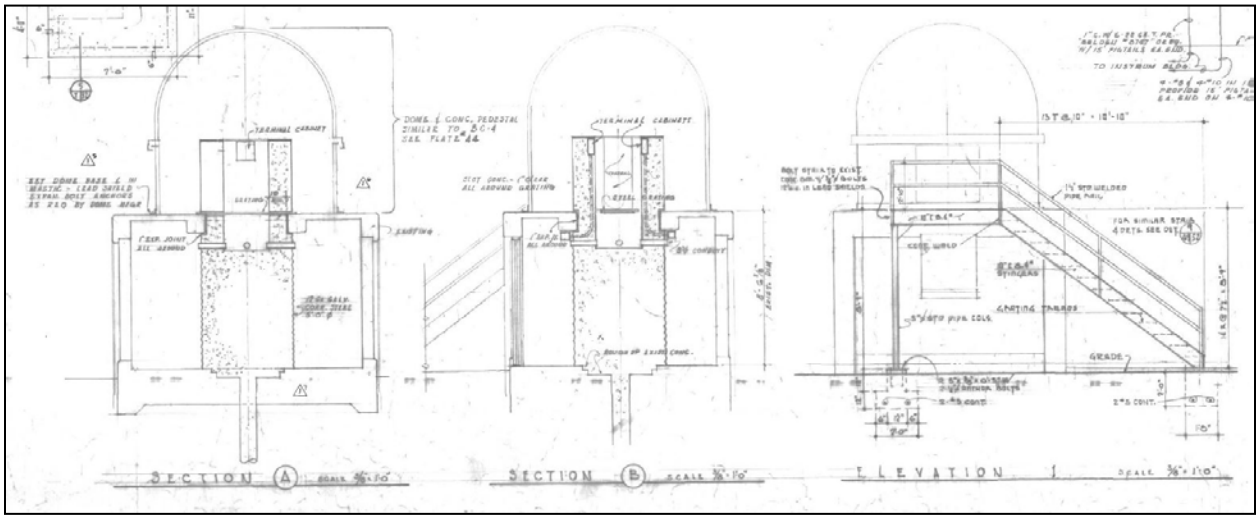

Figure 54. Astrodome fitted to first-generation single cinetheodolite building, 1958 (Drawing Set WS-HK)

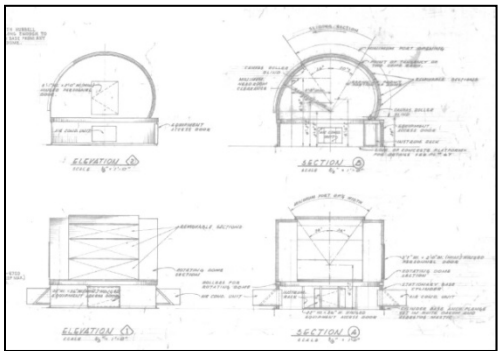

Figure 55. Parabam Ballistic Camera shelter, 1959 (Drawing Set WS-IN)

Figure 56. Ballistic camera shelter, STAR Site, ca. 1965 (WSMR Museum Archives)

Beginning in 1960, WSMR planned the third series of optical instruments to be placed in astrodomes. Dubbed "Type A" through "Type D", the new series consisted of eight different types of instrumentation mounts ranging from concrete pads at grade to enclosed raised steel-frame structures. The raised steel-frame assemblies would replace the first generation post and lintel concrete and CMU infill buildings constructed between 1950 and 1955.

Assemblies with 10-foot astrodomes fitted with cinetheodolites and fixed cameras were placed on stand-alone concrete pads (Type "A"), telescopes on raised steel frame platforms (Type "B") (Figure 57), on raised steel frame platforms adjacent to the pre-existing first generation cinetheodolite buildings (Type "B-SS") (Figure 58), and on raised steel frame platforms with the bases enclosed (Types "C" and "D") (Figures 59 & 60).

Figure 57. Type "B" Platform, 1960 (Drawing set WS-JR)

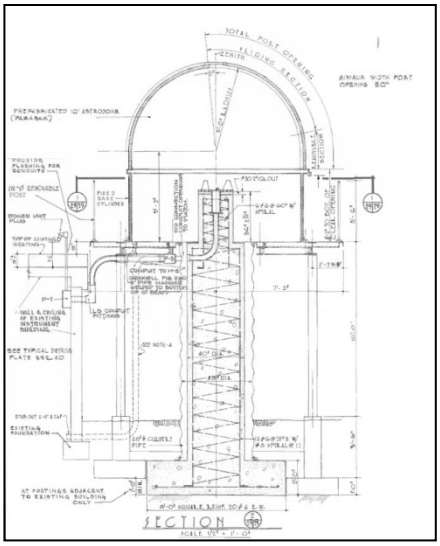

Figure 58. Type "B-SS", 1960 (Drawing set WS-JR)

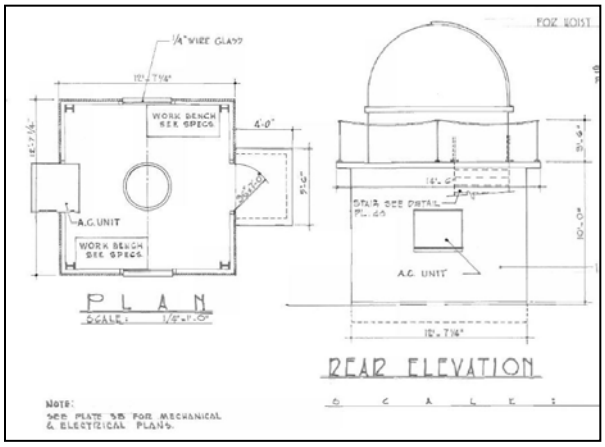

Figure 59. Type "C" shelter, 1960 (Drawing set WS-JR)

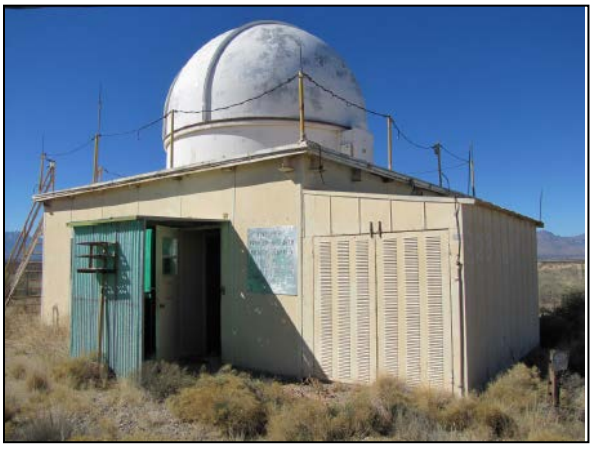

Figure 60. Type "D" shelter, 1960; Gregg Site 2015

To illustrate possibly just representing a handful of one-off designs, Figure 61 shows an unusually tall astrodome shelter fitted with an IGOR. Figure 62 is a camera shelter retrofit.

Figure 61. Elevated IGOR astrodome" at Malpais Site (WSMR Range Data Book, 1963)

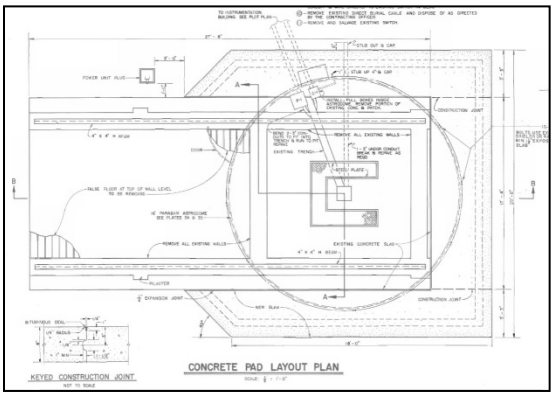

Figure 62. Retrofitted camera shelter for astrodome, 1960 (Drawing Set WS-JR)

A new effort occurred in 1961 and 1962 with the construction of instrumentation sites for the "Highspeed [*sic*] Cinetheodolite Installation Phase I". Limited to the vicinity of the launch complexes, the structures consisted of similarly designed 10 and 20-foot steel-frame assemblies with Parabam-manufactured 10-foot astrodomes (Figures 63 and 64); none of the steel-frames were designed with enclosures. Designed to house the Contraves cinetheodolites, all of the astrodomes were fitted with dome drive units. These assemblies were all designed to carry steel-frame hoist assemblies to raise and lower instruments from grade (Figure 63).

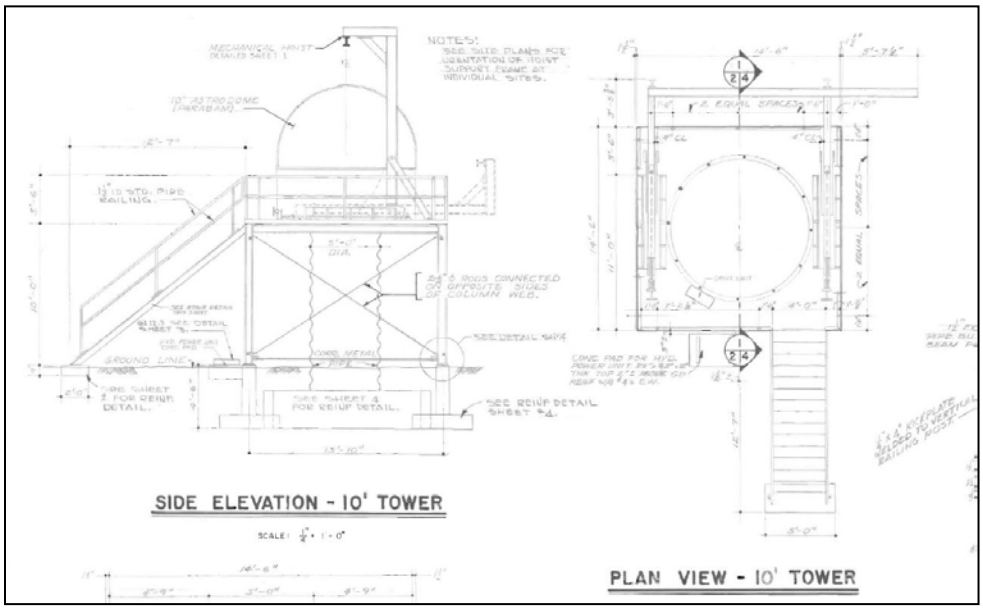

Figure 63. Ten-foot structure for "Highspeed Cinetheodolites", 1961 (WMR Drawing set WS-KI)

Figure 64. Twenty-foot structure for "Highspeed Cinetheodolites", ca. 1970 (WSMR Museum Archives)

The last group of fixed astrodomes to be installed at WSMR came in 1979 with 11 fixed telescope sites with identical 20-foot tall steel-frame towers (Figures 65 and 66). Defined as "fixed telescope sites", the plans reveal no indication as to what type or models were planned. This was the last of the dedicated instrumentation sights to be constructed with the astrodome as a key component. This was last of the permanent facilities to house these instruments. From that point forward most instrumentation would be mobile, including cinetheodolites; the cost and flexibility of mobility for advanced testing made fixed construction for multiple instrumentation stations obsolete at WSMR (see Section 2.4). Figures 66 and 67 illustrate the premanufactured maintenance buildings designed to accompany the stands.

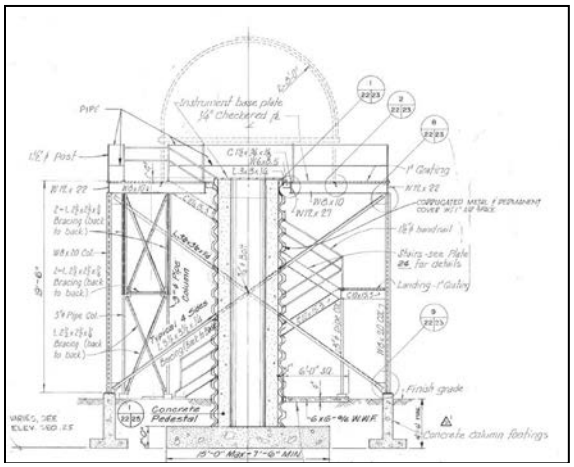

Figure 65. 20-foot fixed telescope stand, 1979 (WMR Drawing set WS-UB)

Figure 66. 20-foot telescope platform, 1979 at NW 50 Site, WSMR, 2015

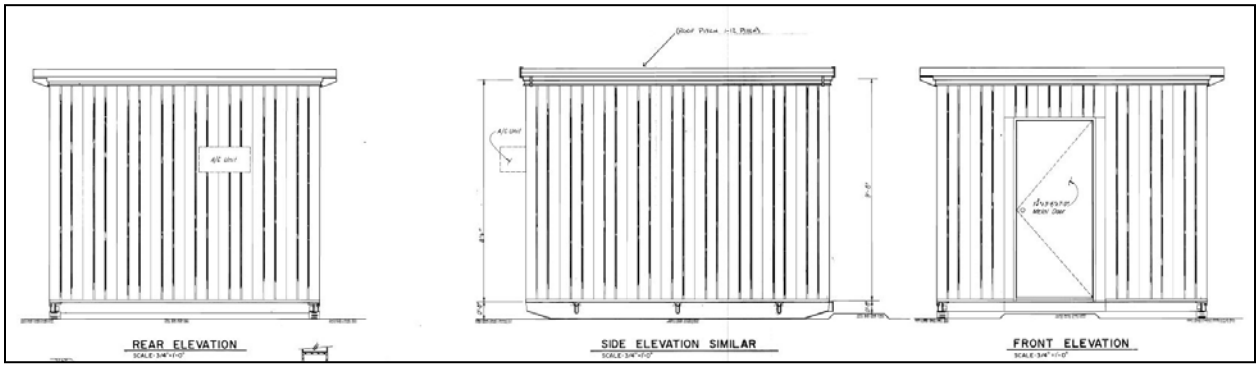

Figure 67. Fixed Telescopes Maintenance building, 1979 (WSMR Drawing Set WS-UB)

2.4.2 Electronic Instrumentation

Electronic instrumentation was as varied and complex as the myriad of optical instruments that performed on the WSMR ranges over the decades. As stated earlier, electronics in missile tracking covered a wider array of duties than simply tracking—this included receivers *and* transmitters, radars, communications and timing signals, the critical common link that aligns all types of instrumentation data in an exact point of time. Tracking radars were placed at main station hubs such as C-Station in the southern range, Alamo Peak in the east-central section (west of and the Oscura and Red Butte stations to the north (AN/FPS-16 2016: 12). Most other

facilities constructed for electronic instrumentation were designed to house the electronic equipment; antennas were typically mounted nearby or affixed to the building.

The five primary types of Cold War Era range-wide electronic tracking instrumentation that multiple facilities were constructed for were: Doppler Velocity and Position System (DOVAP), velocimeter, telemetry, communications, and range timing (WSMR 1956: ii). DOVAP determines the velocity and position of a vehicle in space. The omnidirectional system uses the Doppler Effect. The system operated as basic radar by using stations scattered across the Range to keep in constant contact with the missile. By measuring the timing difference between the outgoing and incoming radio signals, observers could track the missile's speed and relative position on the range (Missile 1960:15). An internal report from 1960 describes the system:

> Data is transmitted and then collected at the recording stations (Figures 68 & 69) in the form of an oscillograph presentation of the Doppler output of each receiver station and is recorded both photographically and on magnetic tape, together with the range timing. The Dovap *[sic]* transmitter, located in the vicinity of the launching site, radiates the continuous wave (CW) signal; a beacon in the missile receives the signal, doubles the frequency and retransmits the signal to the receiving stations. The stations beat the signal against the first harmonic of the original ground signal received directly from the transmitter. The beat difference is the Doppler frequency because of the change in the received frequency as the missile moves through space (WSMR 1960: 12-13).

Figure 68. DOVAP Transmitter, 1951 (Courtesy of Emmett Savage)

Figure 69. DOVAP Antenna mounts, WSMR 2016

Figure 70 shows the building type for a DOVAP transmitter. As stated earlier, first generation support buildings were designed to house electronic equipment and, while purely utilitarian, were designated specifically for the instrument in use.

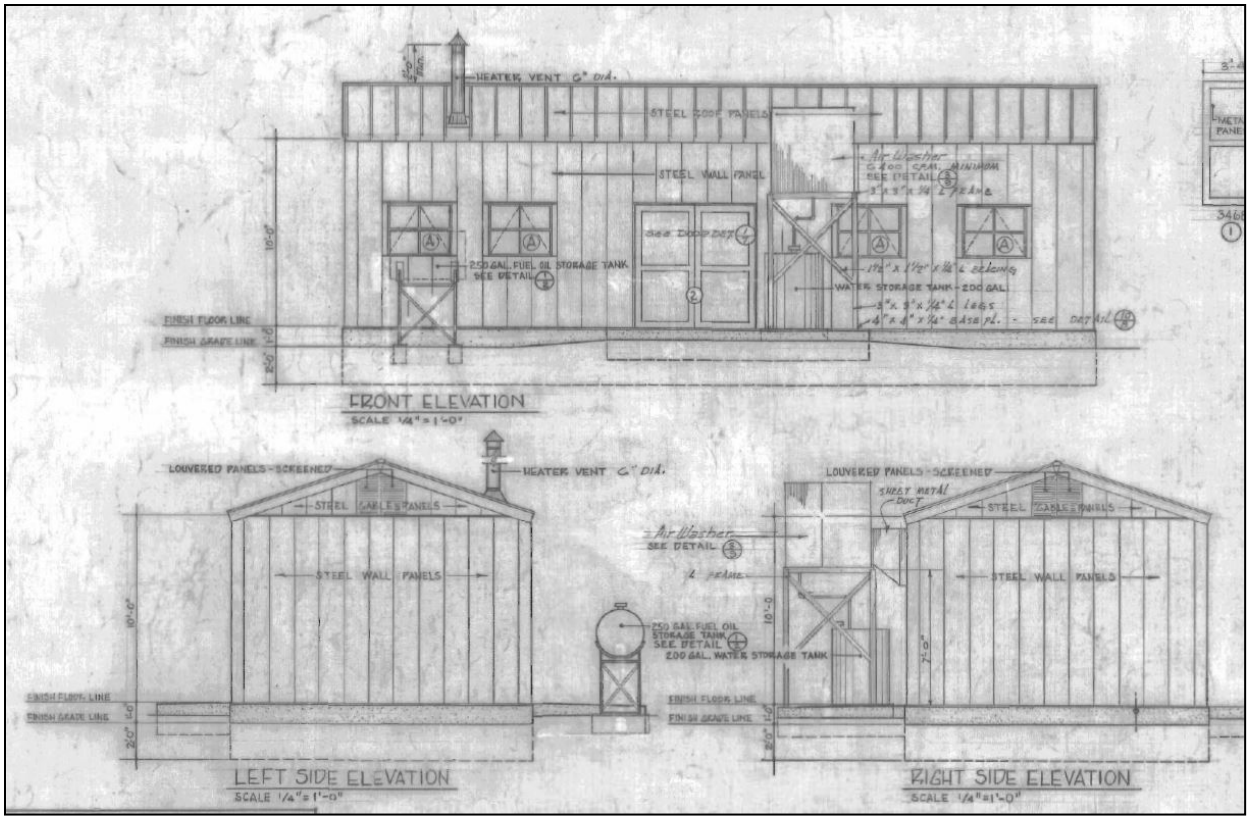

Figure 70. DOVAP Transmitter Shelter, 1955 (WMR Drawing set WS-EM)

Velocimeter instrumentation is similar to DOVAP in that it also utilizes the Doppler Effect using a directional dual antenna (Figures 71 & 72). Using microwave reflection, the offset between the signal hitting a test article in space and the return signal could track the missile's speed and relative position.

Figure 71. Velocimeter at WSPG (WSMR Picture Brochure, 1956)

Figure 72. S-Band Velocimeter, ca 1960 (Bellinger Collection, WSMR Museum Archives)

Two types of buildings were designed for the velocimeter. The first, in 1955, was designed to house the equipment when not in use (Figure 73). In 1959, a second building was designed to service the equipment (Figure 74).

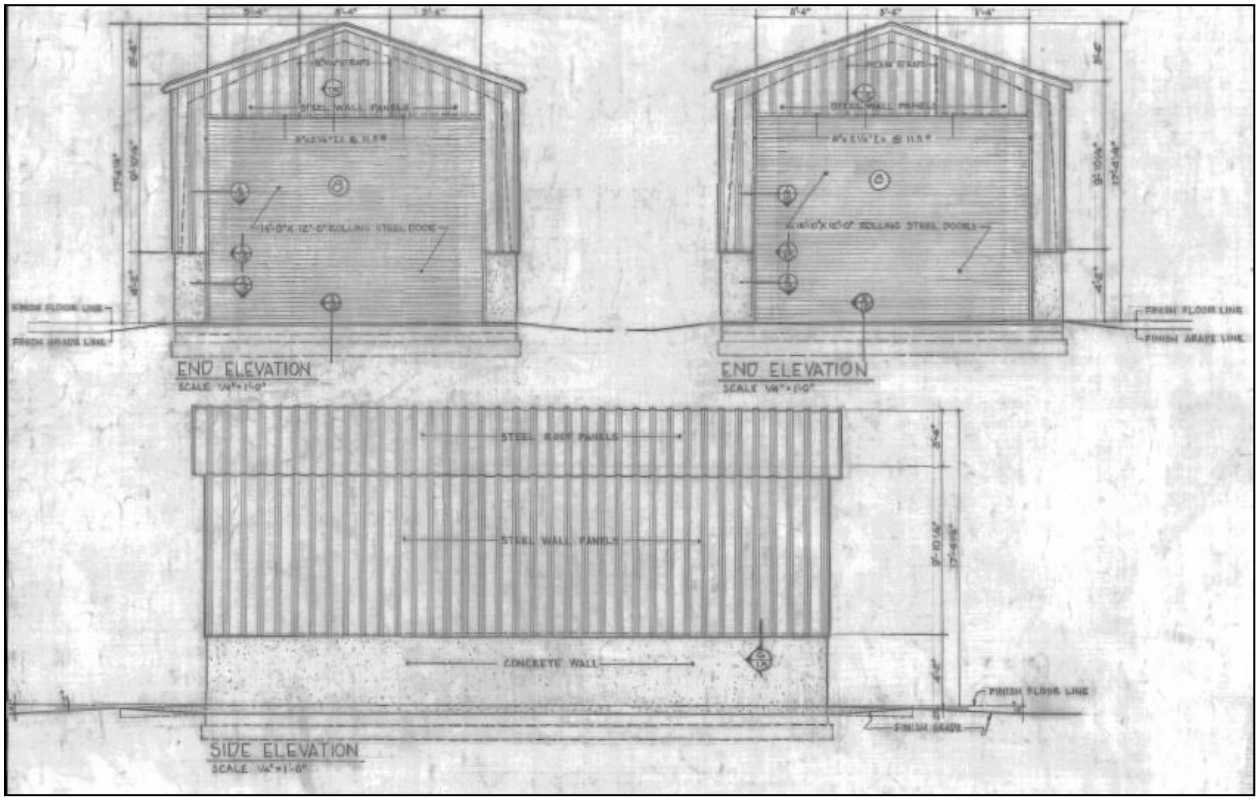

Figure 73. Velocimeter shelter, 1955 (WMR Drawing set WS-EM)

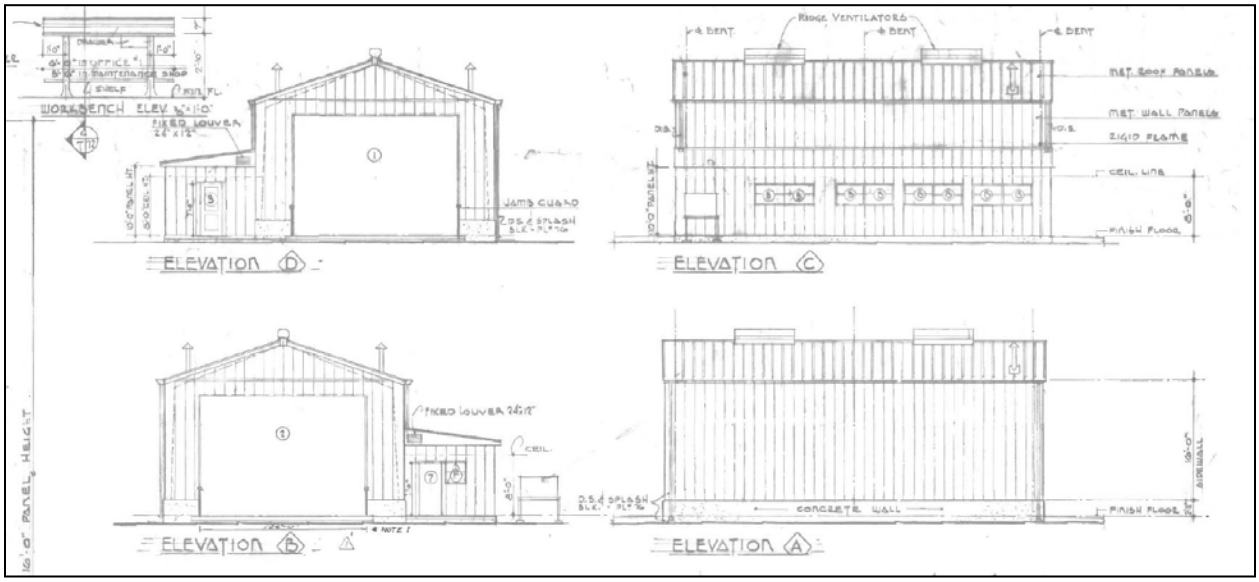

Figure 74. Velocimeter service building, 1959 (WMR Drawing set WS-IN)

Telemetry systems use on-board sensors on the rocket or missile to relay information regarding its operation to ground recording stations via radio transmission; "the science of measuring something in one place and reporting it to another" (WSMR Museum display). Typical telemetry data includes measurements of skin temperature, internal pressures, battery levels, fin positions, and timing information (Eckles 2013:156). Figures 75 and 76 illustrate two types of telemetry receiving antennas at WSMR.

Figure 75. Telemetry Antenna (WSMR Picture Brochure, 1956)

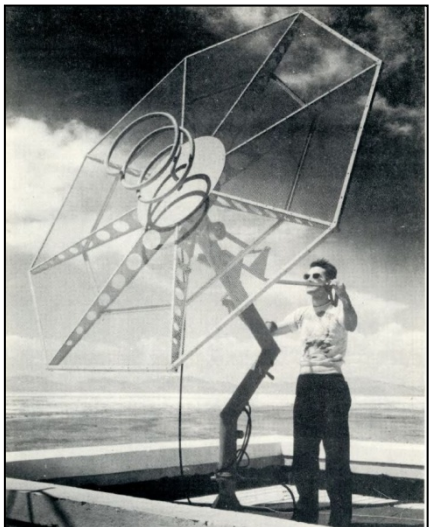

Figure 76. Telemetry Antenna (WSMR Picture Brochure, 1956)

Buildings for telemetry were constructed in the first generation permanent structures and came in two sizes (Figure 77). Figure 78 illustrates the semi-permanent remote station building.

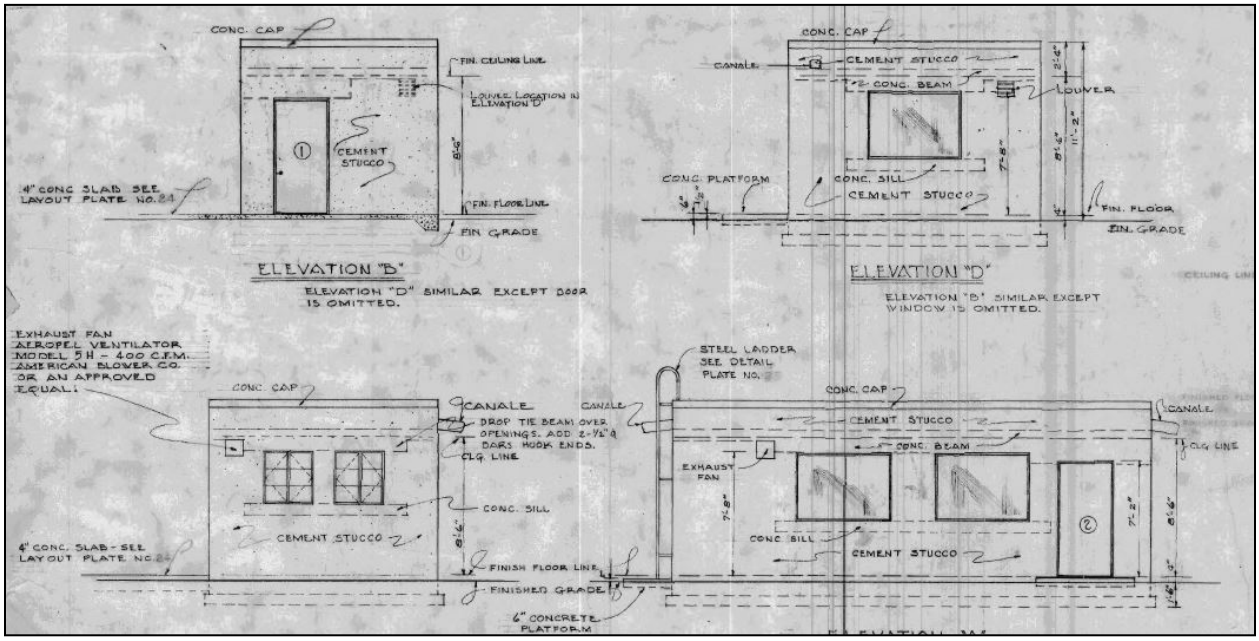

Figure 77. Telemetry buildings, 1950 (WSMR Drawing Set WS-BF)

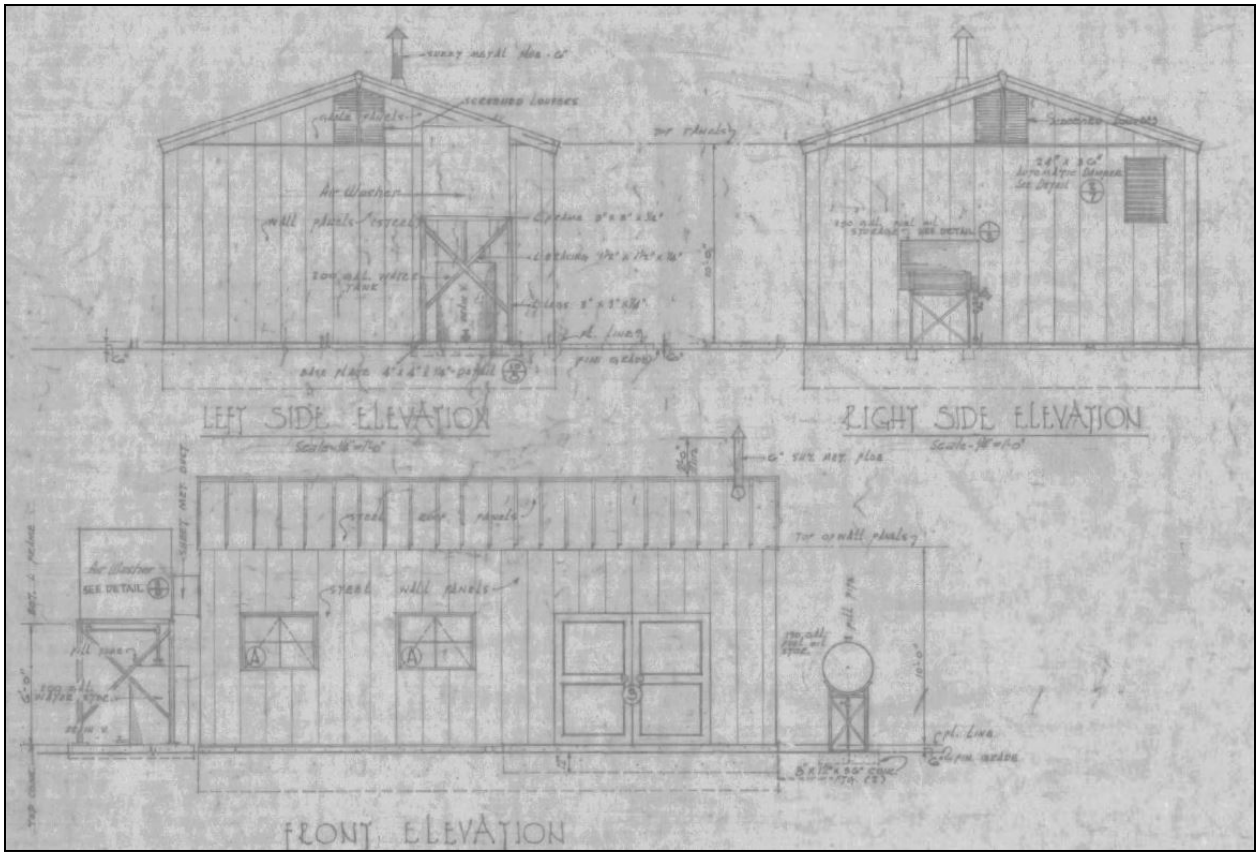

Figure 78. Telemetry building, 1955 (WSMR Drawing Set WS-EL)

Instrumentation timing is critical to align all instrumentation so that when disseminating data from a wide variety of devices, all can be correlated to a specific point in time. This allows engineers an exacting reference point from which a bigger picture can be ascertained. This synchronized timing process saved hundreds of man hours in the data reduction process (Poisall 1956: 1). A technical description illustrates the process:

> There are twenty-five Timing stations; eight in the South Range and seventeen in the North Range. The Timing System provides the instrumentation systems with fixed timing rates, elapsed time and control signals. These signals are combined into pulsed signals and modulated carrier signals in standard IRIG formats for distribution and utilization. The instrumentation timing system consists of central time code generation equipment, wire and radio distribution equipment, and timing terminal equipment. The time code generation equipment consists of three IRIG time code generators with automatic comparison and switch-over in event of a failure in the on-line generator. The time code generators are synchronized to Greenwich Mean Time by National Bureau of Standards radio transmissions (WSMR 1967: 19).

Figure 79 shows a type of antenna used in the WSMR timing stations, but many of the timing signals were transmitted by wire.

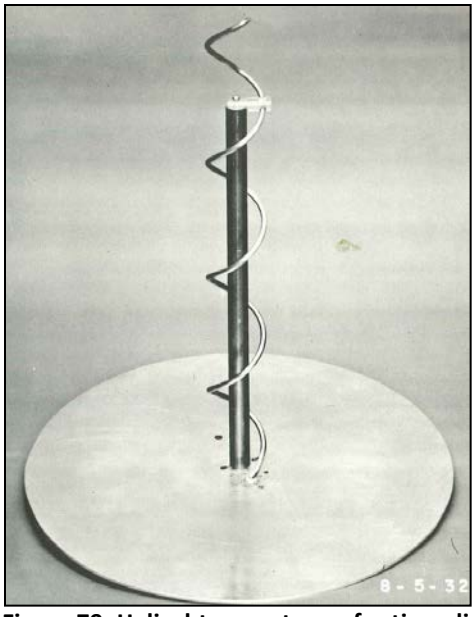

Figure 79. Helical-type antenna for time distribution signals, ca. 1955 (WSMR Museum Archives)

To house equipment for the timing stations at remote stations, WSMR used a standard steel-frame building (Figure 80).

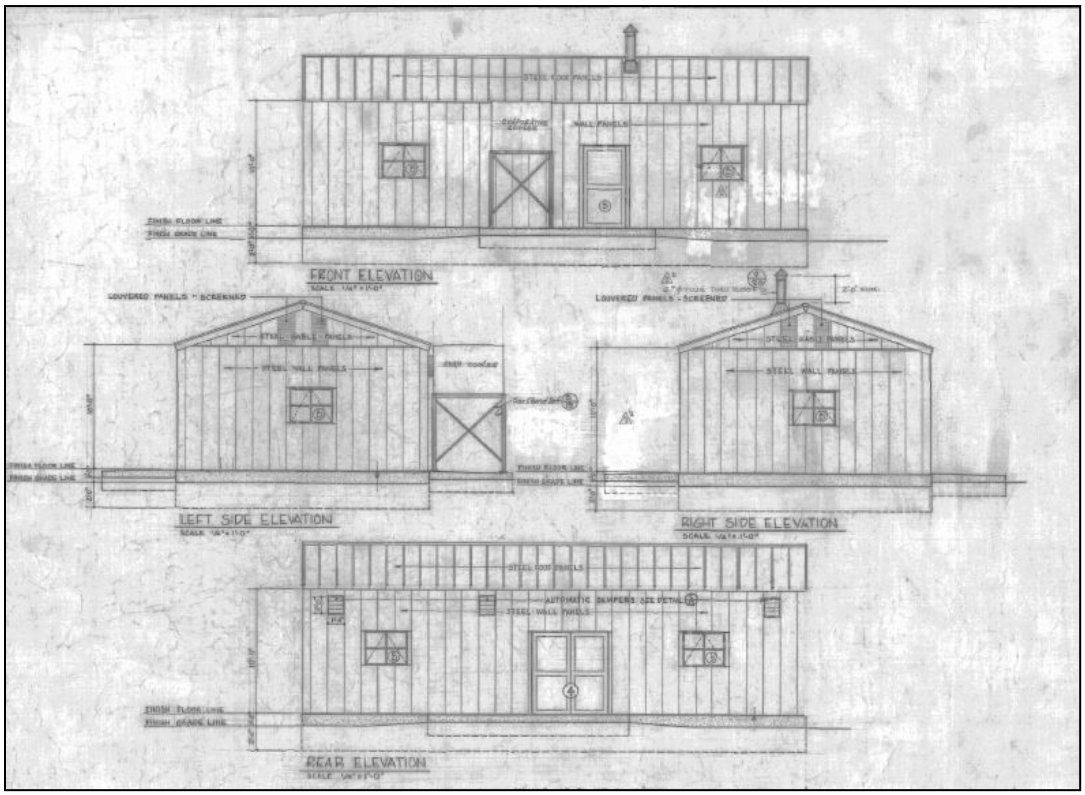

Figure 80. Timing Distribution building, 1955 (WSMR Drawing Set WS-EM)

2.4.3 Instrumentation Support Buildings

As mentioned earlier, many support buildings were erected for instrumentation support, most along the lines of premanufactured, steel-frame utilitarian structures. Figure 81 shows the very first purpose-built instrumentation support building. The remainders are found in the 1959 instrumentation drawing set WS-IN and do not refer specifically to an instrument type (Figures 82 through 85).

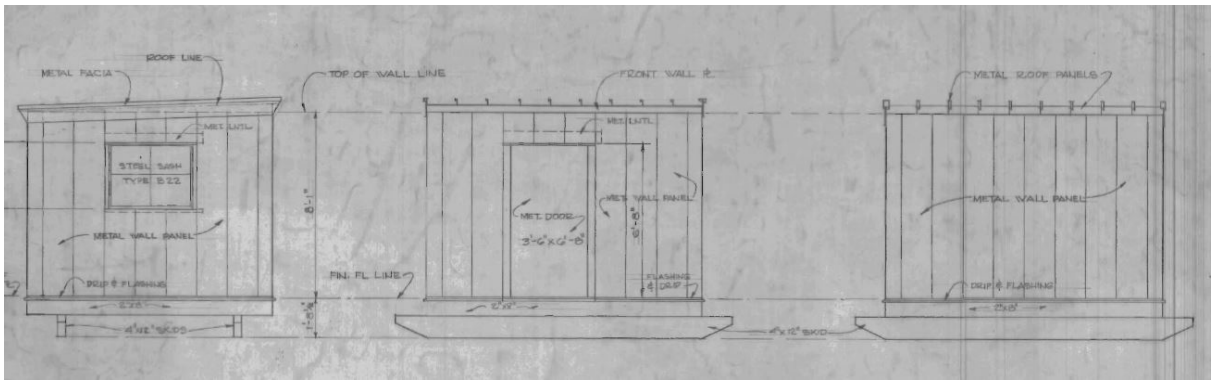

Figure 81. Portable Building WS-BF 1950

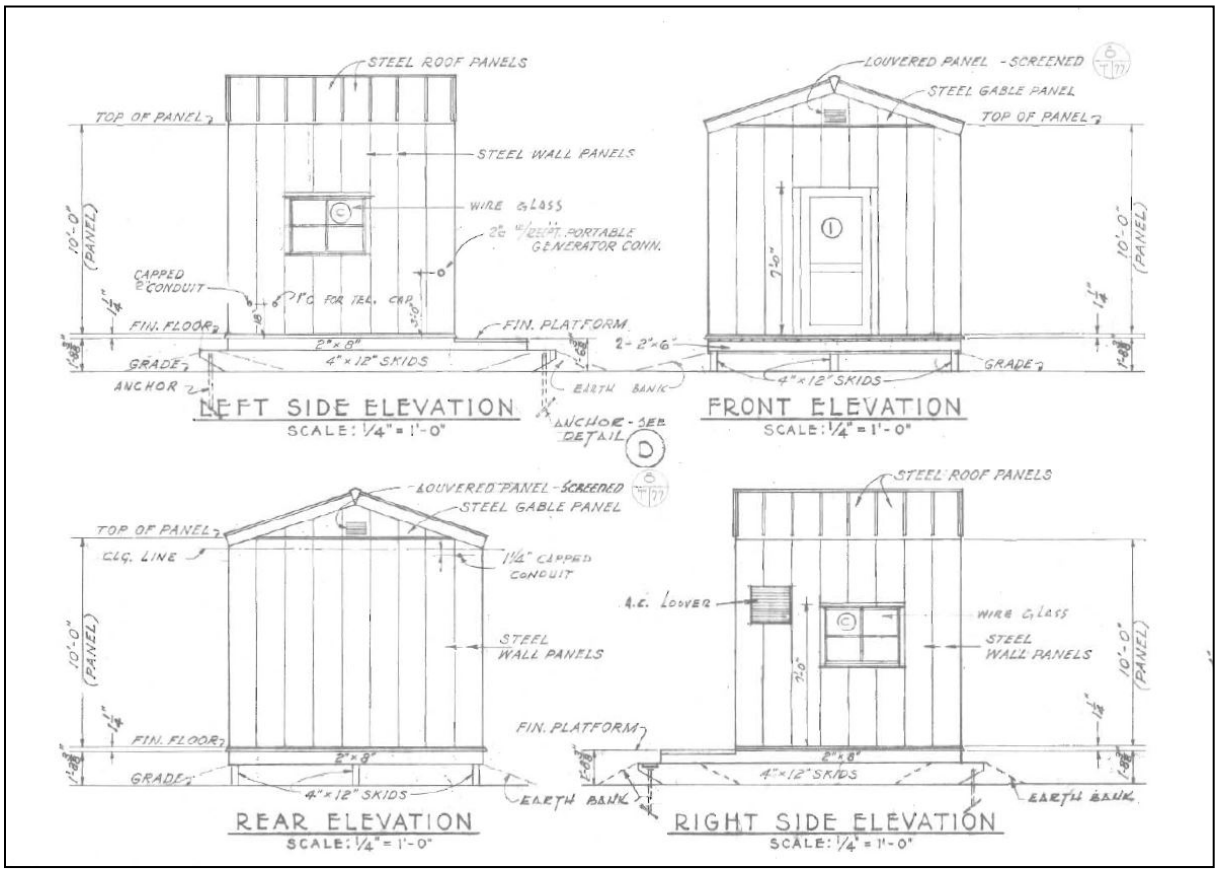

Figure 82. 10 x 12 Moveable Instrumentation, 1959 (WSMR Drawing Set WS-IN)

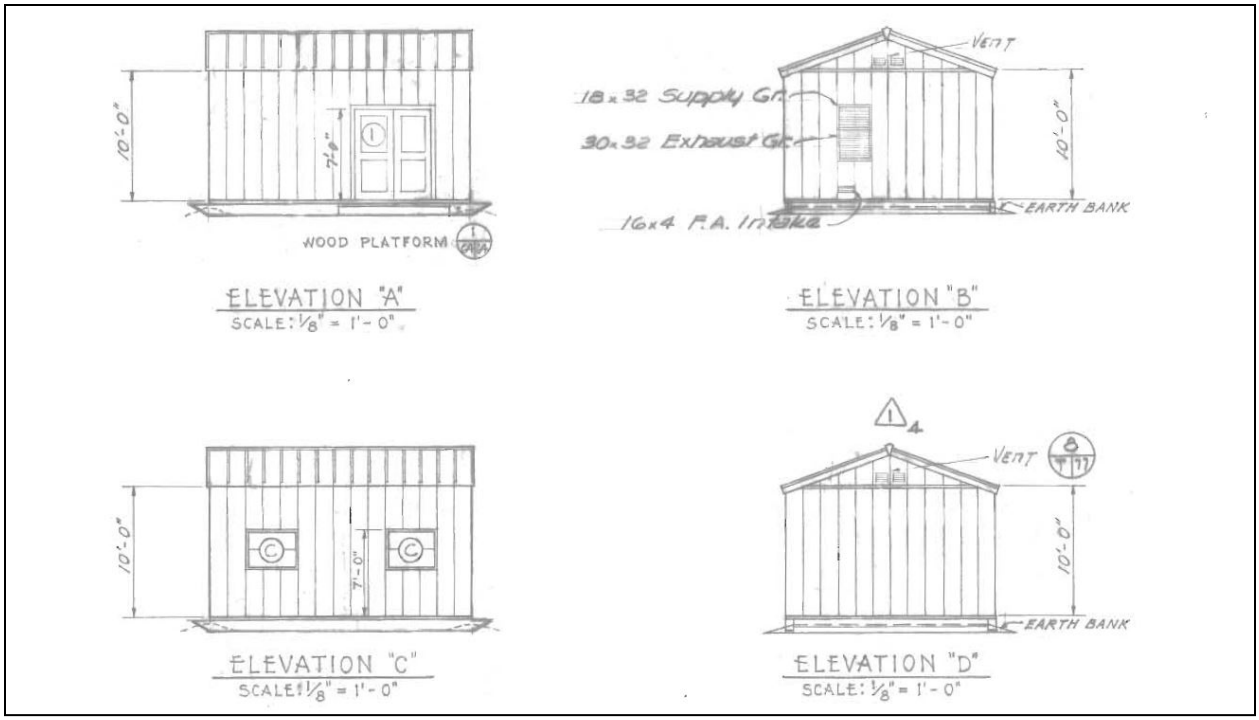

Figure 83. 16 x 20 Moveable Instrumentation, 1959 (WSMR Drawing Set WS-IN)

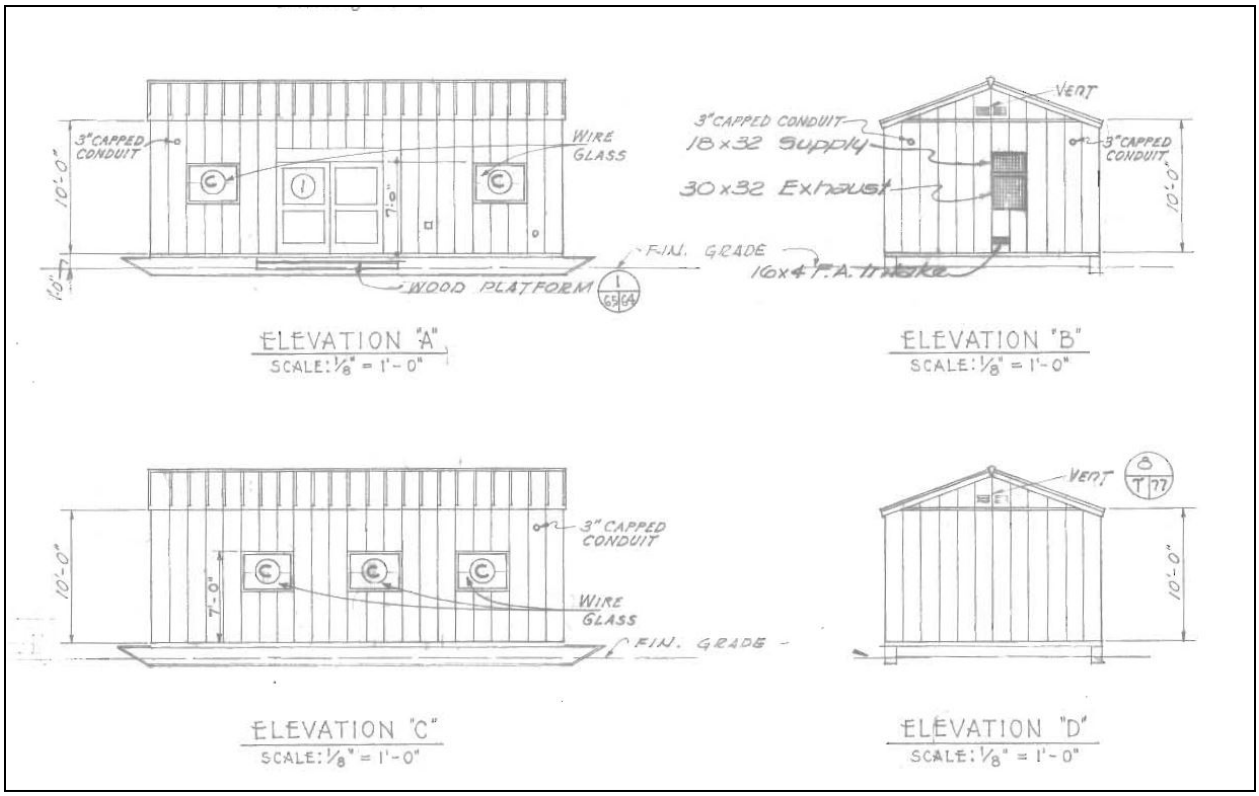

Figure 84. 16 x 30 Moveable Instrumentation, 1959 (WSMR Drawing Set WS-IN)

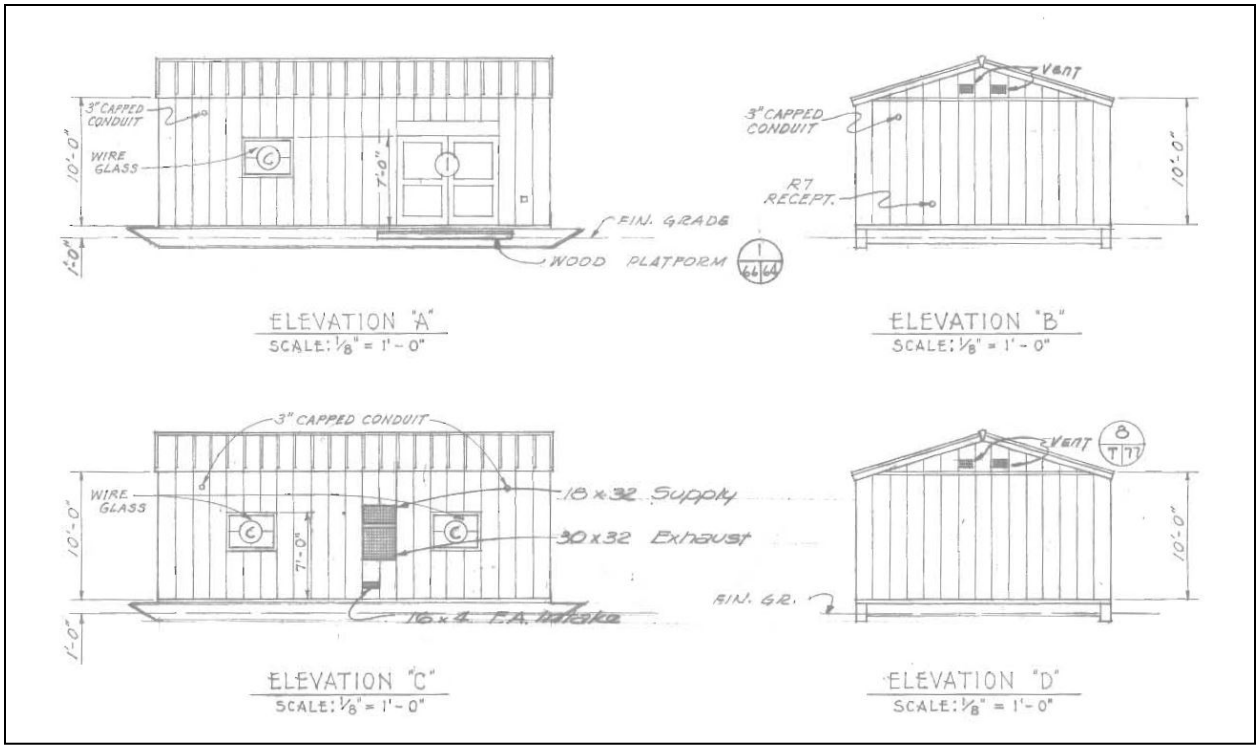

Figure 85. 20 x 30 Moveable Instrumentation, 1959 (WSMR Drawing Set WS-IN)

2.5 Sites for Mobile Instrumentation

As ubiquitous as instrumentation shelters at WSMR are the dozens of sites constructed for the placement of mobile tracking devices, otherwise referred to as "trailerized" (Joe Gold, personal communication 2016). These instruments, both optical and electronic were sent all over the ranges wherever a test required them (Figures 86 & 87).

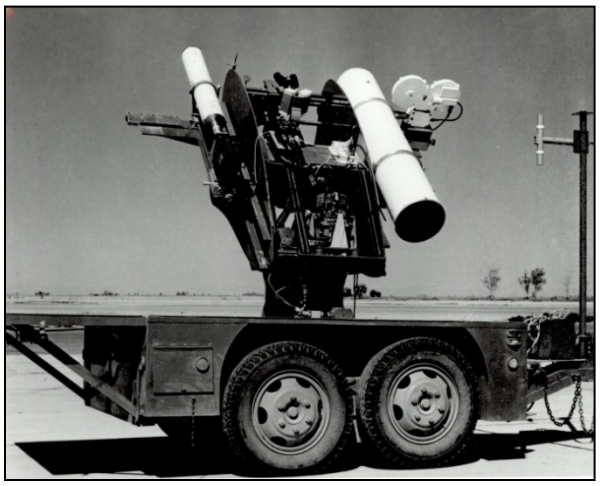

Figure 86. Trailerized tracking telescope, ca. 1950 (Bellinger Collection, WSMR Museum Archives)

Figure 87. Trailerized instrumentation, ca. 1970 (Bellinger Collection, WSMR Museum Archives)

Figure 88. Mobile Cinetheodolite Mount (MCM) at WSMR, ca. 1963 (Museum Archives)

Figure 89. WSMR Lightweight Optical Tracking System (LOTS) (Bellinger Collection, WSMR Museum Archives)

Though placing instruments on wheeled carrier devices was done very early on, it is not until 1960 that the design and execution of these sites was formally designed (Figure 90). As the ranges moved away from permanent instrumentation structures, these sites were usually raised well above grade and fitted with power, communications, and timing connections. Figure 91 illustrates the more sophisticated evolution with its Mobile Optical Sites program.

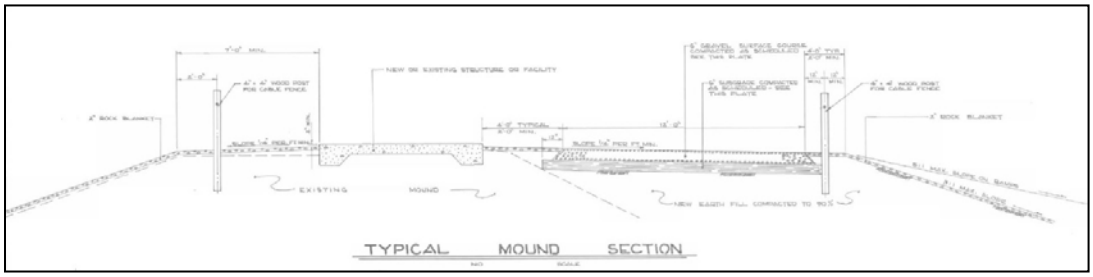

Figure 90. Typical Mound Section, 1960 (WSMR Drawing Set WS-JR)

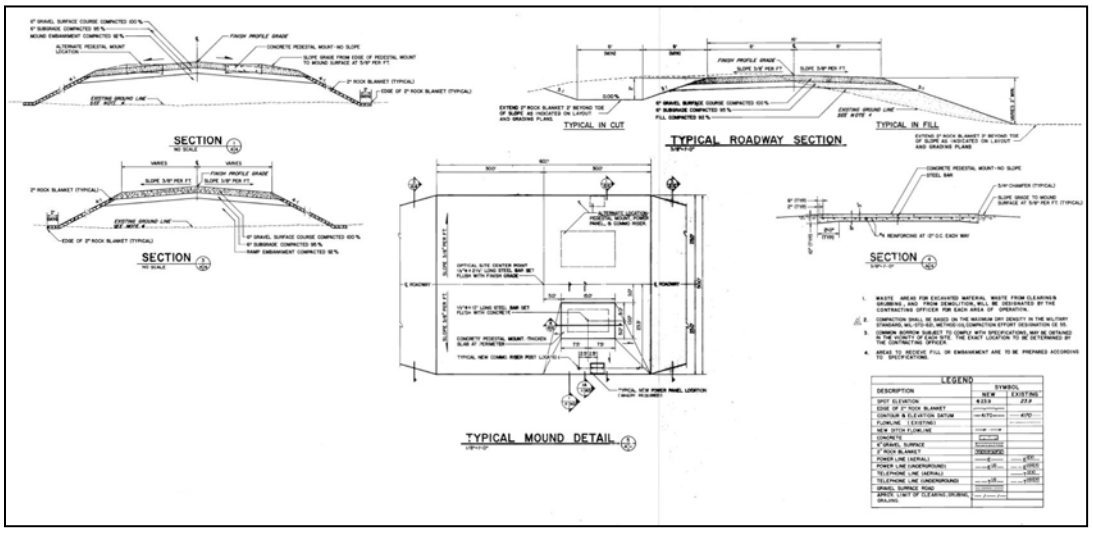

Figure 91. Mobile Optical Sites, 1976 (WSMR Drawing Set WS-UD)

2.6 Summary

Most of the numerous Cold War Era instrumentation building and structure types that are found all over the 4,000 square-mile facility have been abandoned in place. The sheer number and potential limitations of the extant drawing sets and archival images may not do this inventory justice. However, it is a starting point for understanding the range and complexity of the many structures constructed over a forty year period. The intent is to create a typology and precursor to a mitigative measure for which to craft a Programmatic Agreement between the Advisory Council on Historic Preservation, White Sands Missile Range and the New Mexico State Historic Preservation Officer (SHPO). This document will be intended to support evaluations for numerous resources and receive SHPO concurrence, relieving WSMR from additional responsibilities under Section 106 of the National Historic Preservation Act (NHPA). Without such document, the cost and effort for a range-wide NRHP inventory and evaluation would be prohibitive and delayed indefinitely.

CHAPTER 3: CRAFTING A PROGRAMMATIC AGREEMENT (PA)

3.1 Introduction

The focus of this effort asks how cultural resource managers (CRM) responsible for compliance under Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended) and its implementing regulation (36 Code of Federal Regulations (CFR) PART 800 – Protection of Historic Properties) can collectively manage a group of mostly abandoned Cold War Era resources. Inventorying and evaluating these disparate and far-flung resources is a potentially very costly and time-consuming process. This case study explores the creation of a draft programmatic agreement, one avenue available to categorize types or collective groups of buildings, structures, objects, or sites that WSMR CRM professionals can execute under an agreement between the US Army (federal agency), the New Mexico SHPO, Advisory Council on Historic Preservation (ACHP), and, if appropriate, Tribal Historic Preservation Officers (THPO). This will allow for the agency to make decisions, primarily demolition, under agency-sponsored facility reduction programs without the lengthy and expensive NRHP evaluation process.

Historic buildings and structures inventories and NRHP evaluations have been undertaken at military installations since passage of the NHPA and issuance of Executive Order 11593 in 1971 (see below). However, many of those studies have been limited in scope and tend to focus on properties that are known, or are likely to have historic significance. As such, many resources, particularly those of the Cold War Era have yet to have been subject to adequate recordation and NRHP-eligibility recommendations—this is particularly true for large installations such as WSMR. For example, it was not until 2015 that a substantial collection of resources at WSMR were thoroughly inventoried and accompanied by a substantive historic context in which to adequately apply the criteria for significance for eligibility to the NRHP (Myers et.al 2015).

Almost singularly unique to the 4,000 square-mile landmass is the forty years of remote instrumentation site development spread far afield with additional sites, buildings, and structures added over time. When an agency has such a collection, particularly one with multiple identical types, the agency may explore alternative ways to address their responsibilities under Sections 106 and 110 to streamline the process of recording and evaluating a widely dispersed group of similar resources. It is the duplicative, or "repetitive nature" (Bronin and Rowberry 2014) of these particular resources and planned undertakings for which the PA is being considered.

Chapter 2 provided the context for these dedicated instrumentation resources. As a qualitative study, Chapter 3 is devoted to the background and process by which a PA is created. To provide context for this draft PA, this section informs the reader on the process that illustrates the "where it lives, and how it is done" component. It starts with a definition of programmatic agreements in regard to Section 106 of the NHPA and the background by which they came about. It then describes the typical components of a PA. Lastly, it explores the mechanics of the process, the key players, the strategies, and the drafting of such documents. Since programmatic agreements vary greatly in terms of the agencies and signatories, the US Army and its procedures will be the primary focus.

3.2 Programmatic Agreements and Their Origin

The term "programmatic agreement" has its roots in the NHPA. Section 106 (54 U.S.C. § 306108; formerly 16 USC 470f) requires federal agencies to "take into account" the impact of an undertaking[4], "an effect on a historic property when the action has the potential to result in changes to the character or use of the historic property" (WSMR 2015). Historic properties are buildings, structures, sites, districts, and objects that meet the criteria for listing in the National Register of Historic Places (NRHP or National Register; 36 CFR 60). Section 110 directs federal agencies to (among other things) inventory and evaluate properties for historic significance under their care and management beyond considerations related to specific projects. Codified in Section 110 in 1980 was the 1971 Executive Order 11593 which requires federal agency heads to locate, inventory, and nominate all NRHP-eligible cultural resources for listing in the National Register and to exercise caution until these inventories and evaluations are complete to ensure that no eligible federally owned property is transferred, sold, demolished, or substantially altered. The Order outlined procedures for meeting the inventory requirements of NHPA and the National Environmental Policy Act (NEPA) and establishes the principle of "interim protection," which dictates that until a resource has been evaluated, it must be treated as if it were eligible for listing in the National Register (Protection and Enhancement 1971).

The process by which large agencies such as the Army must fulfill these responsibilities can be challenging. Whether directed by Section 106 for project-specific undertakings or simply managing inventories under Section 110, the staggering number of buildings, structures objects and sites can be overwhelming for many facilities. Under normal procedures for complying with Section 106, agencies must follow 36 CFR §800 Subpart B, the process by which individual, project-specific inventory and evaluation of resources are undertaken (ACHP 2015). However, under 36 CFR §800 Subpart C, the ACHP allows Federal agencies to develop their own procedures to implement Section 106. These "program alternatives" include programmatic agreements (36 CFR §800 800.14 (b). This is where the NHPA recognizes that some situations can benefit greatly in reduced cost and time for the agencies by providing an alternative, so long as the proposed agreement fundamentally complies with the spirit and intent of the law. In essence, a PA establishes a process for compliance with one or more federal laws, usually historic preservation laws.

One of the key players and often a signatory[5] in the PA process is the Advisory Council on Historic Preservation. Established by the NHPA in 1966, the ACHP is "an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources, and advises the President and Congress on national historic preservation policy" (ACHP 2015 b). The independent agency acts as a guide and intermediary to assure federal agencies responsibly manage historic properties under their care. ACHP has a legal responsibility to encourage federal agencies to include historic preservation considerations into their projects.

[4] An "undertaking" as defined by NHPA is a project, activity, or program, funded, permitted, licensed, or approved by a federal agency.
[5] A "signatory" in a PA are the "concurring parties" which could extend to include THPOs and members of the public (ACHP b)

Another signatory, also key to the legal process, is the State Historic Preservation Officer, or SHPO. The NHPA under *16 U.S.C. 470a(b) — State Historic Preservation Programs* " provides for the designation and appointment by the Governor of a "State Historic Preservation Officer" to administer such program in accordance with paragraph (3) and for the employment or appointment by such officer of such professionally qualified staff as may be necessary for such purposes; …" (NHPA). The SHPO essentially acts as the agent at the state level to assist the federal government in managing preservation issues. This includes the review and participation in program alternatives such as PAs and Program Comments.

One aspect of PAs and Memorandums of Agreement (MOA) is the engagement of "consulting parties", sometimes outside the signatories of the document. This includes the public, who, under Section 106 (36 CFR 800.6(a)(4) have a right to express their concerns about a federal undertaking. In the case of many military facilities, particularly in the western US, federally-recognized Native American tribes who have a connection to the land on which the resources lie are required to be notified and, in many cases, can be signatories as well. THPOs are representatives for their sovereign nation and by US law have a right to "comment" on federal undertakings that may affect their historic cultural properties. Since some military facilities such as WSMR are inaccessible to the general public, little interest is expressed. However, if expressed, they must be allowed to review the proposed undertaking in the agreement and allowed to comment.

Programmatic Agreements have been in use since the 1970s, formerly referred to as Programmatic Memorandums of Agreement (PMOA). Experts in the field consider some good and others not so good, or even indifferent (King 2008). Most military CRM's are familiar with national programmatic agreements, developed with the ACHP, such as *Management of Historic Family Housing Units* and *Demolition of World War II Temporary Buildings* (ACHP 2014). However, agencies may also implement PAs for categories of resources that are germane to one facility—common types of resources with common kinds of undertakings, with similar effects. These types of documents are commonly regarded as "procedural" or "program" programmatic agreements as opposed to "project-specific programmatic agreements". This allows for agencies, especially in this case of dedicated instrumentation sites and facilities at WSMR, to address a specific compliance process for these types of resources where "the effects of an undertaking are not fully known" (AASHTO; ACHP).

3.3 Programmatic Agreements Process

At this point it has been established that creating an alternate way to address compliance under Section 106 for these numerous related and duplicate resources will save the Army a significant amount of time and money. As part of the Army's Facilities Reduction Program (FRP), this process will allow many more redundant facilities to be demolished without individual inventory and NRHP evaluation. At a minimum, there are likely more than 200 buildings, structures, objects, and sites that comprise this collection—consultation with cultural resources professionals both at WSMR and elsewhere has resulted in a collective acknowledgement that this programmatic agreement would be a worthwhile pursuit.

There are some clear benefits with this approach. Agencies have found that PAs offer quicker turnaround on projects, especially important when emergent mission activities call for relocation or removal. Any person familiar with NEPA and Section 106 environmental compliance requirements will tell you that it's the long pole in the tent. It should come as no surprise that environmental compliance is considered by many uninformed mission planners as holding up progress. Another time-saving benefit is the elimination of SHPO review if power over decision-making is agreed to be left at the agency level. Predictability is what results from an agreement that identifies the resources and offers an efficient, less costly and time consuming alternative (AASHTO).

The American Association of State Highway and Transportation Officials (AASHTO) have produced one of the few comprehensive, explanatory step-by-step "how-to" guides for preparing and executing PAs (AASHTO). This "programmatic agreement toolkit" follows a natural progression of steps and supplemental information that is the basis of the following process for the creation of the draft programmatic agreement. It is interspersed with information relative to the DOD, Army, and WSMR. Though these efforts rely on a definitive process, the authors strongly advise that the focus remain on the resources, *not* the process. The point being that too often, these efforts are driven by an "it's how it's always been done" mentality and the tendency to rely on boilerplate examples using a formulaic approach. The intent of the law and its alternatives put the historic resources first. This is a primary reason why the historic context and typology section was created for this proposed programmatic agreement.

From a philosophical perspective, the impetus behind using alternative approaches to Section 106 requires some understanding of the process, a good handle on the resources in question, and deciding whether or not the implementation of a programmatic agreement is worthwhile. One of the crucial questions asked by the "toolkit" was in regard to results. Is it worth the effort, does it contribute to our ability to preserve cultural resources, and does it make us better stewards? Having contextualized and categorized the resources in question and, knowing that leaving them abandoned in place over the next several decades is both poor stewardship and less than adequate compliance with NHPA, it seems this alternative is proactive in both ways.

AASHTO's website recommends that trust and cooperation between consulting parties is critical to the successful implementation of a programmatic agreement. For an agreement of this type, NHPA requires that the document must be signed off by the federal agency, the SHPO, ACHP, appropriate THPOs, members of the public, and other interested groups, considered consulting parties (Sec. 800.14 (b)(2)(i)). These signatories each play a role in the legitimacy and execution (not to mention possible termination) of an agreement. It has been recommended that early planning practices such as interfacing with ACHP and other signatories by providing the goals of the programmatic agreement in plain language without formatted legalese will assist greatly in establishing trust and participation from the numerous players (AASHTO).

Leadership is stressed as critical to a successful programmatic agreement. As in most government agencies, it is established that something needs to be done, but lack of effective leadership to shepherd the process, which may require multiple staff and resources, often ends in delay and poor execution. Leadership in the development and implementation of a programmatic agreement requires a clear understanding of the process, good planning, and effective

communication. Further, developing relationships between the agencies and setting the right tone for negotiations is important to building trust; "If there is no buy-in or leadership at the executive level, the development of a programmatic agreement is doomed" (AASHTO).

The mechanics of the process are spelled out and emphasize logistics. Who will be involved and what are their roles and responsibilities? There must be a meeting schedule and interim goals and deadlines. Also important is the vetting process—legal review, peer review, and ultimately, public review (AASHTO).

Once all the parties have ironed out the multitude of details and the document has been thoroughly reviewed by staff, legal experts, and the signatories, it is time to put pen to paper to have the agreement go into effect. If well prepared, thorough, and properly vetted, the process should proceed relatively smoothly. The federal agency is responsible for preparing the agreement by qualified staff or contractors. Both are responsible for engaging consulting parties throughout the process. SHPOs, THPOs, and especially the ACHP will help in assuring the language and components of the PA are in line with accepted formats (ACHP).

3.4 Components and Framework of the Programmatic Agreement

As a legal document, the PA is intended not only to be binding, but act as a guide to the purpose and process by which it is to be executed. It identifies the primary agency who will undertake the terms and why. Generally speaking the "why" identifies the alternate approach to Section 106 and the resources that will be the subject of the agreement, otherwise referred to as the Area of Potential Effect (APE). It identifies specific sections of applicable laws, particularly NHPA, 36 CFR 800, 36 CFR 60, and often references the National Environmental Policy Act (NEPA)—Army Regulation 15-4 directs that the laws governing historic preservation are to be "integrated with NEPA compliance and with planning and execution of any undertakings, projects, activities, or programs that may affect cultural resources" (Army 1997: 23). WSMR, like most military facilities, has a governing document known as an Integrated Cultural Resources Management Plan or ICRMP.[6] Per Army regulation, cultural resources projects are reviewed through the overall NEPA process (US Government).

In an effort to craft the particular language of the draft PA in Chapter 4, this section will provide a step-by-step overview of the mechanics of organizing the components of a PA as well as peripheral guidance on the nuances of the process. It is both an attempt to educate an agency on how to put together such a document, but also to provide some understanding of the boilerplate language that has become common to these types of agreements. ACHP has continually provided guidance to agencies on drafting, implementing, monitoring, amending, and terminating these agreements. Its numerous resources on the subject lead preparers towards making informed decisions on what types of program alternatives they should pursue for their particular needs and goals. Websites like ACHPs *Guidance on Section 106 Agreement Documents* (ACHP) and AASHTOs, *What is a Programmatic Agreement?* (AASHTO) served as the basis for this section—years of experience with what works and what does not makes these sites invaluable in

[6] WSMR combines natural and cultural resources in their Integrated Natural and Cultural Resources Management Plan (INCRMP).

parsing the various nuances of a PA.

The NEPA process is at the heart of all federal agency undertakings. The law was enacted in 1970, not long after NHPA. Title I contains a Declaration of National Environmental Policy that states that the federal government must "use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony", that agencies "evaluate the environmental and related social and economic effects of their proposed actions" (United States EPA). Like Section 106, though broader in scope, NEPA requires federal agencies to assess the environmental effects of their proposed actions before any decisions are made. This includes reviewing permit applications, adopting federal land management actions, and construction (or demolition) of infrastructure and publicly-owned facilities. As mentioned above, the Army, like most federal agencies, develops their own procedures for NEPA compliance known as 32 CFR Part 651 (US Army 2002). Historic resources, considered "cultural resources", along with archaeology and Native American considerations, includes Section 106 of NHPA as one of numerous components in Army NEPA analysis. Depending on the type of analysis, other factors could include natural resources, air quality, noise, water quality, runoff, etc.

In 2001, the ACHP approved the adoption of Army Alternate Procedures (AAP) to replace prior Army guidance in compliance with Section 106 of the NHPA. The revised procedures include the option for the agency to create a Historic Preservation Component (HPC) within its ICRMP which would allow the facility (WSMR) to carry out Section 106 responsibilities without consulting with SHPO on each undertaking. It requires that the CRM (and staff) possess the appropriate professional Secretary of the Interior qualifications (Advisory Council on Historic Preservation 2015). Currently, the WSMR INCRMP has no such component in development so the PA was chosen as the appropriate expedient approach to management of the resources in question.

A Prototype PA was considered in the development of the draft. This option is consistent in every way with a standard PA but is designed to be a template from which additional PAs can be crafted without involvement from ACHP. Prototype PAs tend to be oriented towards statewide, regional, or national resources (ACHP 2012) in the care of a particular agency. In this case study, the resources under consideration are unique to WSMR and therefore would not apply to similar resources at the statewide level, let alone regional or national consideration—WSMR is a rarity among Army facilities. Therefore a Prototype PA was discounted for this study.

Most guidance suggests that before drafting the agreement, the agency engage the primary signatories to negotiate the basic terms of the agreement. There is no better way to engage these parties than to establish a face-to-face relationship with those key players. Before meeting in person, it is recommended that an outline in plain language be distributed—this is a critical introductory step. While it is recommended that discussions include "phasing" the inventory of resources in the APE, the agency has already done much of this work through the context (Chapter 2) and brings this to the table. This preemptive approach will go a long way towards gaining confidence from the ACHP, SHPO, THPO(s), and other consulting parties that the agency is serious about the implementation of an agreement and the appropriate management of the resources.

Assuming the preliminary engagement has occurred and the parties have reached a general consensus, the draft legal document is then crafted. The following overview is geared towards the project in question—that is, the implementation of an alternative process for WSMR to address the NRHP evaluation requirements for a specific, but disparate class of buildings, objects, and structures that run the risk of losing their historic significance through lack of resources to individually evaluate them individually. Each section will be identified and described.

Every PA has a bolded, capitalized title header that clearly identifies it as an agreement, who the agreement is between, and the purpose for the agreement. In this case, the agreement is between the US Army Garrison, White Sands Missile Range, New Mexico (the lead agency), the New Mexico State Historic Preservation Officer, and the Advisory Council on Historic Preservation. As will be explained in Chapter 4, it is unlikely that the THPOs in the region that have a legitimate right to participate, very often they do not.

The introductory clauses back up the terms and set out boundaries and parameters for execution. This is where one finds multiple paragraphs that begin with "Whereas". These introductory statements identify the agency, establish the agency's goals that are covered in the PA, findings about the effect of the undertaking (if known), legal authorities and laws that apply, consultation with ACHP, SHPO, THPO and the public, and any other relevant information[7]. They consist of established facts, whereas the stipulations (below) address what actions will be taken.

This is sometimes followed by a section entitled "Background", a listing of supporting documents to back up the clauses. These are typically referred to as "attachments". Most commonly found are appendices which serve as supplemental information. These typically include maps, lists of previously recorded resources, and procedures already in place, planned procedures, or in this case, a historic context to provide substantive meaning to the category of resources.

As the primary function of the of the PA is to provide a program alternative to Section 106, the AASHTO guidance for preparing programmatic agreements points out that the heart of the agreement is found in the middle. It addresses the critical questions of "What are we going to do? How are we going to do it? Who will be doing what and when? …[I]t addresses the process" (AASHTO). As a blueprint for action, it lays out the operating procedures. The draft PA in Chapter 4 will illustrate how the language of the process unfolds.

Regarding "who will do what and when", the programmatic agreement lays out the roles and responsibilities for the signatories in the stipulations section. It is recommended that no terms be set or duties be assigned to any parties other than the signatories. While this may seem obvious, assumptions are often made about supplemental duties that are assigned to non-signatories—these are non-binding and may therefore cause delay, or failure of execution (AASHTO). If such a critical role need be performed in effectively executing the terms, preparers should consider engaging those who may assist the process and bring them on as signatories. The stipulations

[7] Most military documents are loaded with confusing acronyms and legal documents filled with jargon. The best documents are known to include an appendix with a glossary of terms and/or a list of acronyms.

cover in greater detail all aspects of responsibilities and associated legal requirements. For broader scope programmatic agreements, these can include a whole host of requirements.

For this comparatively limited programmatic agreement, stipulations begin with "Project Review", which mandates collaboration with NEPA, identifies professional qualifications, guides determinations as to whether actions are undertakings or not, determines the APE, describes effects and exempted undertakings, assessing effects, and resolving effects. Next, "Significance Standards" based on NHPA and INCRMP standards are required to be current. This is followed by "Reporting Damage," the process by which accidental adverse effects are addressed. Public outreach, a critical component in all NHPA activities, is set out in the "Broader WSMR Outreach" section. "Dispute Resolution" lays out the procedures for resolving differences among the parties to the agreement. An "Annual Report" section describes the protocol for preparing and submitting an annual report for the terms of the PA. Fiscal Requirements and Sources", insure that the agreement has adequate funding and alternate procedures if not. The "Amendment" and "Termination" sections allows for changes to be made or dissolution of the agreement by the signatories. Lastly, "Duration" simply puts a time frame on the agreement—ten years is typical. From a legalese perspective, some of these are relatively self-explanatory but each of these will be explained in Chapter 4 as it applies to the draft agreement.

Lastly, the signature lines are laid out for the signatories. In some cases, the number of parties to a programmatic agreement can be quite lengthy. This is especially true where multiple parties in the military and civilian chain of command must be signatories for an agreement to be fully binding.

Appendices are also included in the agreement package. Not to be confused with "background" documentation, this documentation provides specific information to back up the agreement terms. Of particular importance to this effort is the inclusion of the historic background and typology for the referenced resources in the agreement. This PA utilizes a historic context in order to satisfy the documentation of the resources being subject to a program alternative. Military PAs typically include the facility's ICRMP and procedures, as well as relevant agency regulations.

3.5 Mitigation as a Stipulation

One of the more powerful ways to create support for this particular endeavor was to address the resources and their background up front. Very often, programmatic agreements at military facilities tend to focus on leaving the decisions regarding NRHP-eligibility and managing historic and yet-to-be evaluated resources to the CRM; reporting requirements are typically an annual review that is submitted to the SHPO. This approach, while effective, can lead to unilateral decisions that can leave historic resources inadequately evaluated and vulnerable to arbitrary decisions. Again, the detailed historic context provides a substantive reference to support the CRM in good decision making; "PAs address mitigation up front" (AASHTO).

Mitigation is a process in Section 106 that provides some balance through efforts to "mitigate"

the loss or significant alterations to known or as of yet to be inventoried and NRHP-evaluated resources by providing something in return that preserves the history of that resource (NPI; 40 CFR 1508.20 of the NEPA regulations). Traditionally this has been done through Historic American Building Survey/Historic American Engineering Record (HABS/HAER) recordation. This typically consists of large format photography, scaled architectural drawings, detailed description, and historic context. Other types of mitigation are also used. Examples include public interpretive media such as interactive displays and informational pamphlets.

To mitigate the loss of all of the building and structure types, the agreement contains a few stipulations that recognize the role many of these long-forgotten resources played in the history of missile tracking. First, the PA points to a specific instrumentation structure type and optical device that have already been preserved in the WSMR Missile Park. Secondly, the agreement includes the retention of a few representative instrumentation sites, and guidelines for some form of public interpretive media.

The primary form of mitigation was to choose the best representative examples of instrumentation buildings and structures and set them aside for future interpretive value. This is a creative way to capture and retain extant types that might otherwise be lost as time goes on. Since they represent duplicative entities spread throughout the ranges, it assures that collectively, the historic nature and character of the sites and resources are not erased. For those buildings and structures that may have yet to be captured, Appendix G of the agreement spells out the terms of mitigation. With this approach and with the representative, set-aside examples in the agreement, WSMR is relieved of having to create numerous MOAs for each undertaking where a building or structure has been deemed NRHP-eligible.

The one aspect of Section 106 that remains subject to full compliance is the Determination of Eligibility (DOE) to the NRHP. As such, a list of specific resources must be attached to the agreement indicating that only these resources have been agreed upon regarding eligibility with consultation with ACHP and SHPO. This is specified in the agreement. Any newly discovered buildings and structures are still subject to an evaluation, but the Appendix contains a provision to use the historic context created for this PA as a legitimate tool with which to help make that determination.

3.6 Summary

Like most agreements, programmatic agreements are legally binding contracts, but also social contracts among the parties. It requires good-faith consultation, serious communication in its development phase, and effective leadership and appropriate resources to execute successfully. This alternate approach is designed to streamline the Section 106 process to assist CRMs in executing their responsibilities under NHPA *and* the Army's NEPA coordination requirements. Much of this group of dedicated instrumentation-related buildings, structures, objects, and sites is slated for eventual demolition under the Army's Facilities Reduction Program (FRP). This methodology section has been prepared in advance of drafting a programmatic agreement to provide insight into best practices and step-by-step guidance to assure a quality outcome.

CHAPTER 4. DRAFT PROGRAMMATIC AGREEMENT FOR WSMR INSTRUMENTATION FACILITIES

Assuming the fundamental components of the agreement have been discussed among the signatories and basic concurrence among them exists, the crafting of the PA begins. Numerous existing and template PAs were consulted to assure every aspect was considered. This chapter lays out a draft legal document that will, with fine-tuning, be the guiding framework to comply with an alternative to Section 106.

The overarching goal of the document is to provide the CRM with a pathway towards quickly identifying specific buildings and structures at dedicated instrumentation sites that could be altered, moved, or demolished without individual recordation and evaluation as the stipulations illustrate. They also address those "as yet unidentified" resources that fall under the historic context but were not captured in the list. Interwoven into the following breakdown are reasonable ways to resolve the problem, the solution to the problem, and justification for why the particular solution was chosen.

This section is organized as follows: The "Whereas" clauses of the agreement are laid out in bold lettering. This is followed by a brief explanation of the specific meaning of the language followed by (where appropriate) a rationale for the inclusion. The stipulations section is laid out with only the section headers bolded. Most of these stipulations are standard for PAs and explained throughout the section and are referenced by appendices.

PROGRAMMATIC AGREEMENT
AMONG THE
UNITED STATES DEPARTMENT OF THE ARMY,
THE NEW MEXICO STATE HISTORIC PRESERVATION OFFICER AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING ALTERNATE PROCEDURES FOR COMPLIANCE WITH SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT FOR UNDERTAKINGS REGARDING RESOURCES AT DEDICATED INSTRUMENTATION SITES ON WHITE SANDS MISSILE RANGE

As described in Chapter 3, the title first identifies the parties to the agreement—who is involved. The agency here is the US Army who has responsibility for compliance under NHPA. The New Mexico SHPO, as the reviewing authority for all undertakings, is included. The ACHP serves as the legal authority under NHPA to assure the terms are within the legitimate authority for the agency to pursue. The second part of the title identifies the goal of the agreement under the specific section of NHPA (program alternatives), and identifies the resources and their location.

WHEREAS, the United States Army (Army), proposes to continue to coordinate and administer an ongoing program of operation, maintenance, training, testing, construction, and demolition at White Sands Missile Range (WSMR); and

This statement sets the tone for WSMRs fundamental mission activities that are its primary function. Many emergent testing activities have the potential to impact sites in the ranges. In this case, demolition is included as the aforementioned FRP includes the removal of obsolete facilities that no longer serve the mission.

WHEREAS, WSMR is a federally owned and operated facility, plans to carry out projects pursuant to Army Regulation, thereby making the projects undertakings subject to review under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. Section 470f and its implementing regulations, 36 CFR Part 800; and

WSMR identifies itself as a federal agency with requirements from its command to carry out projects in support of ongoing Army missions. It identifies these projects as "undertakings" acknowledging its compliance requirements under Section 106 of NHPA. 36 CFR Part 800 is the process by which the agency must take into consideration the projects potential to adversely affect historic properties.

WHEREAS, WSMR has determined that the development of a Programmatic Agreement (PA), in accordance with 36 CFR § 800.14(b)(2), is warranted because specific details on some projects are unknown and the effects on historic properties cannot be fully determined prior to their approval, and for the routine nature of many actions that are part of the ongoing management and operation of WSMR; and

36 CFR § 800.14(b)(2) are the NHPA procedures for developing a PA. Here the Army is justifying its program alternative approach. Because, as the statement suggests, the Army cannot reasonably determine effects on a wide range of property types and their duplicative nature, it has chosen to negotiate with SHPO and ACHP to execute a more streamlined approach. Understanding the nature and typology of these resources, as provided by the historic context, the Army has provided a baseline for which to execute the stipulations.

WHEREAS, pursuant to Army Regulation, the Army has designated the Garrison Commander (Commander) to serve as the agency official responsible for compliance with the requirements of Section 106 of the NHPA; and

While it is the role of the CRM to execute the terms of the agreement from the Army side, the legal responsibility for compliance belongs to the Garrison Commander. Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, assigns a whole host of environmental roles and responsibilities to the garrison commander including being the signatory on "permit applications, permits, compliance agreements, and consent orders…" (Environmental Protection 1997). Garrison commanders are not, as a rule, experts in environmental law and regulations.

They rely heavily on subject matter experts and legal counsel in executing responsibilities under environmental laws.

WHEREAS, the purpose of the undertaking consists of the reuse, alteration, or demolition of vacant and redundant Cold War Era buildings and structures at dedicated instrumentation sites on the WSMR-controlled properties; and

The statement identifies the agency's purpose in creating this agreement. WSMR has numerous sites, buildings, and structures that are considered "redundant" and are no longer in use. Under the Army's FRP, recapturing square footage from underutilized buildings and structures frees up footage for new construction. This is because DOD agencies are restricted, in most cases, from new construction where a balance of footage is not gained through the disposal of underutilized and vacant space. The reality is that underused and vacant buildings and structures do not necessarily receive the care they need to remain viable and may become a liability to the agency. This undertaking addresses those specific resources.

WHEREAS, WSMR has defined the area of potential effect (APE) as buildings and structures at dedicated instrumentation sites at WSMR, including sites outside the WSMR boundaries (as shown in Appendix A); and

In essence, the APE is *all* of WSMR and those specific off-site areas that are under the responsibility of the Army. However, the APEs will likely be limited to building footprints with small buffers or the core of the instrumentation sites. This is the first reference to an appendix. As described in Chapter 3, the appendices are reference and supporting documents.

The APE for this agreement is supported by WSMRs list of dedicated instrumentation sites that were erected during the Cold War Era (Appendix C). This list identifies the sites (site names) and/or the individually-numbered (WSMR 5-digit) buildings and structures. On occasion, buildings and structures captured in the types identified in the historic context are not within a named site, so the agreement includes both site names and individual identifiers.

WHEREAS, WSMR has determined that undertakings as defined in 36 CFR Part 800.16(y) associated with the operation, maintenance, and demolition of facilities at dedicated instrumentation sites at WSMR may have adverse effects on historic properties (to include as yet unidentified properties), all of which upon evaluation could become eligible for listing in the National Register of Historic Places (NRHP) and has consulted with the New Mexico State Historic Preservation Officer (NMSHPO) pursuant to 36 CFR Part 800; and

This statement is a catch-all for the agency's overriding responsibilities under Section 106 of NHPA. It acknowledges that, no matter what stipulations are set forth in the following section, they must bear in mind that some properties are, in fact, eligible for listing. With that distinction, a set of responsibilities to mitigate the partial or total loss was negotiated (see Appendix G). The

consultation reference to SHPO again indicates that the agency has engaged in discussion with SHPO regarding the creation of this PA.

This is the heart of both the problem and basis for the solution. The extensive inventory of obsolete facilities that are scattered far afield in the 4,000 square mile test range has created a management problem for the Army at WSMR, especially as they age and limited funding is available for their continual maintenance and upkeep. As part of a concerted effort on the part of the Army to reduce the cost and liability of these numerous facilities, FRP programs aim to eliminate these resources. In doing so, however, the demolition or significant alteration requires the Army to first inventory and evaluate them under Section 106.

The key phrase here is "may have adverse effects on historic properties". 36 CFR Part 800.16(l)(1) defines "historic properties" as those which are included or eligible for listing on the NRHP. Without a concerted effort to evaluate these facilities under Section 106, the agency cannot ascertain whether or not the removal will constitute an adverse effect. This is where the historic context and stipulations come into play. While PAs allow agencies to forego most of their responsibilities under Section 106, it does not allow agencies to make decisions on Determinations of Eligibility (DOE). As such, the agency must identify specific resources and create a list of properties of eligible and ineligible properties.

WHEREAS, WSMR has notified and consulted with the Advisory Council on Historic Preservation (ACHP) and the New Mexico State Historic Preservation Officer (SHPO) pursuant to regulation 36 CFR Part 800.6(a)(1)(i)(C) and 800.14(b)(3) implementing Section 106 of the National Historic Preservation Act (NHPA), as amended, 16 U.S.C. 470f, and pursuant to such consultation, has developed this Programmatic Agreement (PA) in accordance with 36 CFR 800.14 in order to establish efficient, streamlined procedures to comply with Section 106 that constitutes a departure from the normal Section 106 process (36 CFR 800.14(b)(1)(iv) and(v); and

Here the Army references 36 CFR Part 800.6(a)(1)(i)(C), whereby it has appropriately engaged with the legal authorities in regards to "consultation', that is, the engagement of these parties and invitation to others such as THPOs and other interested parties to participate in the process. The ACHP is always invited to comment. In the case of procedural PAs, ACHP may decline signatory authority as long as 800.14(b)(3) specifically defines programmatic agreements and the process by which they are executed. Many of the sections in the stipulations portion of PAs are derived from the language of 800.14 and some are included in this document as well. 36 CFR 800.14(b)(1)(iv) and 36 CFR 800.14(b)(1)(v) simply state that a "programmatic agreement may be used…Where routine management activities are undertaken at Federal installations, facilities, or other land management units" (iv), or "Where other circumstances warrant a departure from the normal section 106 process". The Army has chosen to execute their compliance responsibilities under a program alternative.

WHEREAS, this PA outlines the installation's program to identify, evaluate, treat, and consult on resources at Cold War Era dedicated instrumentation sites affected by its

undertakings, and offers expedited compliance procedures with that portion of the ACHP's regulations (36 CFR Part 800) implementing Section 106 of the NHPA for undertakings pursuant to the Stipulations in this PA; and

Following on the previous acknowledgement of responsibilities, the agency here references that, in addition to streamlined alternatives, the agency is still responsible for any types of resources in the historic context that might still be unknown. The stipulations will provide specific procedures in regard to Cold War Era instrumentation facilities.

WHEREAS, WSMR has consulted with federally-recognized tribes, and invited them to participate in development of this PA; and

As the statement points out, the THPOs were invited to be consulting parties to the agreement. As mentioned in Chapter 3, the Native American Tribes, represented by THPOs, have been relatively unresponsive when invited to participate in military built environment consultations, especially when not located on historical-cultural sites. Depending on the sensitivity of the situation, some tribes may want to be signatories as opposed to consulting parties as signatory authority puts them in a place to terminate the PA if issues arise—consulting parties, even those who sign the document, have no legal authority in the process.

WHEREAS, WSMR has invited the public, pursuant to comment through notice in local newspapers and has made the draft PA available through the WSMR Directorate of Public Works, Environmental Division webpage (https://www.army.mil/dpw/Environmental/PA2.html**) and has considered all recommendations, if any, into this PA: and**

Also required to be invited as consulting parties, members of the public are allowed the right to comment on the PA. As mentioned in Chapter 3, routine matters such as the management of Cold War Era buildings and structures, do not typically interest the public or cause concern regarding their loss—there is rarely any response.

WHEREAS, WSMR has created a historic context (Appendix B) in consultation with NMSHPO and ACHP, and SHPO concurs with the context in which to place many of the Cold War era buildings and structures at dedicated instrumentation sites, and agrees with the eligibility determinations in Appendix C; and

This statement sets the tone for creating significant "buy-in" from ACHP and the SHPO for agreeing to the alternate approach and stipulations in the agreement. It is this document that both broadly and specifically identifies the types of facilities that are being considered for alternate management under the agreement. In standard Section 106 practice, resources are both identified and provided a historic context under which they are judged to be historically significant, or *not*. The agency, knowing the complexity of the range of resources and their function over four decades, proactively created the context to strongly send the message to ACHP and SHPO that they know what the resources are and where the potential historic significance might lie. This is

a major step in compliance with evaluating resources under Section 106. With this document, the agency has a reference in which to point to in making decisions on the management of those resources. It is the list of resources that accompanies the historic context determined eligible or ineligible for listing. The ineligible properties are ones that are no longer subject to Section 106 and the agency can proceed with their undertaking.

WHEREAS, WSMR has determined, in consultation with the NMSHPO, that 26 dedicated instrumentation buildings and structures are eligible for the NRHP and 173 have been determined not eligible for the NRHP; and

Here the individual resources of the inventory of the resources on the WSMR ranges described in the historic context and list are counted and divided by "eligible" and "not eligible". This statement is included to make a point. First, only a few of these buildings and structures are considered eligible for listing, while the bulk of them are considered *not* eligible. The SHPO has concurred with the findings. This gets at the fundamental challenge for which the PA was conceived in the first place. In order to streamline the Section 106 process, all of the duplicate resources are captured and where they are not, there is a provision in the stipulations for dealing with them.

WHEREAS, WSMR has publically interpreted one of the most historically significant instrumentation resources of the Cold War Era, the IGOR, and a instrumentation stand with astrodome at the WSMR Museum Missile Park;

This statement provides a sense that the agency has already acknowledged that instrumentation played a historic role in rocket and missile testing during the Cold War (See Chapter 2 for discussion on IGOR). It illustrates that WSMR has taken steps to provide a public interpretation of these resources, an important component to satisfying the spirit of NHPA.

WHEREAS, WSMR has set aside dedicated instrumentation sites with representative resources for historic interpretation as partial mitigation as found in Appendix D; and

This statement is illustrative of the negotiated mitigation between WSMR, the ACHP, and NMSHPO to preserve a small number of examples of Cold War Era instrumentation sites with representative buildings and structures in lieu of the loss of possibly hundreds of such types through planned footprint reduction. This would otherwise be formalized in a Memorandum of Agreement which is outside the scope of this PA.

WHEREAS, in accordance with 36 CFR § 800.6(a)(l), WSMR has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination providing the specified documentation, and the ACHP has chosen to participate in the consultation pursuant to 36 CFR § 800.6(a)(l)(iii); and

Here WSMR has acknowledged its responsibilities and notified the ACHP. In the preliminary negotiation stage, the ACHP may offer comment or not. In some cases, the ACHP will choose not to participate in the PA process and waive its signatory authority. In this case, they have chosen to participate.

NOW, THEREFORE, WSMR, the ACHP, and the NMSHPO (signatories) agree that undertakings shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertakings on historic properties.

The following statements, identified with Roman numerals, spell out the terms under which the program alternative will be executed. Much of the following language is standard for PAs but tailored here for the purposes of this specific program alternative. It spells out procedures and policies that will govern the management of the facilities identified in the list and historic context. Where appropriate, footnotes will describe any processes that have not yet been explained.

STIPULATIONS

WSMR will ensure that the following procedures are implemented:

I. PROJECT REVIEW

A. Policy: WSMR shall avoid adverse effects to historic properties under its management, to the extent possible, while meeting mission needs, and coordinating Section l 06 responsibilities with the National Environmental Policy Act (NEPA).

B. Procedure

1. Qualifications:

a) All work required to meet the Stipulations of this PA will be carried out under the supervision of a person who meets the minimum standards as identified in the Secretary of the Interior's "Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (as amended and annotated)" (Professional Qualifications) as appropriate for the historic property being addressed.[8]

b) WSMR staff

(1) Cultural Resources Manager (CRM): the CRM is the person responsible, on behalf of the GC (Garrison Commander), for

[8] The Secretary of the Interior's Standards and Guidelines can be found at https://www.nps.gov/history/local-law/arch_stnds_9.htm

meeting the Stipulations of this PA. The DPW (Department of Public Works) Conservation Branch Chief shall be designated as the CRM. If the CRM does not meet the Professional Qualifications, then qualified staff members will fulfill those responsibilities. WSMR will notify the signatories of the name(s) of staff fulfilling CRM responsibilities.

(2) CRM Staff: the CRM Staff shall include qualified staff implementing the Integrated Natural and Cultural Resources Management Plan (INCRMP) for Garrison Command, supervised by the CRM.

2. Determine the Undertaking

a) The CRM or CRM Staff shall determine if the proposed project is an undertaking as defined in 36 CFR § 800.16(y) and subject to this PA.

b) If the CRM or CRM Staff determines the proposed project is not an undertaking as defined in 36 CFR § 800.16(y), or subject to this PA, WSMR has no further obligations under this Stipulation.

c) If the CRM or CRM Staff determine that the proposed project is an exempted undertaking as listed in Appendix C, the CRM shall document this determination for inclusion in the official WSMR, and WSMR has no further obligations under this Stipulation.

d) If the CRM or CRM Staff determines the proposed project is not listed in Appendix C and is an undertaking, the CRM or CRM Staff shall document this determination for the undertaking and continue the Project Review process.

3. Define the Area of Potential Effects and Identify Historic Properties

a) The CRM or CRM Staff shall determine and document the project APE for each specific undertaking, appropriate to the scope and scale of the undertaking, and considering direct, indirect, and cumulative effects in a Historic Cultural Properties Inventory form (HCPI), see Appendix E for an example HCPI.

(1) The CRM or CRM Staff shall determine whether previous identification and evaluation work has been conducted in the APE, if historic properties have been identified, the standard under which the inventory and evaluations were conducted, the types of historic properties are likely to be found, and whether a existing historic context applies.

(i) Any survey, in which standards in Appendix B

apply or WSMR consulted on with the SHPO, is adequate enough not to require WSMR to undertake a new cultural resource survey.

(2) The CRM or CRM Staff shall determine if new cultural resource surveys (to include determinations of eligibility) are needed and shall use one of the following two processes to complete new surveys.

(a) The CRM or CRM Staff shall use a process as outlined in Appendix F, to make a reasonable and good faith effort to identify and evaluate historic properties in the APE.

(b) The CRM or CRM Staff shall consult with the appropriate SHPO, Tribal Historic Preservation Officer (THPO), Tribe, and/or other Consulting Party (as appropriate) to determine the process as needed to complete a reasonable and good faith effort to identify and evaluate historic properties in the APE.

b) If the CRM or CRM Staff does not identify historic properties within the APE, and there is no need for a new cultural resource survey, the CRM and/or CRM Staff shall document this determination for inclusion in the official WSMR database, and WSMR has no further obligations under this Stipulation.

c) If there are properties requiring evaluation present in the APE, the CRM and/or CRM Staff will evaluate the property for eligibility to the NRHP and will forward documentation supporting the evaluations to the appropriate SHPO for review and concurrence.

(1) The SHPO shall be afforded 30 days, upon receipt of all pertinent information, to respond to the determinations of eligibility.

(2) If the CRM or CRM Staff and the SHPO agree that the cultural resources in the APE are or are not eligible for inclusion on the NRHP, the CRM or CRM Staff may proceed to l(B)(4)(b).

(3) If the CRM or CRM Staff and the SHPO do not agree on determinations of eligibility, the CRM can attempt to resolve the disagreement through further consultation, with SHPO responding no longer than 15 days upon receipt of all pertinent information (or as appropriate in consultation with the appropriate SHPO) or the CRM can consult the Keeper of the

National Register pursuant to 36 CFR Part 63 if needed.[9]

4. Evaluate Effects of the Undertaking

a) The CRM or CRM Staff shall work with the appropriate project proponent to discuss best management practices to avoid or minimize effects to historic properties.

(1) The CRM or CRM Staff may consult with the appropriate SHPO and/or Tribe to discuss best management practices to avoid or minimize effects to historic properties.

(2) The best management practice(s) identified by the CRM or CRM staff and discussed with the appropriate project proponent shall be documented.

(3) If any contributing resource within the boundary of an eligible or listed historic district is proposed for demolition, the CRM or CRM Staff shall consider the demolition in accordance with 36 CFR §§ 800.5 through 800. 7 and not in accordance with this PA.

b) The CRM or CRM Staff shall assess the effects of the proposed undertaking on historic properties, including direct, indirect, and cumulative effects, using the criteria of adverse effects (36 CFR § 800.5(a)(l)) and shall make one of the following determinations:

(1) "No Effect to Historic Properties": if the CRM or CRM Staff determines that there are no historic properties or that historic properties present in the APE will not be affected by the undertaking, the CRM or CRM Staff shall document this determination in the Annual Report (Section VI), and WSMR has no further obligations under this Stipulation.

(2) "No Adverse Effect to Historic Properties": if the CRM or CRM Staff determines that historic properties present in the APE will not be adversely affected by the undertaking, the CRM or CRM Staff shall document this determination in the Annual Report, and WSMR has no further obligations under this Stipulation.

(3) "Adverse Effect to Historic Properties": if the CRM or CRM Staff determines that historic properties present in the APE will be adversely affected by the undertaking, the CRM or CRM Staff shall document this determination in the RHPC and Proceed to (B)(5) the Project Review process.

[9] If the agency and SHPO cannot agree on eligibility, the Keeper of the NRHP is legally allowed to make the final decision.

5. Resolution of Adverse Effect to Historic Properties

a) For those undertakings with a finding of "Adverse Effect to Historic Properties" the CRM or CRM Staff shall provide the appropriate SHPO and Tribe(s) with the RHPC including, but not limited to, the following:

(1) project description, to include but is not limited to depth and amount of ground disturbance anticipated and a summary of best management practices and/or alternatives to avoid or minimize effects to historic properties considered but ultimately rejected;

(2) APE map showing the location of the project and of any identified historic properties;

(3) description of the historic properties affected;

(4) any photos as necessary;

(5) standard mitigation measure to be used (see Appendix G); and/or

(6) an alternative mitigation measure as appropriate.

b) The Tribes are under no obligation to provide comments on the effect determination or mitigation measure selected; however, if they wish WSMR to consider their comments regarding the effect determination, Tribes should submit comments in writing within 30 days of receipt. If no comments are received within that time, the CRM or CRM Staff shall make a second attempt to ensure that the original notification was received, if comments will be submitted, and if they wish to participate in the resolution of adverse effects before concluding consultation. WSMR shall take any tribal comments received into consideration before concluding the consultation and will notify the SHPO of any tribal concerns, respecting the Tribal request for confidentiality, and the WSMR response to those concerns.

c) SHPO shall provide any comments to the WSMR effect determination and mitigation measure within 30 days of receipt of all pertinent documentation.

d) The CRM or CRM Staff shall notify appropriate Consulting Parties, and the public, within 10 days of notifying the appropriate SHPO and Tribes of an adverse effect finding and mitigation measure for an undertaking

using the following process:

(1) The CRM or CRM Staff shall prepare and send the HCPI to the appropriate Consulting Parties including a description of the undertaking, an illustration of the APE, a list of identified historic properties within the APE, the explanation for the finding of adverse effects, steps taken or considered by WSMR to avoid or minimize the adverse effects, and any appropriate SHPO comments received by WSMR regarding the undertaking.

(2) When the Adverse Effect is part of an action being analyzed through an Environmental Assessment (EA) or Environmental Impact Statement (EIS) in accordance with NEPA, then WSMR will solicit public participation.

e) Appropriate Consulting Parties are under no obligation to provide comments on the effect determination or proposed mitigation measure; however, if they wish WSMR to consider their comments, Consulting Parties should submit comments in writing within 30 days of receipt. If no comments are received within that time, the CRM or CRM Staff shall make a second attempt to ensure that the original notification was received, if comments will be submitted, and if they wish to participate in the resolution of adverse effects before concluding consultation. If comments are received, WSMR shall take those comments into consideration before concluding the consultation and shall notify the appropriate SHPO of any concerns and the WSMR response to those concerns.

f) The CRM or CRM Staff shall organize a consultation meeting if appropriate, to include the appropriate SHPO, 45 days after notifying appropriate Consulting Parties, to discuss standard or alternative mitigation measures if necessary. Additional meetings shall be scheduled as needed.

g) If through consultation with the appropriate SHPO and Consulting Parties the adverse effects are minimized or mitigated, then the measures agreed to by WSMR, the appropriate SHPO, and Consulting Parties shall be documented in a Memorandum of Agreement as appropriate.

h) The ACHP will only participate in the resolution of adverse effects for individual undertakings if a written request is received from WSMR, a SHPO, or a Tribe.

II. UPDATES TO THE SIGNIFICANCE STANDARDS

A. Policy: WSMR relies on the Significance Standards to guide the evaluation of historic properties.

B. Procedure

1. WSMR shall update the 2015 Significance Standards within two years after execution of this PA in consultation with SHPOs and Tribes.

2. WSMR shall update the Significance Standards every five years in conjunction with major INCRMP updates.

III. REPORTING DAMAGE TO CULTURAL RESOURCES

A. Policy: WSMR recognizes that routine Army activities (i.e., training, operation, and maintenance) pose some risk of damage to historic properties. Through the project review process, project monitoring, and cultural resources awareness training of Garrison staff, military units, and contractors by the CRM or CRM Staff, WSMR attempts to minimize that risk.

B. Procedure

1. When the CRM or CRM Staff are made aware of damage to a historic property (or an unevaluated cultural resource that may be eligible for inclusion in the NRHP), either from unintentional or intentional causes (and may or may not be associated with an ongoing project or training exercise), the CRM or CRM Staff shall review the site records, visit the property, and assess the damage to the property. Activity in and around the site (or portion of site) will cease until the procedures applicable to the level of damage in this Stipulation are completed.

2. If the cultural resource is unevaluated, the CRM or CRM Staff will follow the procedures for documentation and evaluation of that property type (Appendix F) and consult on the determination of eligibility with the appropriate SHPO and the CRM or CRM Staff will follow the procedures found in this Stipulation if the property is determined to be eligible for inclusion in the NRHP.

3. If the damage is so slight as to have no effect on the site, or does not affect the characteristics that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR § 800.5(a)(1)), the CRM or CRM Staff shall make a finding of No Adverse Effect, and report the incident in the Annual Report.

4. If the damage rises to the level of an Adverse Effect, the CRM or CRM Staff shall notify the appropriate SHPO via email, phone, or fax within 48 hours of the initial damage. Within 30 working days, WSMR shall update or prepare a HCPI and the appropriate supporting documents (e.g., site form updates) with a letter signed by the GC.

a) The documentation package will document the circumstances of the damage, its extent and effect, along with potential mitigation measures, as appropriate.[10]

b) The SHPO shall have 30 days to comment on that submission.

c) If mitigation is proposed, and there are no objections to the methods, those measures shall be completed after that 30-day review period and thereafter be reported to the appropriate SHPO.

d) If some other treatment is agreed to by the parties that treatment will be completed after the 30-day review period and thereafter are reported to the SHPO.

e) If the parties are in dispute over proposed mitigation or treatment measures, the parties will follow the procedures in Stipulation V.

IV. BROADER WSMR OUTREACH

A. Policy: When WSMR determines studies produced will have a wider range of interest, they may be published in scholarly journals, periodicals, books, or given as papers at learned and historical societies.

B. Procedure:

1. All studies prepared by the CRM or CRM staff shall be submitted through channels to the WSMR Public Affairs Officer (PAO)[11] to ensure compliance with AR 360-5, *Public Information Policies.*

2. Release of studies prepared under contract will be approved as specified in the contract.

3. The CRM or CRM Staff shall ensure that a process that meets the standards of AR 360-5 is included in the scope of work for contracts approved by WSMR.

[10] The complete package is often referred to as a "Determination of Effect" or "Finding of Effect" (FOE)
[11] All military facilities have a public affairs office. They act on behalf of the Garrison in interacting with the public. Any public outreach including academic publications must be reviewed and approved by the office.

4. Exact location(s) of historic properties or other information that, in the opinion of the CRM or CRM Staff, might endanger the resources or are administrative in nature and have neither research value nor public interest will be released consistent with Section 304 of the NHPA.

5. The CRM or CRM Staff shall provide copies of published articles to the SHPO.

6. The CRM or CRM Staff may attend meetings of local and state organizations concerned with cultural resources management issues at county and state historical societies, and archeological societies.

a) The CRM or CRM Staff may speak on the status of WSMR cultural resources management program. Informal presentations, including slide presentations, may be presented without prior approval of the PAO.

b) The CRM or CRM Staff shall notify the PAO in advance of anticipated formal presentations and coordinate further if the PAO so requests. If a formal paper is given and copies are distributed, the text will be submitted to the PAO prior to the presentation to ensure the requirements of AR 360-5.

c) The CRM will inform the PAO and appropriate members of the command group of any potentially controversial issues raised during formal or informal presentations.

7. The CRM or CRM staff may include the development of popular publications as companions to technical reports when project budgets allow. WSMR will provide Portable Document Files (PDF) of popular publications to individuals and organizations upon request.

8. The CRM or CRM Staff may develop an Internet web page that can be used to disseminate information to a broader audience on cultural resource materials and program.

V. DISPUTE RESOLUTION

A. Should any signatory to this PA object at any time to any actions proposed, or the manner in which the terms of this PA are implemented, WSMR shall consult with such party to resolve the objection. If WSMR determines that such objection cannot be resolved, WSMR will:

1. Forward all documentation relevant to the dispute, including the WSMR proposed resolution, to the ACHP. The ACHP shall provide WSMR with its advice on the resolution of the objection within 30 days of receiving adequate documentation. WSMR shall prepare a written response that takes into account

any timely advice or comments regarding the dispute from the ACHP, signatories, and concurring parties, and provide them with a copy of this written response. WSMR will then proceed according to its final decision.

2. If the ACHP does not provide its advice regarding the dispute within the 30 day time period. WSMR shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the PA, and provide them and the ACHP with a copy of such written response.

B. WSMR shall carry out all other actions that are not the subject of the dispute, subject to the terms of this PA.

VI. ANNUAL REPORT

A. WSMR shall provide an annual report of activities conducted under this PA to all consulting parties and interested members of the public that includes the following:

1. a summary of all projects that proceeded under the procedures in this PA with the following sections:

a) Determination of Eligibility

(1) Date

(2) NEPA #

(3) Project #

(4) Building # (if applicable)

(5) Project Description

(6) Determination of Eligibility

(7) SHPO Determination of Eligibility

b) No Historic Properties Affected

(1) Date

(2) NEPA#

(3) Project #

(4) Building# (if applicable)

(5) Project Description

(6) Project Analysis

(7) No Historic Properties Affected

(8) Comment

c) No Historic Properties Adversely Affected

(1) Date

(2) NEPA #

(3) Project #

(4) Building #

(5) Project Description

(6) Project Analysis

(7) Not Adversely Affected

(8) Comment

d) Adverse Effect

(1) Date

(2) NEPA#

(3) Project#

(4) Building#

(5) Project Description

(6) Analysis

(7) Adverse Affect

(8) Comment

(9) SHPO Date

(10) Mitigation Comment

e) Damage Report

(1) Date

(2) NEPA#

(3) Project#

(4) Building#

(5) Project Description

(6) Analysis

2. a list of undertakings for SHPO with a finding of "no historic properties affected" and "no adverse effect" for the first two years of annual reporting.

4. all projects proposed for the coming year; and

5. recommendations for amending the PA, if any.

B. Upon request, the CRM shall include a list of WSMR professionals who participated in implementation of this PA during the previous and current fiscal years in each PA annual report. The list will include a description of each professional' s current responsibilities.

C. WSMR shall prepare the final report and submit it, through command channels, for approval, reproduction, and release on 15 November each year the PA is in effect.

D. Consulting parties will submit to WSMR within 60 days of their receipt of the annual report any comments or any requests for specific information. If there is no response within.this time, it will be assumed that the annual report is acceptable.

E. WSMR shall hold an annual review and monitoring meeting as appropriate and/or upon request of a signatory party.

F. WSMR shall retain the original documentation of each project undertaken without formal review of the SHPO for a period of three years. Original documentation shall be made available to consulting parties or interested members of the public upon written request.

G. The ACHP shall only receive a copy of the annual report if an amendment is proposed by WSMR.

VII. FISCAL REQUIREMENT AND SOURCES

The Stipulations of this PA are subject to the provisions of the Anti-Deficiency Act (31 USC Section 1341) and availability of funds. If compliance with the Anti-Deficiency Act alters or impairs the ability of WSMR to implement the Stipulations of this PA, WSMR will consult pursuant to Stipulations VIII and IX.

VIII. AMENDMENT

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

IX. TERMINATION

A. If any signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation VIII. If within 60 days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the PA upon written notification to the other signatories.

B. Once the PA is terminated, and prior to work continuing on the undertaking, WSMR shall either 1) execute a Memorandum of Agreement pursuant to 36 CFR § 800.6 or 2) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. WSMR shall notify the signatories as to the course of action it will pursue.

X. DURATION

A. This PA takes effect upon last signature date and will remain in effect thereafter for 10 years. Upon consultation with, and agreement by, other parties of this PA, it may be extended, amended, or terminated at 10 years.

B. This PA shall be reviewed periodically, not less than three years from the execution of the PA. WSMR shall consult with the Signatories to determine whether the PA needs to be extended, amended, or terminated and take such actions as appropriate one year to the date this PA would otherwise expire.

Execution of this PA by WSMR, the NMSHPO, and the ACHP and implementation of its terms evidence that WSMR has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

SIGNATORY PARTIES

GARRISON COMMANDER, WHITE SANDS MISSILE RANGE

_____ DATE:_____

STATE OF NEW MEXICO HISTORIC PRESERVATION OFFICER

_____ DATE:_____
Jeff Pappas

ADVISORY COUNCIL ON HISTORIC PRESERVATION

_____ DATE:_____
John M. Fowler, Executive Director

CHAPTER 5. CONCLUSION AND RECCOMENDATIONS

The process described in the previous chapters has endeavored to explore the background, explain the process, create background materials for, and draft an actual Programmatic Agreement. While an academic exercise, the effort has its basis in a real life scenario. WSMR does indeed contain the resources described in Chapter 2—the historic context could be used in professional practice. In reality, however, all of the components would need to be negotiated. The reader should, at this point, realize that the scenario was created to explore the entire programmatic agreement process.

This does not mean that there is not real value in this effort. WSMR is now in the process of creating an overarching PA that captures *all* of its cultural resources, not just specific areas of the built environment. In doing so, it may very well consider, in negotiation with ACHP and SHPO, to use this context and edited list of resources in a supplemental PA. Aside from archaeological resources, Cold War Era instrumentation buildings and structures present the biggest cultural resources challenge for management by virtue of their sheer volume and widely distributed locations.

In the meantime, we return to the academic realm where we have created a scenario where the signatories have agreed on the terms of the PA and we can assume it has been signed. As a legally binding document, where do we as the CRM, go from here? Using the draft PA as a guide, this chapter will go through a process of concluding statements and recommendations for how to meet their obligations. This final chapter is laid out logically just as the "whereas" background sections and then stipulations are organized in the agreement.

The first and most broad-reaching aspect of the PA is that the list in Appendix C of agreed-upon buildings and structures at dedicated instrumentations sites have been consulted upon and the Army is now free to proceed with any alterations or demolitions with those that are considered *not eligible* or *ineligible* for NRHP listing. Most have been determined ineligible, thanks to the comprehensive historic context and set-aside representative examples in Appendix D—here the Army has taken a leadership role in pursuing a program alternative with a mitigative component to bring to the table. This now clears the path for the FRP program to proceed without any further SHPO consultation.

For those on the list that have been determined *eligible* for listing, the agreed-upon mitigation process codified in the agreement eliminates the need to create a Memorandum of Agreement each time a related site that has yet to be captured in the list or determined eligible. Assessing historic resources tends to be one the most time-consuming of all the NEPA-related requirements a federal agency has to contend with, so the efforts of the CRM with the historic context and a dedicated list, clears many hurdles. Mitigation requirements also include the method of recordation, in this case the HCPI. However, in addition, an additional requirement to include a full historic context is required. This will likely include Chapter 2, the overarching document in which to properly place the resources in a historic context.

For those resources identified as "as yet unidentified properties" that remain subject to Section 106 review, the stipulation in (I)(B)(3)(1)(i)… "any survey, in which standards in Appendix B

[historic context] apply or WSMR consulted on with the SHPO, is adequate enough not to require WSMR to undertake a new cultural resource survey", plays a significant role in streamlining the NRHP inventory and evaluation requirements. The context allows newly discovered resources covered in the context to be evaluated using that context in lieu of having to consider it under a whole new evaluation process. The process for identifying and recording those properties is spelled out in Appendix F. A HCPI is to be prepared and, by the terms of the agreement, can reference the historic context streamlining the evaluation process considerably. Once consulted on, the resource can be cleared of further Section 106 requirements if determined ineligible or, be processed through the PA's mitigation terms should an adverse effect be determined through alterations or demolition undertakings.

This is the heart of the benefit of the PA approach—the document sets up a pathway for compliance with a clearly defined and streamlined approach thereby saving countless hours and dollars of effort normally required to fully comply with the law. The mitigation process assists in streamlining compliance for those who have been determined eligible in Appendix C, and those which have yet to be considered that turn out to be determined eligible.

The mitigations set forth in the PA are twofold. The first is the acknowledgement of the two instrumentation-related interpretive resources—one an actual historically-significant optical instrument and, the other a later Cold War Era instrumentation structure with astrodome. However, the more meaningful action in regards to the PA is the six set-asides in Appendix G; the dedicated instrumentation sites with a range of Cold War Era instrumentation buildings and structures. This set the tone for the SHPO to agree to the ineligibility of the many duplicate building types spread around the ranges. This negotiated give-and-take acknowledges WSMRs willingness to preserve representative examples in lieu of mitigating perhaps hundreds of abandoned buildings and structures in varying degrees of disrepair, many of which have lost sufficient integrity to even be considered eligible.

The ACHP and SHPO are well aware of the DODs inability to preserve all redundant buildings and structures in perpetuity and many, especially those in constantly-changing test and evaluation scenarios are prohibitively expensive to keep in working condition. Further, the evolution and maturation of compliance under a relatively recent law for a vast number of resources has taken time to get up to speed. In reality, historic preservation professionals had not really mastered the formatting and execution until the turn of the twenty-first century, more than 30 years after the creation of the NHPA.

In a similar situation, WSMR agreed to preserve a representative example of a notable contributor to missile and rocket tracking, the AN/FPS-16 radar. This ground-breaking radar and its specially-designed support building was constructed around the globe and, in addition to its sub-orbital performance characteristics, contributed to tracking all of the space programs from Mercury to the Space Shuttle. The agreement was made as mitigation for the demolition of one of six such buildings at WSMR.

While many of the administrative stipulations are self-explanatory and have been adequately described earlier in the document, some recommendations for execution and management should be made. For those properties that have been deemed eligible for listing and those not yet

evaluated and included in the list, Appendix G outlines the procedure for mitigating alteration or demolition. As described in Chapter 3, standard mitigation practices typically include those that are mandated in a HABS/HAER recordation. One component that pre-dates digital photography is either large format or 35 mm black-and-white photography requirement. In recent years, SHPOs have been satisfied with digital submissions in lieu of film but typically require printed images on stabilized papers for long-term survivability. The mitigation agreed to in Appendix G requires digital images only.

Again, with a contracted mitigation process in place and procedures for submission, the historic narratives can be reduced to a general building description and associated maps and locational data; including the historic context provides a complete submission. Printing on acid-free paper and submitting a clean and well-presented package will set the tone for trust with the SHPO that the agency is acting in good faith. It also provides for public outreach efforts, a component that is central to the mission of the state agency in supporting the spirit of the NHPA.

The other good faith effort on WSMRs part must be the proper preservation treatment of the set-aside sites set forth in Appendix D. In addition to a full recordation of the sites, a preservation management plan with a maintenance component is to be prepared to guide in the long-term care of the buildings and structures. Without this plan, future CRMs may not be aware of their responsibilities which could result in the loss of perhaps the only representative examples left for interpretation.

One of the big drivers in creating the PA was to clear the way for demolition of redundant buildings and structures under the Army's FRP program. Reducing footprint reduces maintenance costs and liability issues for the Army. This clears the path for all ineligible resources on the list in Appendix C to be part of a comprehensive demolition program. It also provides an expedited procedure should any additional associated properties be discovered or were missed.

Lastly, the requirement for an annual report poses a challenge for the current and future CRMs. If not prodded by the SHPO for such a document, this requirement could easily fall by the wayside in just a few years. It would be wise to assign a particular staff member with the responsibility of preparing this annual document as part of his or her responsibilities. A good recommendation would be to include the associated responsibility an annual inspection of the set-asides with comments provided in the annual report.

While this draft PA would be subject to many opinions and suggested edits, the basis of this study was to provide both an alternative to Section 106 and illustrate how the process and the actual document might unfold. It is hoped that this effort will be considered in the WSMR's overall PA and provide useful for the basis of a supplemental PA.

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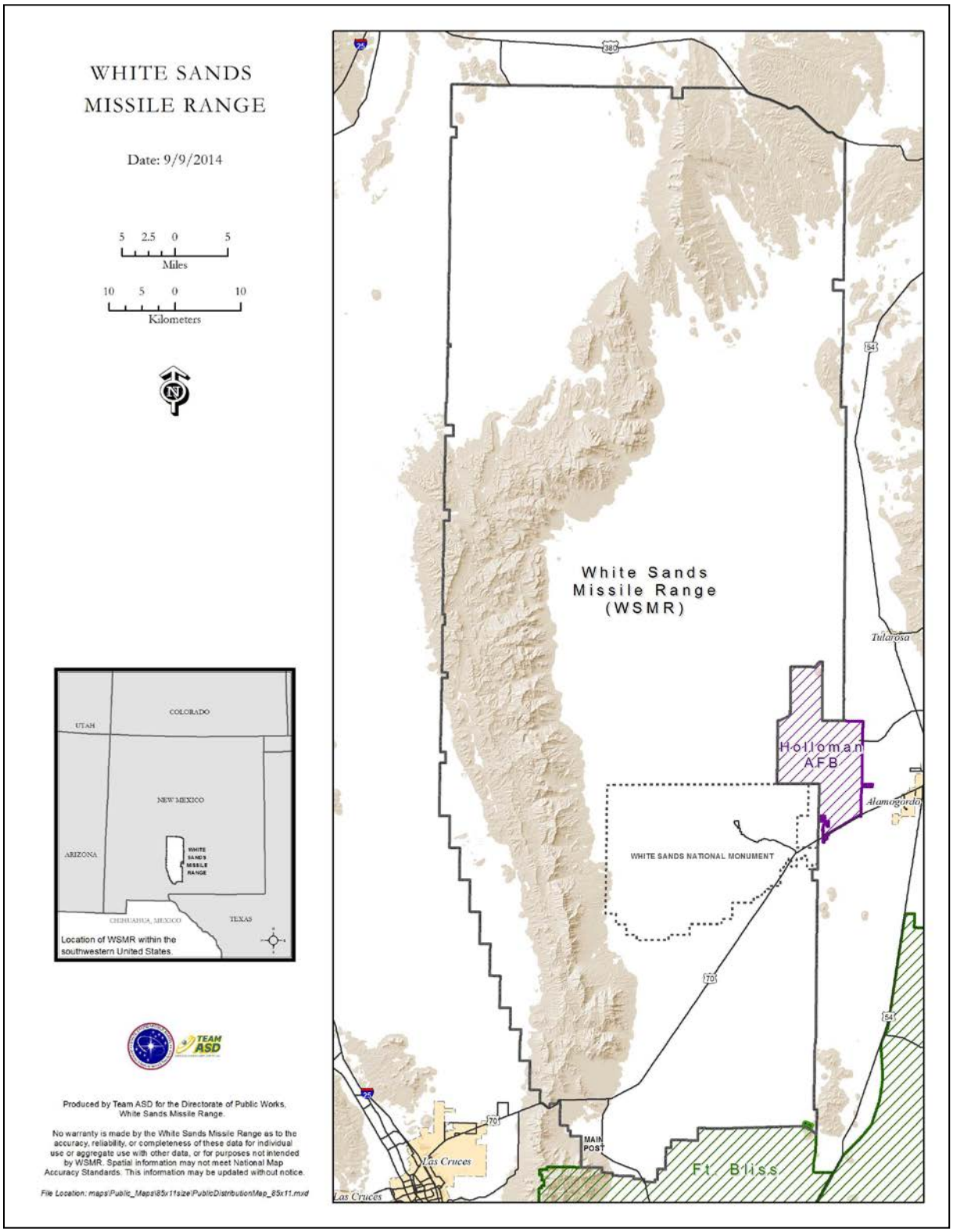
2015 White Sands Missile Range Integrated Natural and Cultural Resources Management Plan and Environmental Assessment 2015-2019. US Army.

US Army Test and Evaluation Command
1967 *Range Instrumentation Layout*. White Sands Missile Range. AD 718666. New Mexico.

What is a Programmatic Agreement?
Electronic document. http://environment.transportation.org/documents/programmatic_agreement_toolkit/WhatIsPA.html.

Woodward, L., and S. Lauchner
2009 Section 106 of the National Historic Preservation Act Programmatic Agreements. Electronic document. http://www.parks.ca.gov/pages/1054/files/hudpasection106review1-13-09.pdf Corona, California.

APPENDIX A: AREA OF POTENTIAL EFFECT (APE) UNDER PROGRAMMATIC AGREEMENT



APPENDIX B: HISTORIC CONTEXT FOR COLD WAR ERA FACILITIES AT DEDICATED INSTRUMENTATION SITES ON WSMR

See Chapter 2, Literature Review, which serves as the historic context for the purposes of the Programmatic Agreement.

APPENDIX C: LIST OF HISTORIC PROPERTIES COVERED IN THIS PROGRAMMATIC AGREEMENT

Site Name	Building Number	NRHP-eligible? Y/N
Army 2 Site	27954	N
B Station	21870	N
Bate Site	29429	N
	26953	Y
Beck Site	34802	N
	34803	N
	34804	N
Ben Site	25573	N
C Station	21910	Y
Bell Site	25573	N
	21911	Y
	21912	Y
	21913	Y
Bill Site	20200	Y
Bowl Site	20701	N
Brillo Site	30160	N
Bunker Site	34502	N
	34503	N
Busta Site	unknown #	N
	unknown #	N
CAD Site	22640	N
Cain Site	31460	N
	31463	N
Cal Site	25765	N
	25768	N
Car Site	25510	N
Carmen Site	27089	N
Chamise Site	unknown #	N
Chas Site	29021	N
Chat Site	23295	N
Chew Site	25100	N
Chub Site	29024	N
Chuck Site	29015	N
Church Site	34710	N
Coker Site	29780	N
Coma Site	unknown #	N
	unknown #	N
	unknown #	N
Conn Site	27088	N
Cowan Site	29378	N

Site Name	Building Number	NRHP-eligible? Y/N
	29383	N
Curt Site	32950	N
	32951	N
	32954	N
D-3 Site	28880	N
	28881	N
	28882	N
D-4 Site	29760	N
D-5 Site	30430	N
	30432	N
D-6 Site	29320	N
	29323	N
D-7 Site	31350	N
D-9 Site	32970	N
	32971	N
	32972	N
Dam Site	33570	N
	33573	N
Dog Site	20460	Y
Easy Site	20102	Y
	20104	Y
	Skyscreen	Y
EC-50 Site	29085	N
Flower Site	25080	Y
	Unknown #	N
Fox Site	27650	N
	27651	N
G Station	25481	N
	25482	N
G-160	34516	N
	34517	N
	34520	N
Gap Site	32990	N
Glover Site	25280	N
Granjean Site	34051	N
	34054	N
Grass Site	21747	N
Green Site	34690	N
	34692	N
	34695	N
Gun Site	30400	N
Gus Site	34821	N
	34822	N
Hanford Site	30580	N

Site Name	Building Number	NRHP-eligible? Y/N
	30585	N
Harriet Site	34600	N
Jallen Site	30880	N
	30881	N
Jed Site	20800	Y
	Unknown #	Y
Ken Site	20510	N
	20512	N
	Unknown #	N
Key Site	25905	Y
Lake Site	20610	N
	20612	N
Lass Site	25180	N
Locker Site	23184	N
	23185	N
M Site	Unknown #	N
Marcial Site	32740	N
Melton Site	34515	N
Mile Site	34991	N
Millie Site	20626	N
Nan Site	28170	N
Nan Prime Site	20620	N
Nancy Site	28171	N
	28172	N
NE-30 Site	28730	N
	28731	N
	28732	N
NE-50 Site	29090	N
	29091	N
NE-70 Site	31630	N
	31631	N
	31637	N
Neus Site	24168	N
New Nick Site	27911	N
	27912	N
	27913	N
Noe Site	20706	N
Norma Site	34776	N
	34777	N
NW-30 Site	30210	N
	30211	N
	30216	N
NW-50 Site	30987	Y
	30990	Y

Site Name	Building Number	NRHP-eligible? Y/N
	30991	Y
	30992	Y
	30993	Y
	30994	Y
	30995	Y
NW-70 Site	31620	Y
	31614	Y
	31615	Y
	31621	Y
	31623	Y
O Site	25060	N
	25061	N
	25063	N
Ortho Site	25070	N
	25071	N
	Unknown #	N
	Unknown #	N
Panther Site	33410	N
Pat Site	25250	N
	Unknown #	N
R Site	23310	N
	23312	N
Ron Site	20495	N
	Unknown #	N
Russ Site	31293	N
SC-50	29059	N
School Site	32450	N
	32451	N
SE-30 Site	28070	N
	28731	N
SE-50 Site	29046	N
	29054	N
	29055	N
	29056	N
SE-70 Site	31425	N
	31427	N
	31429	N
	31430	N
Seehorn Site	28230	N
	31425	N
	28782	N
Seus Site	24015	N
	Unknown #	N
Skillet Knob	32009	N

Site Name	Building Number	NRHP-eligible? Y/N
	32012	N
Stone Site	25005	N
SW-30 Site	28680	N
SW-50 Site	30390	N
	30391	N
	30393	N
SW-70 Site	30330	N
	30331	N
Tare Site	23510	N
	23512	N
	23513	N
Uncle	20712	N
	20713	N
V Site	23015	N
	23016	N
Vega Site	23050	N
	Unknown #	N
Viper Site	22500	N
W Site	21880	N
W Prime Site	21881	N
Water Site	22875	N
	Unknown #	N
WC-50 Site	30909	N
	WS009194	N
Zebra Site	Unknown #	N
	Unknown #	N

APPENDIX D: SITES CHOSEN AS REPRESENTATIVE EXAMPLES OF COLD WAR INSTRUMENTATION BUILDINGS AND STRUCTURES TO BE PRESERVED

In addition to instrumentation structure and a historically-significant Cold War optical instrument (IGOR) preserved at the White Sands Museum's Missile Park, the White Sands Garrison and SHPO have agreed to additional mitigation measures in the Programmatic Agreement.

Cold War Era dedicated instrumentation sites at White Sands Missile Range (WSMR) are numerous and varied—many have multiple periods of construction. Some exhibit characteristics of a single period, some even contain a single building. In an effort to acknowledge the far-flung sites and their collective historic role in capturing rocket and missile performance and flight characteristic data, WSMR has agreed to maintain a few of the best representative examples constructed during the Cold War.

1) Easy Site

Located just north of the Owens Road gate, Easy Site is close to the WSMR Museum and will serve well as an interpretive Site. The site consists of two buildings, a first generation Askania and Mitchell Theodolite Single Unit and a nearby Doppler Receiving Station; neither contain instrumentation so interpretive signage will be placed at the site. Skyscreen, also a first generation instrument, and the last of its kind, will be rehabilitated.

3) Flower Site

This site contains a well-preserved and intact example of a 1961 Twenty-foot Type "Highspeed Cinetheodolite" structure. In addition to retaining its 16-foot Parabam astrodome, the associated portable support building remains in place.

4) Jed Site

Contained within the boundaries of Launch Complex 33 (LC-33), Jed Site contains an extant raised mound with concrete pad and original 10-foot Parabam astrodome that housed a ribbon-frame camera. The associated support building remains in place nearby.

5) NW 50

NW-50 contains an assemblage of buildings and structures that are representative of multiple periods of instrumentation construction. In addition to a first-generation double-cinetheodolite building, a 1958, a second generation cinetheodolite structure with Parabam astrodome is attached on the north side; an intact, adjacent 1959 16-foot by 20-foot "moveable instrumentation" metal support building sits behind the double-cine. The site also contains a 1979 20-foot telescope platform with extant Tommy Tower astrodome, with associated metal support building.

6) NW 70

Similar in nature to NW-50, this site contains first-generation single-cinetheodolite building with adjacent IGOR support building. The site also contains the concrete foundation for the IGOR instrument. The site also contains a 1979 20-foot telescope platform with extant Tommy Tower astrodome, with associated metal support building.

A Preservation Management Plan will be prepared in consultation with the New Mexico SHPO to assure that adequate care and protection is afforded these buildings and structures. The Plan shall include identification of character-defining features, including any extant instrumentation devices not heretofore removed. The plan shall be prepared by a qualified consultant or firm.

An annual inspection shall be performed by a dedicated staff member. The findings, especially in reference to condition and care, as well as retention of character-defining features will be included in the annual report.

APPENDIX E: SAMPLE OF NEW MEXICO HISTORIC CULTURAL PROPERTY INVENTORY (HCPI) FORM

White Sands Missile Range Inventory Form

1. Identification

Historic Name of Resource: Property 27110 Bowen-Knapp Camera Station **Current Name of Resource:** Property 27110 Instrument Building	**Project Name:** White Sands Missile Range Small Missile Range Historic District **HCPI#:** 34089 & 34391 **LA#** 180,221 **NMCRIS#:** 131,728
Resource Ownership & Contact Information: Directorate of Public Works, White Sands Missile Range, NM 88002	**Resource Type:** ☑ Building ☐ Structure ☐ Object ☐ Site

Resource Photograph

2. Location

Street Address: Range Road 279, Small Missile Range **City:** White Sands Missile Range **County:** Doña Ana	**UTM Map Datum: NAD 83** **Zone:** 13 **E:** 366775 **N:** 3594719 **USGS Quad Name/Year:** White Sands, NM 1955

3. Resource Description

Historic Function: Protective shelter and mounting location for fixed Bowen-Knapp camera **Current Function:** The building is no longer in use, abandoned in place	**Current Visible Condition:** ☑ Intact ☐ Altered ☐ Deteriorated **Describe:** Though no longer maintained, the building remains mostly intact and is unaltered.
Construction Date: 1952 ☑ Known ☐ Estimated **Source:** WSMR GIBLIN Realty Data and architectural drawings	**Architect/Builder:** Herkenhoff and Turney, Architects and Engineers, Santa Fe, New Mexico

Resource Description:

The Bowen-Knapp camera shelter buildings at the SMR are one-story, rectangular plan buildings with a reinforced concrete foundation that terminates 25 inches above grade. The slightly recessed walls are constructed with concrete masonry units (CMU) and coated with a stucco finish. The periphery of the uppermost sections of the four walls is finished in a continuous concrete beam, or lintel, that follows the contours where the outer walls drop, creating a large sloped opening on the range-facing elevation. Designed specifically as ballistic range camera shelters, each unit faces the range area perpendicularly as evidenced by an east (or west) facing weather-protection, roll-up steel door. Each of the remaining 15 duplicate buildings is a mirror-image of their cross-range counterpart, each containing a single personnel door that faces away from the range; the steel, recessed panel doors contain two glazed panels divided by a horizontal muntin bar. The door is flanked by reinforced concrete posts and accessed by a simple, 3-step concrete flight due to the raised foundation. The roof is comprised of a one-piece, slightly crowned concrete slab that ranges from 4-inches thick at the outer edges to 6 inches thick at the peak; the roof slab overhangs the walls on three elevations by 12 inches. The roll-up doors, almost in the manner of a roll-top desk, follow the contours of the sloped opening. This opening is the primary field of vision for a fixed camera mounted on an interior concrete pedestal placed close to the opening. Each building is fitted with a small, steel-frame 2/2, double hung sash placed on the north elevation. Electrical power for the buildings comes from an overhead line which connects to the pole line that runs downrange. The interiors are straightforward—each unit contains a centrally-placed concrete pedestal (camera mount) and electrical components are mounted on the outside walls. A second, lower pedestal appears to have been added to some of the buildings. Each of the now vacant structures vary in condition; they have been left to the elements. Other than the demolition of Buildings 27153, 27156, and 27157, most of the buildings have had no major alterations other than electrical conduits have been added and many of the overhead wires have been disconnected from the power lines.

4. Current National Register & State Register Status

National Register Status: ☐Individually Listed ☑Not Individually Listed
State Register Status: ☐ Individually Listed ☑Not Individually Listed
Included in a Listed Historic District: ☐Contributing ☐Non-Contributing ☑Not Included

5. National Register Historic District Evaluation

National Register Surveyor Evaluation:
☐ Individually Eligible ☑Eligible as a District Contributing Resource ☐Not Individually Eligible/Non-Contributing Resource
National Register Criteria: ☑A ☐B ☑C ☐D ☐Criteria Consideration
Level of Significance: ☐Local ☐State ☑National
Name of Historic District: WSMR Small Missile Range Historic District
Area of Significance: Army Cold War Military Industrial Properties (per Lavin 1998)
Period of Significance: Cold War 1946 to 1989
Surveyor Name/Contact Information and Date:

N. Myers & B. Beacham, Epsilon Systems Solutions, 575-528-8197, ebeacham@epsilonsystems.com; nmyers@epsilonsystems.com

White Sands Missile Range National Register Determination:
☐ Individually Eligible ☑Eligible as a District Contributing Resource ☐Not Eligible Individually/Non-Contributing Resource
White Sands Missile Range Remarks:

White Sands Missile Range Name/Contact Information & Date:
Bill Godby, 575-678-6003, william.c.godby.civ@mail.mil October, 2014

SHPO Determination:
☐ Individually Eligible ☐Eligible as a District Contributing Resource ☐Not Eligible Individually/Non-Contributing Resource
SHPO Remarks:

SHPO Contact Name/Contact Information and Date:

6. Additional Information

See Attached Continuation Sheet for Supplementary Resource Photographs, Aerial Photographs, and Location Map.

Properties 27110-27118 and 27150-27158 are Bowen-Knapp camera shelters. These buildings were specially designed and constructed to house Bowen-Knapp high speed cameras. The Bowen-Knapp camera was a high speed ribbon frame camera developed by Dr. Ira Bowen of Caltech, a pioneer in optical design . Dr. Bowen developed the CIT-1 Ribbon Frame Camera as part of a collaborative effort between Caltech and the US Naval Ordnance Test Station at Inyokern California during the 1940s (Bowen 1968; Delgado 1981). The hyphenated "Bowen-Knapp" designation of the camera is apparently due to the role of a Mr. Knapp, a government contact responsible for the funding of the project (Delgado 1981). The ribbon-frame camera was distinctive from standard cine camera equipment in that the speed of the film transport mechanism is continuous throughout the camera, while cine equipment uses an intermittent speed film transport mechanism. The continuous speed mechanism never slows the movement of the film even while it is being exposed, relying on very high shutter speeds to keep the image from being blurred. Intermittent speed film transport mechanisms used in cine equipment halt the film movement while the image is being exposed (Ehling 1967). The Bowen-Knapp CT-1 camera was developed into the CZR-1 series, which during its operational tenure was regarded as a state-of-the art high speed camera (Delgado 1981).

These buildings were built on a standardized plan and are essentially identical except for various modifications made to some examples of the building since they were constructed. Fifteen of the buildings remain extant at the range; three of the buildings (Properties 27153, 27156, and 27157) been razed to the foundations.

Historic Cultural Properties Inventory (HCPI) Continuation Sheet

Historic Preservation Division, New Mexico Department of Cultural Affairs

For HPD Office use only: HCPI No._____ District No._____		
1. Name of property: (historic and/or current name for property) Property 27110: Bowen-Knapp Camera Station	**2. Location:** UTM Datum (NAD83) Zone: 13 Easting: 366775 Northing: 3594719	**3. Local Reference Number:** Property 27110 **4. County** Doña Ana County **5. Date of Survey** 4/17/14

Site Plan/Pictometry

Continued on other side

HCPI Continuation Sheet (continued from other side)

Historic Preservation Office, New Mexico Department of Cultural Affairs

Additional Photographs

¾ view of the exterior, view northwest

¾ view of the exterior, view northeast

¾ view of the exterior, view southwest

Overview of concrete pull box associated with Building 27110

Overview of 4 calibration poles associated with building, view west

HCPI Continuation Sheet

Historic Preservation Office, New Mexico Department of Cultural Affairs

5. National Register Historic District Evaluation (Continued)

Property 27110 was constructed in 1952 as a shelter and mounting location for a Bowen-Knapp high speed camera, as part of a network of 18 identical buildings erected along the east and west margins of the SMR flight or Yaw Line. These camera shelters were an important part of the fixed, metric optical instrumentation system of the SMR that delineated the functional extent and shape of the range on the landscape. These buildings are identical in construction and most remain intact, with the exception of Properties 27153, 27156, and 27157, which have been razed to the foundations. This particular example remains in good condition with only minor modifications, although the Bowen-Knapp camera has long been removed.

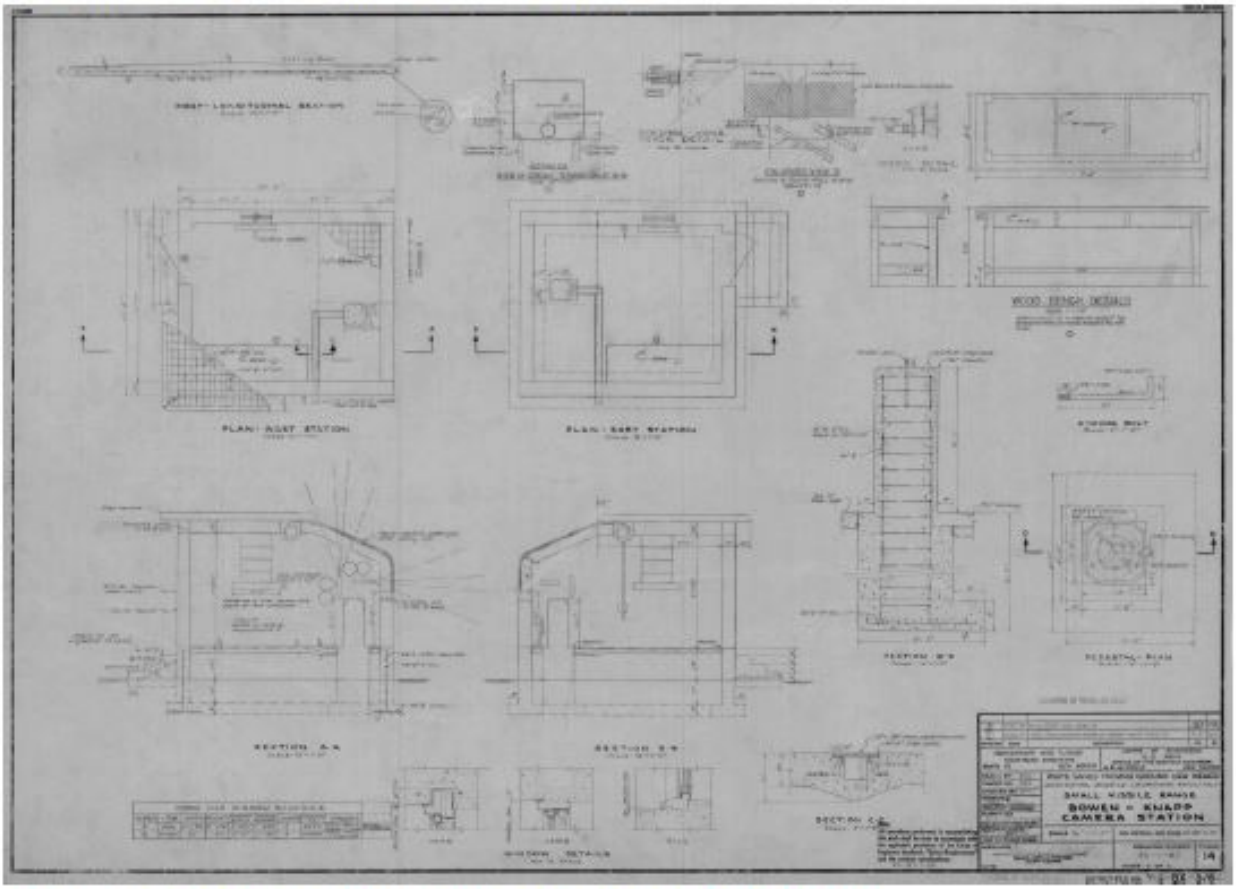
Property 27110 was previously recorded in 2002 by Human System Research (HSR), who recommended the building as individually eligible under Criterion C. This recommendation received SHPO concurrence on September 11, 2002 by James Hare on behalf of Jan Biella (HPD Log No. 065536). However, the 2002 HSR inventory did not evaluate the inventoried properties as a potential district. Epsilon Systems disagrees with this previous determination for Property 27110 as it is one of numerous identical examples of Bowen-Knapp Camera Shelters at the SMR. Therefore, it is not recommended for individual eligibility to the NRHP.

Property 27110 is associated with the history of WSMR and the Cold War and can be linked to specific historic themes identified by Lavin (1998). However, as an individual resource regarded in isolation from the larger network of Bowen-Knapp camera stations, the association is not significant enough for the building to be considered individually eligible under Criterion A. Neither is the building known to be associated with persons whose lives or achievements are individually important to the history of WSMR, the Army, or the Cold War, thus it is not considered individually eligible under Criterion B. The roll-up steel door lends the building some degree of architectural distinction as a specialized design; however, the remainder of the building is of prosaic concrete lintel and CMU construction that is not distinctive of a type, period, or method of construction, nor is it representative of any recognizable style, artistic value, or high degree of craftsmanship. Additionally, the removal of the Bowen-Knapp camera that the building was originally designed to house has diminished the building's integrity, particularly in regard to the elements of workmanship and design. For these reasons, the building is not considered to be individually eligible under Criterion C. No additional information can be provided by the building itself, the design and construction of which are well documented in architectural drawings and other archival resources, and thereby the building is not a candidate for individual eligibility under Criterion D.

However, the SMR is a distinguishable entity that embodies distinctive characteristics whose contributions to the Cold War historic themes of Basic Scientific Research; Materiel Development; and Air Defense, Ballistic Missile Defense, and Army Missiles (per Lavin 1998) are significant to our national history. As such, the SMR as a collective entity is recommended as a potential historic district eligible under Criteria A and C. Though it lacks distinction as an individual resource, Property 27110 is a key component of the range instrumentation network, one of the defining attributes of the SMR. Thus, Property 27110 is recommended as a contributing element to the proposed SMR Historic District under Criteria A and C.

HCPI Continuation Sheet

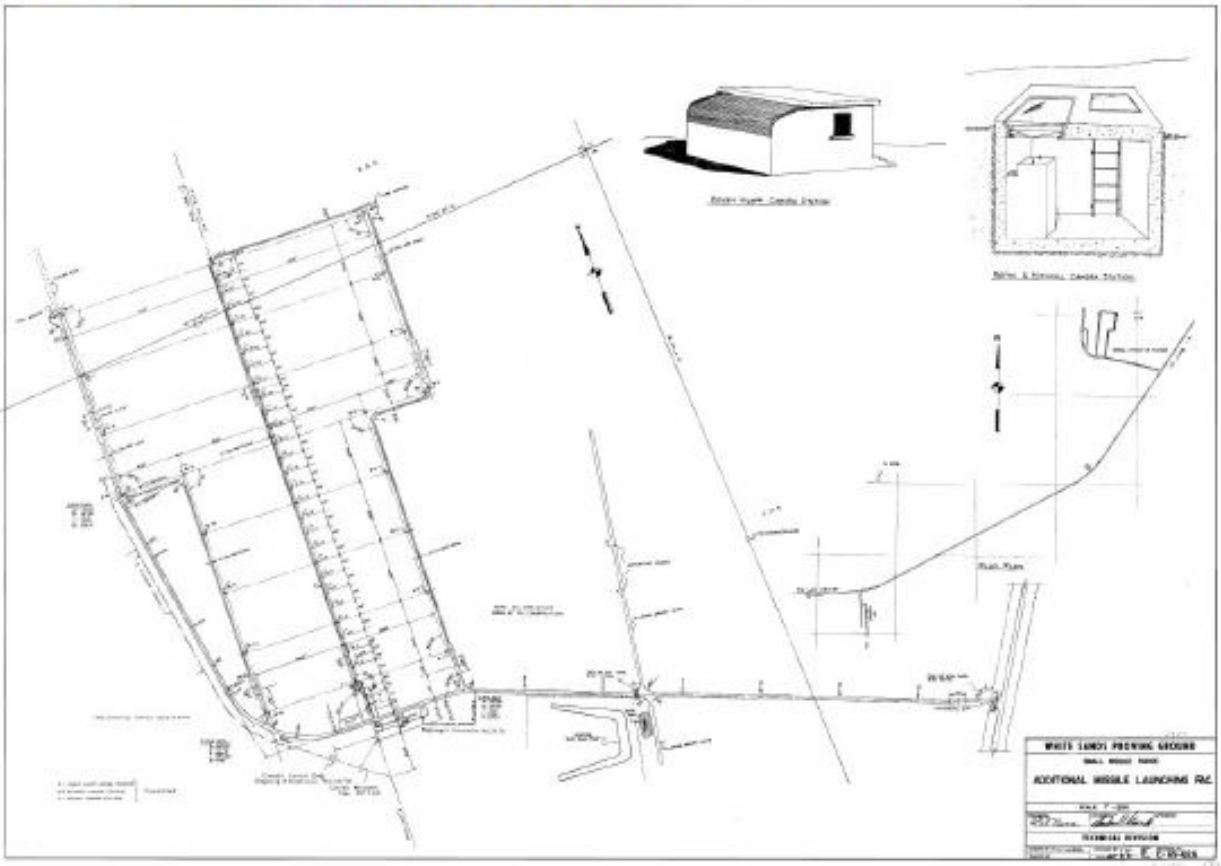
Historic Preservation Office, New Mexico Department of Cultural Affairs



1951 architectural drawing of Bowen-Knapp Camera Shelter from WS-BX plan set

HCPI Continuation Sheet

Historic Preservation Office, New Mexico Department of Cultural Affairs



1951 Overview map of SMR camera network with shelter schematics

HCPI Continuation Sheet

Historic Preservation Office, New Mexico Department of Cultural Affairs

1. FACILITY NO	2. DESIGNATION	3. CATEGORY CODE	4. DESIGNED CAPACITY	5. TOTAL AREA
27110	Elct Eqp Fac	842 40		160

6. UNIT OF MEASURE	7. DRAWING NO	8. MAP NO	9. ☐ LEASED ☒ OWNED
SF	US-BX		LEASE NO

10. AIR CONDITIONING	16. FIRE PROTECTION	18. TYPE OF CONSTRUCTION
a. TYPE	a. NUMBER 1	☒ PERM ☐ SEMI-PERM ☐ TEMP
b. CAPACITY	b. TYPE CO_2 15#	19. BUILDING DIMENSIONS
c. SQ YD AIR COND	17. MATERIALS	a. MAIN BLDG 11'8" x 11'8"
11. HEATING	a. FOUNDATION Conc	b. OFFSETS
a. SOURCE Radiant Heater	b. FLOOR Conc	c. WINGS
b. FUEL Elect	c. WALLS Conc	d. BASEMENT
12. HOT WATER FACILITIES	d. ROOF Conc	e. ATTIC
a. CAPACITY	e. SURFACE	20. TYPE OF CARD
b. TEMPERATURE RISE	f. BASE	☒ BLDG ☐ MISC STR ☐ UTIL DIST SYS ☐ RAILROAD ☐ LAND ☐ SURFACED AREAS
13. NO. USABLE FLOORS 1	14. OTHER MEASUREMENTS	

15. UTILITY CONNECTIONS	NUMBER	SIZE	CAPACITY
a. WATER			
b. SEWER			
c. ELECTRICITY	1		
d. GAS			
e. STEAM			
f. CONDENSATE			

21. REMARKS
15c 4 06 UP 120/208V-3Ø-4W

DA FORM 2877 1 NOV 64 — REPLACES DA FORMS 5-46, 5-47, 5-49, 5-50, 5-51, AND 5-52, WHICH ARE OBSOLETE. — REAL PROPERTY RECORD (AR 735-27)

22. COST DATA

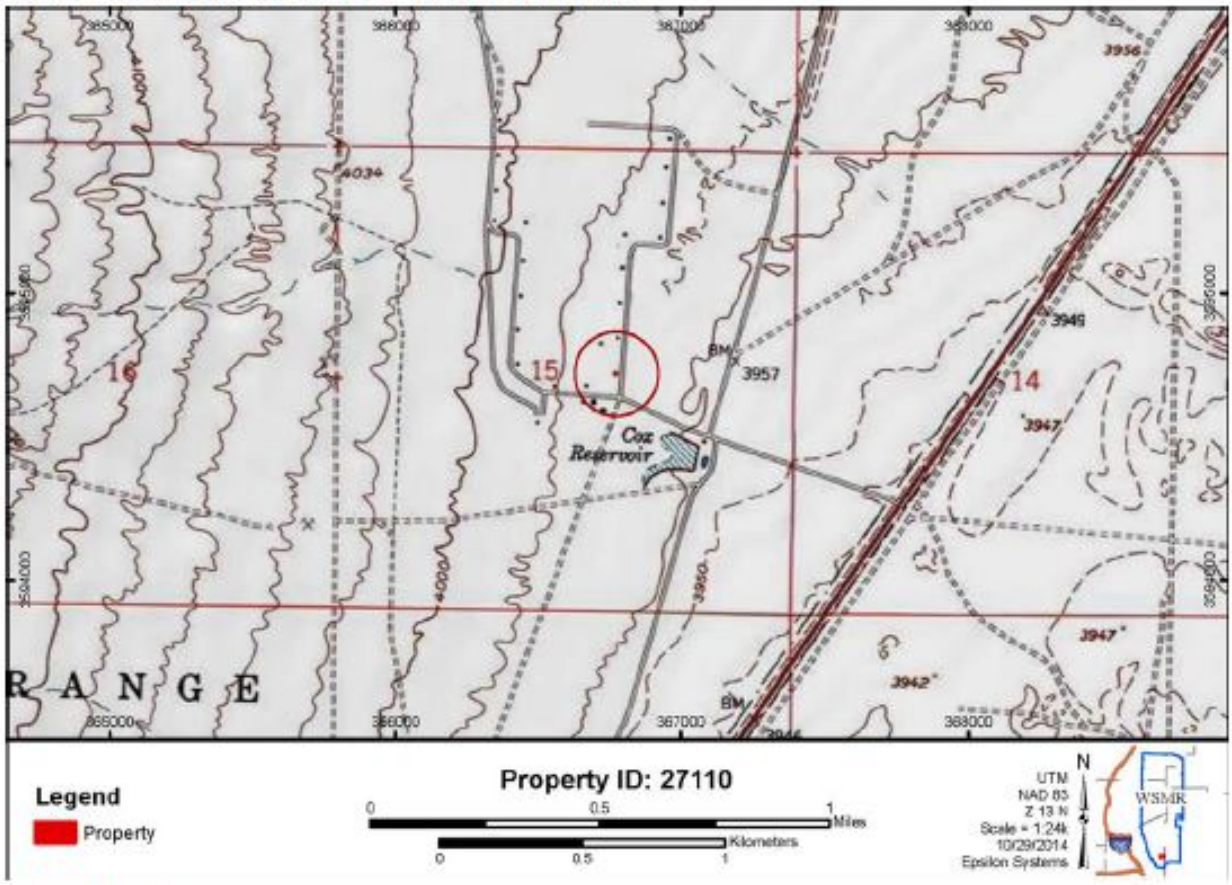
VOUCHER NO	DATE COMPLETED	DESCRIPTION OF CHANGE	COST OF CHANGE	TOTAL COST
D-1467-53	30 Oct 52	Orig Const	2,365.00	2,365.00

CATEGORY CODE	DESIGNATION	FACILITY NO.
842 40	Elct Eqp Fac	27110

Form 2877 Real Property Record for Property 27110

HCPI Continuation Sheet

Historic Preservation Office, New Mexico Department of Cultural Affairs



Location Map

APPENDIX F: IDENTIFYING AND EVALUATING PROPERTIES

The following procedures are applicable to all survey and/or evaluation work plans conducted under a Section 106/NEPA Review--or a general Section 110 project as appropriate. And will be applicable throughout the term of the PA. Work plans will describe the scope of work (including the boundaries of the survey area, acreage or numbers of buildings and structures to be inventoried), the methods to be used, and the expected output (or deliverables). All work will be conducted by or under the supervision of a professional who meets the minimum standards as identified in the Professional Qualifications as appropriate for the historic property being addressed and must be consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716).

I. Historic Buildings, Objects, Structures, and District Surveys

A. Policy: WSMR shall obtain accurate, descriptive field data of all buildings, objects, structures, and districts, not previously surveyed.

B. Procedure

1. At a minimum the following information shall be collected in a survey of the built environment:

a) Building Number;

b) Year Built;

c) Historic Function;

d) Evaluator/Date of evaluation;

e) Historic code;

f) Historic context;

g) Architectural description; and

h) Photo of the primary façade

2. Completing State HCPI Forms

a) Appropriate state forms shall be completed for each recorded building, object, or structure following the appropriate state guidance.

b) WSMR numbers are assigned by the CRM or CRM Staff.

c) The primary number for any historic property on Fort Bliss is the WSMR number; the appropriate state number is the required secondary number.

d) Maps attached to state forms shall conform to the requirements of the appropriate state.

APPENDIX G: STANDARD MITIGATION MEASURES

If the CRM and/or CRM Staff make a finding of Adverse Effect, WSMR must identify consulting parties, including Tribes, and have considered all comments on this plan to mitigate those adverse effects. Options for mitigating those effects which include avoiding the site or sites by design, data recovery, or some other creative mitigation plan (trade-offs, preservation of another site, development of a new historic context in lieu of data recovery, etc), or other plans as may be developed during consultation.

I. Recordation

A. Digital Photography Package: Prior to project implementation, the CRM and/or CRM Staff shall oversee the successful delivery of a digital photography package prepared by staff or contractors meeting the Professional Qualifications for Architectural History, History, architecture, or Historic Architecture, as appropriate. The digital photography package will meet the standards cited in the NPS' *National Register of Historic Places Photographic Policy March 2010* or subsequent revisions (hllp://www.nps.gov/nr/publ icat ion '/bu I let ins/photopol icy/index .htm).

1. The package shall include a comprehensive collection of photographs of both interior and exterior views showing representative spaces and details of significant architectural features and typical building materials. Exterior photographs shall include full oblique and contextual images of each elevation. Exterior views shall be keyed to a site plan while interior views shall be keyed to a floor plan of the building/structure. The photographs shall be indexed according to the date photographed, site number, site name, site address, direction, frame number, subject matter and photographer's name recorded on the reverse side in pencil.

2. The package shall include printed color copies of the digital photographs (on appropriate paper, per NPS Photographic Policy), a CD/DVD of the digital photographs (per NPS Photographic Policy), the completed appropriate state inventory form, select existing drawings, where available, and a written site history of the historic property.

3. The CRM and/or CRM Staff shall submit the package to the appropriate SHPO for review and approval. Once approved by the appropriate SHPO, the CRM and/or CRM Staff shall submit a copy of the approved documentation to a state or local historical society, archive, and/or library for permanent retention.

II. Historic Property Inventory

A. Per Section I of the agreement, the property will be recorded and reviewed.

B. Efforts may be directed toward the resurvey of previously designated historic properties and/or districts which have undergone change or lack sufficient

documentation, or the survey of new historic properties and/or districts that lack formal designation.

C. The designated responsible party shall use appropriate SHPO standards for the survey of historic properties and appropriate SHPO forms as appropriate.

D. The CRM and/or CRM Staff shall prepare a draft inventory report, according to appropriate SHPO templates and guidelines, and work with the appropriate SHPO until a final property inventory is approved.

E. WSMR shall use staff or contractors that meet the Secretary's Professional Qualifications for the appropriate discipline.

III. Historical Context Statements and Narratives

A. Prior to project implementation, the CRM and/or CRM Staff shall work with the appropriate SHPO to determine the topic and framework of a historic context statement or narrative WSMR shall be responsible for completing.

B. The statement or narrative may focus on an individual historic property type, a set of related properties, or relevant themes as identified in the statewide preservation plan.

C. Once the topic of the historic context statement or narrative has been agreed to, the CRM and/or CRM Staff shall continue to coordinate with the SHPO through the drafting of the document and delivery of a final product.

D. The appropriate SHPO shall have final approval over the end product.

E. WSMR shall use staff or contractors that meet the Secretary's Professional Qualifications for the appropriate discipline.

IV. Geo-References of Historic Maps and Aerial Photographs

A. Prior to project implementation, the CRM and/or CRM Staff shall work with the SHPO to identify the historic maps and/or aerial photographs for scanning and geo-referencing.

B. Once a list of maps and/or aerial photographs have been agreed upon, the designated responsible party shall continue to coordinate with the appropriate SHPO through the scanning and geo-referencing process and shall submit drafts of paper maps and electronic files to the appropriate SHPO for review.

C. The appropriate SHPO shall have final approval on the quality of the documentation provided by WSMR.

D. The final deliverable shall include a paper copy of each scanned image, a geo-referenced copy of each scanned image, and the metadata relating to both the original creation of the paper maps and the digitization process.

V. Public Interpretation

A. Prior to project implementation, the CRM and/or CRM Staff shall work with the appropriate SHPO to design an educational interpretive plan.

B. The plan may include signs, displays, educational pamphlets, websites, workshops and other similar mechanisms to educate the public on historic properties within the local community, state, or region.

C. Once an interpretive plan has been agreed to by the parties, the appropriate SHPO and the CRM and/or CRM Staff shall continue to consult throughout implementation of the plan until all agreed upon actions have been completed by WSMR.

APPENDIX H: LIST OF ACRONYMS AND DEFINITIONS

AAP	Army Alternate Procedures
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
ARMS	Archaeological Resource Management System (New Mexico)
BRL	Ballistic Research Laboratories
CFR	Code of Federal Regulations
CRM	Cultural Resource Manager
DOAMS	Distant Object Attitude Measuring System
DOD	Department of Defense
DOE	Determination of Eligibility
DOVAP	Doppler Velocity and Position System
EOTS	Electro Optical Tracking System
FRP	Facilities Reduction Progam
GORID	Ground Optical Recorder for Intercept Detection
HABS/HAER	Historic American Building Survey/Historic American Engineering Record
HAFB	Holloman Air Force Base
HCP	Historic Preservation Component
HCPI	Historic Cultural Property Inventory (New Mexico)
HPD	Historic Preservation Division (New Mexico)
IGOR	Intercept Ground Optical Recorder
ICRMP	Integrated Cultural Resource Management Plan
INCRMP	Integrated Natural and Cultural Resource Management Plan
IRIG	Inter-Range Instrumentation Group
ITOR	Intercept Target Optical Recorder
LRMP	Legacy Resource Management Program
MOA	Memorandum of Agreement
MIGOR	Modified Intercept Ground Optical Recorder
NAWS	Naval Air Weapons Station, China Lake, California
NEPA	National Environmental Policy Act

NGF	Naval Gun Factory
NHPA	National Historic Preservation Act
NOTS	Naval Ordnance Test Station China Lake, California
NPS	National Park Service
PMOA	Programmatic Memorandums of Agreement
NRHP	National Register of Historic Places
PA	Programmatic Agreement
RDT&E	Research Development Test and Evaluation
ROTI	Recording Optical Tracking Instrument
SHPO	State Historic Preservation Officer
TECOM	Test and Evaluation Command (US ARMY)
TETRA	Terminal Tracking Telescope
THPO	Tribal Historic Preservation Officer
USAF	United States Air Forces
WSMR	White Sands Missile Range
WSPG	White Sands Proving Ground
WWII	World War II

APPENDIX I: GLOSSARY OF TERMS

36 CFR Part 800. The Codified Federal Regulation implementing Section 106 of the NHPA. WSMR Programmatic Agreement for the Management, Operation, and Development of Historic Properties

Adverse effect. Includes but is not limited to the physical destruction, damage, or alteration of part or all of a property's characteristics that contribute to the property's eligibility for inclusion in the NRHP. Adverse effects can also include alteration of a property that is not consistent with the Secretary of the Interior's Standards for Treatment of Historic Properties. Examples include the introduction of elements that are out of character with the property or affect its setting, neglect resulting in deterioration or destruction of the property, and transfer, lease or sale of the property.

Advisory Council on Historic Preservation. Established under Title 11 of the NHPA, as amended. The ACHP is to be afforded a reasonable opportunity to comment with regard to proposed federal, federally licensed, federally permitted, or federally assisted undertakings that may affect properties included in or eligible for inclusion in the NRHP.

Area of potential effect (APE). Geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist there. The APE always includes the actual site of the undertaking, and may include other areas where the undertaking will cause changes in land use, traffic patterns, or other aspects that could affect historic properties.

Assessment of Effect. WSMR shall apply the criteria of adverse effect to historic properties within the APE. WSMR shall consider any previous or known views concerning effects which have been provided by consulting parties and the public. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the historic property's integrity.

Building. A historic property type that represents a resource, such as a house, created principally to shelter any form of human activity.

Consulting Parties. Those individuals and organizations concerned with the effects of a particular undertaking on historic properties. May include, but not limited to SHPO, ACHP, tribes, preservation groups, etc.

NRHP Criteria. The general standard by which the significance of a historic property is judged.

Cultural Resources Manager. The CRM is the DPW Conservation Branch Chief that meets qualifications as outlined by the Professional Qualifications and designated by the GC. The CRM is the expert in cultural resources and the administrator of the INCRMP and this PA. The CRM acts on behalf of the GC to coordinate compliance with this PA.

Days. In all instances of time periods for actions, "days" is intended to mean "calendar days" unless otherwise noted.

Design. A quality of integrity applied to the elements that create the physical form, plan, space, structure, and style of a property.

Determination of eligibility. The process of ascertaining a property's eligibility for listing on the NRHP. A property eligible for the NRHP but not actually listed or formally determined eligible by the Secretary of the Interior is afforded the same protection under Section 106 as a listed historic property.

District. A historic property type that represents a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.

Evaluation. Process by which the significance and integrity of a historic property are judged for eligibility for the NRHP.

Geographic Information System. A computer system capable of capturing, storing, analyzing, and displaying geographically referenced information; that is, data identified according to location. Practitioners also define a Geographic Information System (GIS) as including the procedures, operating personnel, and spatial data that go into the system (from US Geological Survey web site).

Historic American Buildings Survey. A program administered by the NPS to record in detail historic buildings through architectural rendering, large format photography, and written documentation.

Historic American Engineering Record. A program administered by the NPS to record in detail historic structures through engineering drawings, large format photography, and written documentation.

Historic context. An organizing structure for interpreting history that groups information about historic properties that share a common theme, common geographical location, and common time period. The development of historic contexts is a foundation for decisions about the planning, identification, evaluation, registration, and treatment of historic properties, based upon comparative significance.

Historic Cultural Properties Inventory. A form used by the State of New Mexico to record historic properties.

Historic property. Any prehistoric or historic district, site, building, structure, object, or traditional cultural property included in, or eligible for inclusion in the NRHP. The term includes artifacts, records, and remains related to and located in such properties.

Integrated Cultural Resources Management Plan (ICRMP) and **Integrated Natural and Cultural Resources Management Plan (INCRMP).** A required Department of Defense planning tool for compliance with statutory management requirements.

Integrity. Authenticity of a property's historic identity, evidenced by the survival of physical characteristic(s) that existed during the property's historic or prehistoric period. Integrity consists of seven elements: location, design, setting, materials, workmanship, feeling, and association.

Keeper. National Park Service (NPS) employ responsible for the NRHP program.

Location. A quality of integrity retained by a historic property existing in the same place as it did during its period of significance.

Memorandum of Agreement (MOA). A formal Section 106 document that outlines an agreement made among individuals, groups, or entities, used to cooperatively work together on an agreed purpose or meet an agreed objective.

Mitigate. Reduce harm to historic properties.

National Register of Historic Places (NRHP). A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture.

National Environmental Policy Act (NEPA). A United State environmental law establishing a national policy promoting the enhancement of the environment and setting up procedures for all federal agencies in which to consider the effects of their proposed actions on the environment.

Object: A historic property type that represents a construction primarily artistic in nature or relatively small in scale and simply constructed, such as a statue or milepost.

Period of significance. Span of time in which a property attained the significance for which it meets the NRHP.

Programmatic Agreement (PA). A Section 106 agreement document that records the terms and conditions agreed upon to resolve potential adverse effects, typically developed for a large or complex project or a class of undertakings that would otherwise require numerous individual requests for ACHP comments under the NHPA.

Proponent. The organization with technical and administrative control over the execution of a project or training exercise; e.g., the DPW acts as the user's agent for construction activity and is the implementing organization for those projects.

Section 106 process. A review process established under NHPA Section 106 and administered by the ACHP under its regulations. During this process, agencies afford the ACHP an opportunity to comment on any agency activity or undertaking that may affect historic properties, and must take such comments into account.

Section 110. The section of the NHPA that defines federal agencies' responsibilities to preserve and use historic buildings and to establish a program to identify, evaluate and nominate historic properties to the NRHP.

Site. A historic property type representing a location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archeological value regardless of the value of any existing structure.

State Historic Preservation Officer (SHPO). A position created under the NHPA. The SHPO is appointed by the governor and charged with the administration of the NHPA and to ensure that the state's interests are considered.

Structure. A historic property type representing a functional construction made for purposes other than creating shelter, such as a bridge.

Transect Recording Unit. A 15 m by 15 m unit or "cell", part of a larger, virtual grid placed over an archeological survey area, in which all cultural materials are recorded, usually by means of a hand-held computer, for later projection and use in a GIS.

Undertaking. Under this PA, an undertaking is defined as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency including those carried out by or on behalf of the Army; those carried out in whole or in part with Army funds, and those requiring Army approval--from 36 CFR § 800.16(y).