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Cultural Resource Report TR117
Division of Earth and Ecosystem Sciences
Desert Research Institute
Las Vegas, Nevada

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Cover Illustration: Aerial overview of Test Cell C facing southeast (RSL 2000). Although several buildings and structures have been removed since this photo was taken, the complex as a whole still retains much the same appearance.

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CULTURAL RESOURCES REPORT TR-117
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An Architectural Survey of the Test Cell C Historic District, Area 25, Nevada National Security Site, Nye County, Nevada

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Prepared for

U.S. Department of Energy
National Nuclear Security Administration
Nevada Field Office, Las Vegas, Nevada

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August 2019

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SUMMARY

The U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office (NNSA/NFO) has authorized an updated recording and evaluation of Test Cell C—which is part of the former Nuclear Rocket Development Station (NRDS) in Area 25 of the Nevada National Security Site (NNSS) in Nye County, Nevada (formerly the Nevada Test Site [NTS])—to meet current and future National Weapons Science, Global and Homeland Security Programs, and Environmental Management mission requirements. This work was done to comply with requirements of Section 106 of the National Historic Preservation Act and its implementing regulations, 36 C.F.R. Part 800.

An architectural survey of 35.75 acres was completed by Desert Research Institute (DRI). This area also represents the potential Test Cell C Historic District and is identified by NNSA/NFO as the Area of Potential Effect (APE) within which the undertaking may directly cause alterations to the character of historic properties. One resource within this area, Building 25-3210 (State Historic Preservation Office [SHPO] Resource No. B2444), was previously surveyed by DRI (Drollinger, Goldenberg, and Beck 2000a). It was found eligible for inclusion in the National Register of Historic Places (NRHP or National Register) under Criteria A and C, and Consideration G. Mitigation of this building was completed prior to its demolition. The APE for reasonably foreseeable effects that may indirectly cause alterations later in time, be farther removed in distance, or be cumulative is the unrecorded NRDS historic district.

The present survey updates the previous survey to present standards and expands it to include the entire Test Cell C complex. This includes updated recording and evaluation of the remains of 25-3210 and its 32 previously unrecorded and unevaluated Accessory Resources. The entire complex was recorded as the Test Cell C Historic District (SHPO Resource No. D346), which is eligible for the National Register at the National Level under Criteria A, C, and D. All nine architectural resources in the district are recommended as contributing elements of the Test Cell C Historic District. Of these, four (25-3210 SHPO Resource No. B2444, 25-3220 SHPO Resource No. B18110, 25-3226 SHPO Resource No. B18111, and 25-3230-32 SHPO Resource No. B18114) are recommended as individually eligible to the National Register under Criteria A and C, and one (KIWI-TNT [Transient Nuclear Test] SHPO Resource No. S2287) is recommended as individually eligible under Criteria A, C, and D. The remaining four resources (25-3214 SHPO Resource No. B18109, 25-3228 SHPO B18112, 25-3229 SHPO Resource No. B18113, and 25-3233 SHPO Resource No. B18115) are not recommended as individually eligible. In addition, the Test Cell C Historic District is regarded as a contributor to the potential national significance of the NRDS Historic District.

ACKNOWLEDGEMENTS

This project was completed by staff at Desert Research Institute (DRI). Most architectural descriptions and the major portion of this report were completed by Ron Reno, PhD, RPA, who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural Historian, Historian, and Archaeologist. Reno also has direct knowledge of the NNSS during the Cold War from working there through most of the 1980s as an archaeologist with DRI. Historical research, context preparation, and much of the evaluation section were completed by archaeologist Susan Edwards. High-resolution digital photographs were taken by Edwards and archaeologist Jeffrey Wedding. Some administrative portions of the report were written by Project Director Maureen King. Photo logs were compiled by Wedding. Archaeologist Cheryl Collins compiled the ARA forms and the final report. Archaeologist Harold Drollinger contributed his long-term experience with Test Cell C, along with documents and photographs he had accumulated. Collins produced the maps and new drawings for the project. Nicole Damon provided technical editing assistance.

We also benefitted from the survey conducted in 2000 of Building 25-3210 by Nancy G. Goldenberg (Carey & Company Architecture), Colleen M. Beck, and Harold Drollinger and from the series of black and white photographs of portions of the facility taken by the Remote Sensing Laboratory (RSL) as part of the mitigation effort.

Tiffany Gamero, Industrial Sites and Long-Term Monitoring Lead for Environmental Management, Nevada Program and Carrie Stewart, National Environmental Policy Act Compliance Officer for the NNSA/NFO, served as the program managers overseeing this project. Reed Poderis, Environmental Restoration Program Manager with Mission Support and Test Services (MSTS), coordinated site access and logistics. Poderis and Alissa Silvas of MSTS provided a detailed project description. Kevin Wilcox and Dan Sturman of MSTS ensured timely access to the Test Cell C facility, making certain the necessary gates and doors were open to allow DRI personnel to explore and document the building's interior. Additional support from MSTS was provided by Brian Foskett and Al Kjos. Ben W. McGee, Senior Scientist with MSTS, shared his extensive knowledge of Test Cell C, which included touring the facility with the field crew. Martha DeMarre, Nuclear Testing Archive Manager with MSTS, provided access to many of the historic documents and engineering drawings essential for this report.

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I. INTRODUCTION

The U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office (NNSA/NFO) has authorized an updated recording and evaluation of Test Cell C. This facility is part of the former Nuclear Rocket Development Station (NRDS) in Area 25 of Nevada National Security Site (NNSS) in Nye County, Nevada (formerly the Nevada Test Site [NTS]) (Figure 1). Future alterations to the facility are anticipated to meet current and future National Weapons Science, Global and Homeland Security Programs, and Environmental Management mission requirements. Therefore, this survey was done to comply with requirements of Section 106 of the National Historic Preservation Act and its implementing regulations, 36 C.F.R. Part 800.

An architectural survey of 35.75 acres was completed by Desert Research Institute (DRI). This area also represents the potential Test Cell C Historic District and is identified by NNSA/NFO as the Area of Potential Effect (APE) within which the undertaking may directly cause alterations to the character of historic properties. One resource, Building 25-3210 (SHPO Resource No. B2444), within this area was previously surveyed by DRI (Drollinger, Goldenberg and Beck 2000a). It was found eligible for inclusion in the National Register of Historic Places (NRHP or National Register) under Criteria A and C, and Consideration G. Mitigation of this building was completed prior to its demolition. The APE for reasonably foreseeable effects that may indirectly cause alterations later in time, be farther removed in distance, or be cumulative is the unrecorded NRDS historic district.

The present survey updates the previous survey to present standards and expands it to include the entire Test Cell C complex. This includes updated recording and evaluation of the remains of 25-3210 and its 32 previously unrecorded and unevaluated Accessory Resources. The entire complex was recorded as the Test Cell C Historic District (SHPO Resource No. D346), which is eligible for the National Register at the National Level under Criteria A, C, and D. All nine architectural resources in the district are recommended as contributing elements of the Test Cell C Historic District (Figure 2). Of these, four (25-3210 Resource No. B2444, 25-3220 SHPO Resource No. B18110, 25-3226 SHPO Resource No. B18111, and 25-3230-32 SHPO Resource No. B18114) are recommended as individually eligible to the National Register under Criteria A and C, and one (KIWI-TNT [Transient Nuclear Test] SHPO Resource No. S2287) is recommended as individually eligible under Criteria A, C, and D. The remaining four resources (25-3214 SHPO Resource No. B18109, 25-3228 SHPO Resource No. B18112, 25-3229 SHPO Resource No. B18113, and 25-3233 SHPO Resource No. 18115) are not recommended as individually eligible. In addition, the Test Cell C Historic District is regarded as a contributor to the potential national significance of the NRDS Historic District.

In 2010, the NTS became the NNSS. Because of the nature of the discussion in the Historic Context below, "NTS" is used throughout that section, otherwise "NNSS" is used to refer to the site. The survey area is located in unplatted sections of T13S R51E Mount Diablo Baseline and Meridian (projected) in Area 25 of the NNSS. It is within the NRDS in Jackass Flats, which has long been recognized as a potential historic district (Figure 3). An oblique aerial photo of the Test Cell C complex is shown on the cover of this report.

II. RESEARCH DESIGN

Objectives

This historic resource project was undertaken to comply with requirements of Section 106 of the National Historic Preservation Act of 1966, as amended. During 2000, the primary Test Cell C building within the Test Cell C facility, Building 25-3210 (SHPO Resource No. B2444), was recorded (Drollinger, Goldenberg, and Beck 2000a) and determined eligible for inclusion in the NRHP. Mitigation of the building was completed prior to demolition in 2011. The present survey updates the previous survey to present standards and expands the effort to include the entire Test Cell C complex, which is considered the potential Test Cell C Historic District (D346).

Project Description

The remaining structures and buildings at Test Cell C are described in the *Federal Facility Agreement and Consent Order* (FFACO) as Correction Action Unit (CAU) 572. These include:

Four dewars and associated piping (B18114 AR-3213 A&B, B2444 AR-3218 A&B);

Structure 25-3203, Cooling Tower (B18110 AR-3203);

Structure 25-3207, Borated Water Tank (B18110 AR-3207);

Structure 25-3208, Elevated Water Tank (B18110 AR-3208);

Building 25-3220, Equipment Building (B18110);

Building 25-3230, Motor Drive Building (B18114);

Building 25-3231, Pump House (B18114);

Building 25-3232, Cryogenic Evaluation Lab (B18114);

Nuclear Rocket Development Station (NRDS) #4 Substation (B18115 AR-3215); and others.

The primary Test Cell C building (Building 25-3210), the attached concrete shield wall, the Moveable Shed (Building 25-3211), and the Nuclear Furnace Piping were previously demolished under CAU 116. Demolition of Building 25-3211 and the nuclear furnace piping and tanks was completed in 2009. Prior to demolition of Building 25-3210, all remaining pipe ends, floor drains, and other openings in the basement were sealed with grout. Building 25-3210 and the attached concrete shield wall were demolished in 2011. Approximately 1,350 cubic meters of radioactive and polychlorinated biphenyl (PCB)-impacted debris were placed in the basement of Building 25-3210. A minimum of 1 foot of grout/concrete was placed over the basement. Remaining debris was packaged and disposed. Due to radiological activation of the reactor pad and remaining radiological and PCB-impacted debris entombed in the basement of Building 25-3210, a FFACO use restriction (UR) was established. The UR includes the original portion of the concrete reactor pad north of Building 25-3210 and the basement of Building 25-3210.

The U.S. Department of Energy, Environmental Management Nevada Program (EM NV) anticipates an environmental restoration project for disposal of all wastes and demolition of Test Cell C buildings and structures as part of a FFACO closure action. While there is not an approved closure plan for CAU 572 at this time, the expected remediation and demolition activities would include the following:

- Draining equipment and piping of residual fluids;
- Collecting waste characterization samples (asbestos and drained fluids) and performing radiological surveys for waste determination;
- Removing equipment, waste, and material from the buildings and yard, including, but not limited to, the following:
    - Asbestos-containing material (e.g., wall panels, pipe/electrical insulation, mastic sealant, ceiling and floor tiles)
    - Total petroleum hydrocarbon-impacted soil
    - PCB-containing ballasts and soil
    - Excess chemicals
    - High-efficiency particulate air filters
    - Fluorescent light bulbs, mercury vapor lights, and sodium vapor lights
    - Freon
    - Radiological check sources
    - Lead-containing fuses, lead-acid batteries, lead-glass windows, and lead solids/shielding
    - Mercury-containing items
    - Circuit boards
    - Mineral oil
    - Diesel fuel
    - Compressor, gear, hydraulic, and motor oils;
- Grouting floor drains;
- Demolishing all buildings and support structures (e.g., sheds, trailers, storage tanks) within the fenced compound using mechanical methods; and
- Disposing of waste (majority would be disposed as low-level waste).

Survey Methods

Methods used in this survey were designed to comply with *Instructions for the Architectural Resource Assessment Form* (SHPO 2017), as revised.

The specific history of the resources was researched using the extensive archive of NNSS materials at DRI. Desert Research Institute also maintains files of all cultural resource reports related to the NNSS. In addition, Harold Drollinger contributed his personal archive of documents and research aids accumulated through many years of researching Area 25 and surrounding areas. Drawings were acquired from the NNSS Engineering Records Library. A representative sample of the multitude of available drawings was recovered from that facility, and a selection was made of those with sufficient informational content to warrant detailed examination. Reynolds Electrical and Engineering Company (REECo) photographs were obtained from the Nuclear Testing Archive, and other historical photographs were obtained from the Remote Sensing Laboratory (RSL). In addition, an extensive online search of the facility and the programs that made use of it was conducted. Local libraries and interlibrary loan requests were used to acquire monographs on specific aspects of the nuclear rocket propulsion programs and key individuals associated with space technology and policy. An author's extensive personal library of southern Nevada economic and social history, the development of the United States space program and policy, nuclear testing, and the peaceful applications of nuclear energy was used to bolster the context. Aerospace trade journals from the 1950s and 1960s, along with the corporate reports of the private industry participants in the Rover and Nuclear Engine for Rocket Vehicle Application (NERVA) programs and the NRDS building contractors were reviewed. A selection of maps, aerial photos, and drawings is included in this report. All are unclassified.

Architectural recording was conducted by Ron Reno under the direction of Maureen King in January 22 to 24, 2019. High-resolution digital color photography of exteriors, interiors, and context was done by Susan Edwards and Jeffrey Wedding at the same time. The entire 35.75-acre APE for potential direct alterations to historic properties was inspected closely enough that it is unlikely that any architectural buildings or structures escaped notice. Resources within the portion of the APE for possible indirect alterations (the unrecorded NRDS Historic District) were identified based on archival research (see below - Previous Research).

Buildings and major structures are identified on the NNSS by numbers with the Area 25 prefix. This number was used as the field identifier for both Principal Resources and for any Accessory Resources that have an NNSS building number. These numbers are tied to all existing documentation regarding the resources. This building number is the equivalent of an assessor's parcel number in this regard.

Our recording and evaluation of Building 25-3210 is an update of the two reports produced by Drollinger, Beck, and Goldenberg (2000a) and Drollinger, Goldenberg, and Beck (2000a). In addition, this report provides documentation of all Principal and Accessory Resources in the historic district. Appendix A contains a list of the tests that occurred at the Test Cell C facility during its operation. The 2000 site form and Historic Properties Inventory form for Building 25-3210 are attached as Appendix B. The District and Architectural Resource Assessment forms documenting our present work are in Appendix C.

Previous Research

Table 1 presents the previous cultural resources projects in Area 25 associated with the Rover program. Nine historic properties have been documented, considered eligible to the NRHP, and adverse effects from the Decontamination and Decommissioning program have been mitigated for four of them by way of Historic American Engineering Record (HAER) documents submitted to the National Park Service. The HAER for the Engine Maintenance, Assembly, and Disassembly (E-MAD) facility was for the removal of equipment. Other facilities in Area 25 contemporary with Test Cell C—such as Engine Test Stand-1 (ETS-1), the Reactor Control Point, and the Support Area—have not been recorded.

Table 1. Historic Properties Associated with the Area 25 Rover Program.

Historic Property	DRI Report No.	Purpose
R-MAD* Facility	SR022900-1 HAER Nv-29-A	Historical Evaluation Historic American Engineering Record
Jr. Hot Cell	SR032095-1	Historical Evaluation
E-MAD Facility	SR082696-1 HAER Nv-25	Historical Evaluation Historic American Engineering Record
Test Cell A	SR021400-1 HAER Nv-33	Historical Evaluation Historic American Engineering Record
Test Cell C	SR021500-1 HAER Nv-30-A	Historical Evaluation Historic American Engineering Record
Railroad Transport System	SR070799-1	Historical Evaluation
L-2 Locomotive	HE072710-1	Historical Evaluation
RMSF*	SR052003-1	Historical Evaluation
Jackass and Western Railroad	HE072610-1	Historical Evaluation

*See the following paragraph for acronym definitions.

In Area 25 (originally Area 400), nine historic properties in the NRDS have been determined eligible to the NRHP for their role in the development and testing of nuclear reactors and engines as part of the Rover program for nuclear-powered rockets in the United States space program and in the national defense strategy of the United States during the Cold War. These include the Reactor Maintenance, Assembly, and Disassembly (R-MAD) facility (Drollinger, Beck, and Goldenberg 2000b; Drollinger, Goldenberg, and Beck 2000b); Jr. Hot Cell (Beck et al. 1995); E- MAD (Beck et al. 1996; Drollinger et al. 1997); Test Cell A (Beck et al. 2000, 2001); Test Cell C (Drollinger, Beck, and Goldenberg 2000a; Drollinger, Goldenberg, and Beck 2000a); the Railroad Transport System (RTS) (Drollinger 1999); the L-2 locomotive (Jones and Drollinger 2010); the Radioactive Material Storage Facility (RMSF) (Drollinger 2003); and the Jackass and Western Railroad (Drollinger 2012). Other major facilities at the NRDS are the ETS-1 facility, the Reactor Control Point complex, and the Support Area complex.

The R-MAD facility, site 26NY9277, was used for the assembly and disassembly of nuclear reactors on railroad cars tested at the NRDS (Drollinger, Beck, and Goldenberg 2000b; Drollinger, Goldenberg, and Beck 2000b). The facility encompassed approximately 53 acres. The main R-MAD building, constructed in 1958, was a multi-room, concrete and metal building with approximately 61,290 square feet of floor space. The "Beetle," a remote-controlled, self-propelled machine built by General Electric, was also housed at the R-MAD facility and was used for handling exposed radioactive equipment associated with the reactor tests. Operating from 1958 to 1973, the Kiwi, Phoebus, NRX (National Research Experimental), and Peewee test reactors were assembled and disassembled at the R-MAD facility. The Tory II-C reactor from the Pluto program was also stored here before it was transported to the E-MAD facility for disassembly. In the late 1970s and early 1980s, the Ballistic Missile Office of the U.S. Air Force used the R-MAD facility for the MX Canister Assembly and Test Launch Program. The R-MAD facility was demolished as part of the Decontamination and Decommissioning program. All that remains of this facility is a metal tower used in the MX experiments and the shop behind the main R-MAD building, which was possibly used as a warehouse or a paint shop.

Jr. Hot Cell, site 26NY9277, is a contributing structure to the R-MAD facility. It was a relatively small hot cell located south of the main building that was used to prepare samples following the nuclear reactor tests (Beck et al. 1995). It was a simple building made of corrugated galvanized metal, and it was dismantled as part of the Decontamination and Decommissioning program.

Test Cell A, site 26NY11260, was the first nuclear reactor testing facility for nuclear rockets in the United States and probably the world (Beck et al. 2000, 2001). It served as the proving ground to test nuclear reactors and determine their viability to power rockets in space. Because of constant design changes in the reactor, as well as in the facility itself through time, the subsequent testing facilities, Test Cell C and ETS-1, benefitted from the knowledge gained from Test Cell A. Constructed in 1958 and in operation until 1966, the Test Cell A facility encompassed 18.4 acres and included various buildings and structures. The key component was the test cell, which was a one-story building with a partial second story and two additions, totaling 4,390 square feet of floor space. The east wall was the most distinctive characteristic. It was made of reinforced concrete and 19 feet, 8 inches high and 4 feet, 7 inches thick to shield the interior from the reactors placed against the exterior surface for testing. The reactors were assembled and mounted on special train cars at the R-MAD facility and transported by rail to the test cell. At least 90 reactor and system tests were conducted at Test Cell A, including Kiwi A, Kiwi B, Cold Flow, NRX A4 EST, and NRX A5. The test cell and other buildings have been demolished.

Test Cell C, site 26NY11258, was constructed in 1961 and covered approximately 23 acres. Larger and more powerful nuclear reactor tests were conducted at this site than at the Test Cell A facility (Drollinger, Beck, and Goldenberg 2000a; Drollinger, Goldenberg, and Beck 2000a). The focus of the earlier short report and subsequent HAER was only the main test cell. The other parts of the facility (e.g., dewars, buildings, and other structures) were not recorded or included in those two documents. These components are the focus of the current architectural survey and are discussed in detail in the report sections below.

The E-MAD facility, site 26NY10127, has one of the largest hot cells in the world for working with radioactive material (Beck et al. 1996; Drollinger et al. 1997). The E-MAD building is a large, multi-room, concrete and metal structure with approximately 75,000 square feet of floor space. A later version of the R-MAD facility, the E-MAD building was constructed in 1965 principally for assembling and disassembling the more advanced nuclear rocket engines. During the late 1970s and early 1980s, the E-MAD facility was used in a program for handling and packaging spent fuel and for modeling the scenario of spent fuel at reactor sites (Baird 1996). Spent fuel assemblies packaged at the E-MAD facility were used in the Climax Spent Fuel Test in Area 15 of the NNSS. The HAER for this facility was developed in response to the planned removal of manipulator arms from workstations along the hot bay for post-test dismantling of test engines. The arms were sent to Los Alamos National Laboratory to be reused. Although discussed, the building and accessory buildings and structures were not part of the HAER, which only included photographs of the arms. DRI produced a revised architectural survey documenting the condition of the E-MAD facility as of early 2019 (Reno et al. 2019).

The Railroad Transport System was specifically designed for the NRDS and consisted of two modified train engines and a flatcar for conveying and emplacing nuclear reactors and engines (Drollinger 1999). The three components of the Railroad Transport System included a manned control car, a prime mover engine, and the engine installation vehicle. It was also used in the late 1970s to transport and emplace nuclear fuel assemblies in dry holes at the E-MAD facility for studying procedures on the handling and storing of high-level radioactive materials as part of the Climax Spent Fuel Test conducted in Area 15. The prime mover engine was donated to the Boulder City Railroad Museum in southern Nevada in 2006. The two other vehicles are still at the E-MAD facility.

Another important train engine, the L-2 locomotive, was the General Electric 25 ton, 150 horse power (hp) switcher engine used for moving light loads because it was able to access tracks that could not support the weight of heavier engines (Jones and Drollinger 2010). It was manufactured in 1943 as part of the Jackass and Western Railroad. The L-2 locomotive was used as a general purpose engine that assisted in transporting nuclear test vehicles and other equipment between the NRDS facilities. It was also used in the spent fuel test program at the E-MAD facility. The L-2 engine was donated to the Boulder City Railroad Museum in southern Nevada.

The Radioactive Material Storage Facility (RMSF), site 26NY11769, was constructed in 1964 and 1965, and it was centrally located between the E-MAD facility, Test Cell C, and ETS-1 (Drollinger

2003). The facility was used for the surface storage of both nuclear fuel and non-nuclear hardware from the disassembly of nuclear reactors and engines after they were tested. It is a second-generation facility for handling radioactive material; an earlier facility was located next to the R-MAD facility. The RMSF was in operation from ca. 1964 to the end of the NRDS program in 1973. The facility is a 142-acre plot of land enclosed by two sets of wire fencing, with the interior fence designating a higher level of security. Penetrating the two fences are a single-track rail line and a road adjacent to the rail line. Access to the facility is through separate locked gates, one for ground vehicles (cars, trucks) and a second for the rail line. Within the inner fence, the rail line branches into seven spurs, with the last two spurs leading to concrete bunkers. The main purpose of the spurs and bunkers was to park flatcars loaded with nuclear fuel elements in containers having neutron absorbers and reactor components. Still operating as a storage facility, the RMSF currently houses seven test cars, nine flatcars, two engines, and one dump car.

The Jackass and Western Railroad, site 26NY14637, served to efficiently transport test reactors and engines and other equipment among the NRDS testing facilities. Specifically, nuclear test reactors and engines were assembled on special train cars at the R-MAD and E-MAD facilities, and then moved by rail to the test cells. The test vehicles were returned by rail after testing to these same facilities for disassembly to observe the results. The railroad, started in 1957 and completed in 1965, was officially registered and has approximately nine miles of track, which represents possibly the shortest franchised line in the western United States.

Current National Register Eligibility

Test Cell C is one of nine historic properties in the NRDS that have been determined eligible to the NRHP for their role in the development and testing of nuclear reactors and engines as part of the Rover program for nuclear-powered rockets in the U.S. space program and in the national defense strategy of the United States during the Cold War. The NRDS is described in more detail in the Historic Context section below.

Building 25-3210 at Test Cell C was recorded and evaluated as contributing to the National Register under Criteria A and C by Drollinger, Goldenberg, and Beck 2000a and in the associated Historic Property Inventory Form. A HAER document (Drollinger, Beck, and Goldenberg 2000a) was submitted to the National Park Service as a mitigation measure for removal of the building. It did not cover any of the many surrounding resources.

The main rail line, site 26NY14637, was recorded and recommended as eligible to the National Register under Criterion A (Drollinger 2012). This site does not include spurs to various facilities, such as those found at Test Cell C.

III. HISTORIC CONTEXT

Setting

Test Cell C is located on the NRDS, which occupies much of Jackass Flats. It is in Area 25, near the southwest corner of the NNSS (Figures 1 and 3). It is near the north edge the southwest-trending floor of the valley, on the bajada of the Calico Hills to the north. Test Cell C is immediately east of Topopah Wash, which is dry except during flash floods like all drainages in the area. It is at an elevation of 3,820 feet and is surrounded by the sparse vegetation of a creosote-bursage plant community. The bajada surface in the vicinity of Test Cell C is fairly flat and composed of fairly sandy sediments with abundant gravel and small cobbles, which were easily bladed into cut-and-fill terraces for buildings and parking areas. A low pass to Mid Valley and Lookout Peak form the northeast border of Jackass Flats, and Little Skull Mountain forms the southern boundary. A paved road runs eastward along the base of Little Skull Mountain toward Frenchman Flat. The main access road passes over the mountain itself toward Mercury, which is the primary base at the NNSS. Fortymile Canyon forms the western boundary of the NRDS and Yucca Mountain occupies the entire western skyline beyond. Jackass Flats opens out into the Amargosa Desert to the southwest. An access road follows this route to Lathrop Wells.

Background

Nuclear Testing

Nuclear testing has been a major and important part of the history of Nevada and the United States (Tlachac 1991a, 1991b). Much of this activity revolved around the NNSS (formerly known as the NTS), where most of the developments and experiments in nuclear weapons were actually tested, both above- and belowground. Main highlights and key historic facilities and sites of the NNSS include the town of Mercury, Camp Desert Rock, the Experimental Farm, Doom Town, Japanese Village, Area 12 Support Facility, the Control Point, Area 5 atmospheric testing structures, Yucca Flat subsurface testing, and the NRDS (Tlachac 1991b). The consequences of this activity have been felt worldwide, and most notably, played a vital role in the national defense of our country and helped shape world politics.

Renamed the NNSS in 2010 to better reflect its current mission, the site continues to support the stewardship of the nation's nuclear deterrent, as well as provide nuclear and radiological emergency response capabilities and training; contribute to key nonproliferation and arms control initiatives; and execute national-level experiments in support of the National Laboratories (NNSA 2018). For clarity in the following discussion of the Cold War historical context, the designation NTS will be retained because it was the name used during most of the Cold War.

The history of the NTS begins in the late 1940s, when a search was conducted to establish a test site in the continental United States that was remote from major population centers but near the nuclear research laboratories, particularly the lab in Los Alamos, New Mexico (Fehner and Gosling 2006;

Titus 1986:55-57). The main reasons for this were security, safety, shorter travel times between the test area and the labs, and the economic costs of transporting people and equipment between the proving ground and various facilities (Hacker 1994:40-43; Lay 1950; Ogle 1985:44; Tlachac 1991a). At the time, testing was conducted at the Pacific Proving Grounds and was enormously expensive in both costs and time. In addition, security of the Pacific locale was a major concern because it was outside the confines of the United States. The ideal location would need to have favorable and predictable weather and terrain to accommodate year-round testing, have a low population because of radiological concerns, be under federal control, have basic infrastructure in place or nearby, and be in reasonable proximity to the Los Alamos laboratory (Hacker 1994:42; Lay 1950; Tlachac 1991a). The best place that satisfied these conditions was in southern Nevada.

Final selection of a continental testing location stalled until the onset of the Korean War finally propelled the issue forward. President Truman formally designated the desert land surrounding southern Nevada's Frenchman and Yucca Flats as the location for nuclear weapons tests within the United States on December 18, 1950 (Fehner and Gosling 2000:48-52). The first land withdrawal by the AEC establishing an official testing ground in the United States for nuclear weapons in Nevada was on February 12, 1952, under Public Land Order 805. Subsequent parcels were obtained under Public Land Orders 2568 and 3759 and by a Memorandum of Agreement between the U.S. Air Force and the AEC. The memorandum was superseded by a second one in 1982 between the Air Force and the U.S. Department of Energy, Nevada Operations Office (DOE NOO). Today, the NNSS encompasses an area of 1,375 square miles (3,561 square kilometers).

Although land for the NTS was not officially withdrawn from the Las Vegas Bombing and Gunnery Range until 1952, construction of the facilities for the soon-to-be Nevada Proving Grounds began in 1951. The first nuclear weapon test at the new facility was carried out in Frenchman Flat on January 27, 1951 (Ogle 1985:43-44; Titus 1986:58). Between 1951 and 1958, numerous atmospheric nuclear weapons tests were conducted in Yucca and Frenchman Flats on the NTS.

Both the United States and the former Soviet Union ceased nuclear testing in 1958 by self-imposed moratoriums at the urging of internal and external forces (Ogle 1985:30-31). However, by 1961, both superpowers were once again conducting tests. Except for a few surface and near-surface tests, most of the tests after the moratorium were placed underground. After ratification of the Limited Test Ban Treaty among the Unites States, the Soviet Union, and Great Britain in 1963, all tests were underground (Friesen 1995:6). Underground tests on the NTS between 1963 and 1992 would be conducted in either shafts or tunnels on Yucca and Frenchman Flats, around Shoshone Mountain, and on Buckboard, Pahute, and Rainier Mesas. A second moratorium on nuclear testing was established in 1992 and no nuclear tests have been conducted by the United States since that date. A total of 928 nuclear tests were conducted on the NTS, with 119 performed in the 1950s and 809 after testing recommenced in 1961 (NNSA/NFO 2015; Friesen 1995:6, 10).

Atoms for Peace

Well before Eisenhower made his famous "Atoms for Peace" address to the United Nations General Assembly in December 1953, scientists had been exploring the various applications of nuclear science and radioactive materials for non-military purposes (Creager 2013). Until the late 1930s and the outbreak of war in Europe, virtually all of the research efforts had been for peaceful objectives—from Rontgen's discovery of X-rays in 1895 to early efforts using radioisotopes in medicine and industry (Creager 2013; Hacker 1994; Mahaffey 2009). With the end of World War II, many researchers looked beyond the weaponization of the atom seeking new, non-destructive applications, such as the use of fissionable material to generate electricity, ensure food safety by irradiating bacteria, and provide more advanced medical treatments and diagnostics using radioactive isotopes.

Although established as a nuclear weapons proving ground, several programs that promoted the peaceful use of the atom would find a research home at the NTS in the 1950s and 1960s. These included the Plowshare Program, which was a study of nuclear explosive excavation applications for massive construction and mineral extraction projects; Operations BREN and HENRE, which were dosimetry experiments conducted to aid in monitoring the health of the atomic bomb survivors, military personnel, and the nuclear industry workforce; and the Pluto and Rover programs, which included the design and testing of nuclear reactors to power aircraft and rockets destined for space (Beck et al. 2011; Edwards and Goldenberg 2007, 2012; Fehner and Gosling 2000).

Nuclear Powered Rockets

> *There can be no thought of finishing, for aiming at the stars, both literally and figuratively, is the work of generations, but no matter how much progress one makes there is always the thrill of just beginning.* Robert H. Goddard in a letter to H.G. Wells (April 1932) (Crouch 1999:20).

Whether articulated or not, that may have captured the sentiments of a great many people as they began work on the Rover project in late 1955. Those already involved in rocketry development had focused their efforts on missiles and rockets for exclusively military purposes, but now they would be striving to create a means of traveling to the moon and beyond for space exploration as well.

The concept of nuclear propelled spacecraft was not completely foreign. As James Dewar (2004:1-2) notes in his seminal work *To the End of the Solar System*, Robert H. Goddard envisioned the use of atomic power for space travel decades before the notion of an atomic bomb had captured the interest and angst of scientists in the late 1930s. It may have been the discovery of radium at the dawn of the century that inspired Goddard as a college sophomore in 1906 to speculate on the viability of atomic-fueled rockets for interplanetary travel. Although a handful of others would grasp Goddard's ideas, most researchers rejected his theory in the first decades of the twentieth century (Clary 2003; Dewar 2004:2; Lehman 1963). However, time has a way of silencing detractors and reeling in skeptics. It wasn't until just before his death in 1945 that a growing segment of the scientific community came to recognize the veracity of his ideas and began building on the foundation laid by Goddard in the post-war years (Clary 2003:231; Dewar 2004).

Nuclear-propelled rockets were first seriously discussed in a broader forum in 1944 by personnel at both Los Alamos Scientific Laboratory (LASL) and the University of Chicago Metallurgical Laboratory (Bussard 1962:169; Bussard and DeLauer 1965:1; Dewar 2004:10). Following these discussions, the first significant study dealing with the concept of nuclear rockets, aircraft, and ramjets was produced in 1946 as a secret document (now declassified) by personnel at the Johns Hopkins University Applied Physics Laboratory (Bussard 1962:169; Bussard and DeLauer 1965:2). This document summarized the contemporary information about nuclear propulsion as well as the principles and problems inherent in developing such systems. The document made evident that little or nothing was known about the specific properties of materials that might be needed to build the systems. A second secret document (also now declassified) was prepared in 1947 by the North American Aviation Corporation's Aerophysics Laboratory, which focused on nuclear ramjets and rockets of different sizes for military objectives (Bussard 1962:170; Bussard and DeLauer 1965:2: Dyson 2002:23).

In 1946, the U.S. Air Force established the Nuclear Energy for Propulsion of Aircraft (NEPA) project at the Oak Ridge National Laboratory in Tennessee to explore the possibility of low-altitude nuclear aircraft (Bussard and DeLauer 1965:2; Larson 1950:2). Work on this project continued intermittently until 1949 (Bussard 1962:170). The Lexington Project, an ad hoc study group convening in 1948 at the Massachusetts Institute of Technology at the behest of the AEC, determined that the low-altitude nuclear aircraft was the least difficult system to develop, followed by the nuclear ramjet for powering missiles, and that the nuclear rocket was the most difficult to develop. The NEPA project evolved into a new and expanded Aircraft Nuclear Propulsion (ANP) program in 1951 when the U.S. Air Force joined with the AEC to develop the systems, focusing primarily on piloted military aircraft (AEC 1956). In 1955, the U.S. Navy also became interested and requested a feasibility study for a nuclear-powered seaplane (AEC 1956). The ANP program ended in 1961 but produced few results (Bussard and DeLauer 1965:4; Mahaffey 2009:283-298). In contrast to earlier beliefs, researchers found that a nuclear-propelled, low-altitude aircraft was the most difficult of the three systems to develop, primarily because of size constraints and safety considerations. Eventually, both the military and project scientists determined little advantage was to be gained in developing ballistic missiles powered by nuclear engines when compared with existing chemically propelled missiles, and therefore effort and money could be spent elsewhere (Baker 1996:62; General Advisory Committee 1960:28).

In the 1950s, an article by Bussard (1953)—who at that time was working at Oak Ridge National Laboratory on the potentialities of a wide range of missions for nuclear rockets—sufficiently influenced the U.S. Air Force to direct, through the AEC, LASL, and University of California Radiation Laboratory (UCRL) (later known as Lawrence Livermore National Laboratory), studies on the feasibility of linking nuclear power with rockets (AEC 1962:71; Baker 1996:48-49; Bussard 1962:170; Bussard and DeLauer 1965:3; General Advisory Committee 1956:18-24; House 1963). The great appeal of nuclear propulsion, as opposed to chemical propulsion, was its smaller size and greater velocity to enable bigger payloads. Consequently, it was considered more efficient and preferable to chemical systems, particularly for the long and complex journeys required to explore the solar system (see Angelo and Buden 1985:ix; Schreiber 1961:25, 29). In 1955, the Condor Committee of the U.S. Air Force Scientific Advisory Board recommended starting work on a nuclear-propelled rocket (Baker 1996:55; House 1963). In 1957, a reactor-powered engine using uranium-loaded graphite fuel was selected as the method to be developed based on the studies by LASL and UCRL (AEC 1962:71). The construction and testing of rocket reactors were assigned to LASL within the Rover program and UCRL was given a similar task for ramjets, which was thereafter referred to as the Pluto program (AEC 1958a, 1958b; Schreiber 1958:70).

The Nuclear Rocket Development Station

Engineering and experimentation in a laboratory setting can only take a new technology so far. Field-testing was required to demonstrate the feasibility of the nuclear space-propulsion concept and the viability of the reactor design. The NTS—with a record of nuclear weapons testing, including atmospheric or aboveground tests—was chosen as the place to conduct the nuclear propulsion field tests because of the possibility of an excursion within the reactor. In addition, the initial testing protocol for the reactors required the release of a radioactive exhaust plume into the atmosphere. Such a release was acceptable for the NTS at the time, but not at the other locations considered for ground testing the reactors (AEC 1958a; see Bernhardt et al. 1974; see Friesen 1995; House 1963). The land chosen for the nuclear engine testing area was Jackass Flats—a broad, open alluvial valley on Air Force-administered land adjoining the western NTS boundary. Surrounded by low mountains, the relatively flat terrain, open vistas, and sparse desert vegetation made the flats ideal for constructing the multiple testing and support facilities envisioned for the Rover program (Dewar 2004:29-31).

By the time the nuclear rocket propulsion program ended in 1973, miles of roads, multiple water wells, and seven major facilities within the NRDS complex dotted the northern half of the valley (Figure 3). These principal structures included two test cells (Test Cell A and C); the Reactor Maintenance, Assembly, and Disassembly (R-MAD) facility, the Engine Maintenance, Assembly, and Disassembly (E-MAD) facility; one engine test stand (ETS-1), the Reactor Control Point, and the Support Area complex. A dedicated railroad used to transport the test reactors and engines linked the test cells, engine stand, and assembly/disassembly buildings (Beck et al. 1996). It also included a support infrastructure consisting of water wells and pipelines, powerlines, communications lines, sewage and radioactive waste management systems, security, and a transient housing area of trailers.

Initial development of the facility that would come to be known as the NRDS began in 1956 as a joint AEC and U.S. Air Force effort that eventually evolved into an AEC and National Aeronautics and Space Administration (NASA) project (AEC 1957:10, 1958a, 1961:71, 1964:109; Baker 1996:57; Beck et al. 1996:26; House 1963; Miller 1984:1). In 1961, the NRDS area—which was approximately 318,000 acres—was officially withdrawn from the Nellis Air Force Range and allocated to the AEC under Public Land Order 2568, and the NRDS moniker was made official (Miller 1984:1; Space Nuclear Propulsion Office 1969:75).

On paper, the nuclear rocket propulsion program's research divisions and funding streams were clear. In practice, they would be less straightforward, sometimes overlapping and occasionally contradicting (see Dewar 2004:44-59). The stated mission of the AEC was to fund and oversee the development of nuclear propulsion reactors and reactor technology, whereas NASA, who had taken over the role from the U.S. Air Force, assumed responsibility for nuclear engine design and engineering and integrating the reactors into engines (AEC 1963:168). Administration of the program was by a newly created joint AEC/NASA Space Nuclear Propulsion Office (SNPO) located in Georgetown, Maryland—headquarters of the AEC—with operating extensions in Albuquerque, New Mexico; Cleveland, Ohio; and Las Vegas, Nevada (Aviation Week [AW] 1960a:29, 1961:30). Harold B. Finger was tapped to be its first manager, a position he held from 1960 until 1967 (American Nuclear Society 2019).

The primary mission of the NRDS at the NTS was to support the Rover program in developing and field-testing nuclear rocket reactors and engines for the space program (AEC 1961:69; House 1963; Miller 1984:1). Named by Herbert York after the Rover Boys fictional book series about the adventurous deeds of three brothers, the program was initially envisioned in three stages (Dyson 2003:23). The first stage involved three tasks: 1) to develop and test reactors to investigate and solve various problems in achieving a high-power density, 2) to develop and test reactor materials capable of withstanding high temperatures, and 3) to generate new concepts for converting nuclear energy into useful propulsion forms (AEC 1960:77). The second stage was to design and test a nuclear engine for actual flight, and the third stage, performed by NASA, was to incorporate the engine into a Saturn V launch vehicle for flight-testing (AEC 1964:109; Schreiber 1961:33). All these tasks were done in coordination with LASL and the private industry contractors participating in the original Rover program and its second phase, designated NERVA (Nuclear Engine for Rocket Vehicle Application), which began in 1961.

As work on the Rover prototype reactor designs and engineering progressed at LASL, ground was broken on the first NRDS test facilities and supporting infrastructure in 1957 (Beck et al. 1996:26-30). Building began at Test Cell A in 1957 with the R-MAD facility and a portion of the railroad and the control point following soon after (Beck et al. 1996:26-30). The reactors were assembled at the R-MAD facility, mounted on a flatbed railroad car for transport to Test Cell A for the test run, and then trundled back to the R-MAD facility for disassembly and post-test analysis.

For the initial build-out, Burns & McDonnel Engineering Company of Kansas City, Missouri, was designated the architect-engineer for the Rover test area, with REECo providing maintenance and minor construction support services. By early 1958, nearly $10 million dollars had been slated for the Rover test area in Jackass Flats. The construction work underway included the central control building and its associated facilities, such as a standby generator station, an administration building, several warehouses, and miscellaneous structures. Test Cell A and the 30,000-square-foot R-MAD building were progressing, along with a portion of the railroad transportation network for moving the reactors. Both local and regional companies participated in the initial erection of the testing facilities. The contract for the NRDS control point area buildings went to J.A. Tiberti Construction

Co., of Las Vegas, Nevada. Sierra Construction Co., Inc., also of Las Vegas, erected the R-MAD building and American Car and Foundry (ACF) Industries was responsible for furnishing and operating all of its interior handling systems. The Petroleum Combustion Engineering Co., of Los Angeles, California, built the Test Cell A structures and its tank farm. Under extension of an earlier contract, Edgerton, Germeshausen and Grier (EG&G) was charged with installing and operating some of the control and recording instrumentation in the Rover area (AW 1958:25; AW 1960b:66, Beck et al. 1996).

The first nuclear rocket reactor test at the NRDS, designated Kiwi-A, was conducted in 1959 (AEC 1961:69; Bussard and DeLauer 1965:3; Schreiber 1961:29) using the newly completed Test Cell A and R-MAD facilities (U.S. Congress 1960:831). The nuclear rocket program evolved quickly in its first five to six years. Modifications to the reactors and testing facilities came rapidly. For example, early in the program, even before the first Kiwi reactor test took place, LASL engineers recognized that another test cell was needed. Newly recognized limitations in the Test Cell A configuration led to a funding request for the immediate construction of another test cell that incorporated the ability to simultaneously test the combination of both reactor and flow system dynamics using a full-scale turbopump system and gas-drive generator. Two million dollars were appropriated for FY1960 for the accelerated construction of Test Cell C (AW 1960c:25; U.S. Congress 1959:777-778). Beginning with the Kiwi-B4 reactor, Test Cell C would become the workhorse for the program hosting all of the full-scale reactor and engine tests until ETS-1 came online in 1968 (Dewars 2004:90).

More test series followed the conclusion of the Kiwi reactor runs, including NRX, Phoebus, Pewee, XE, and Nuclear Furnace (Angelo and Buden 1985:179-183; Friesen 1995; LASL 1973). Following the initial outline of the Rover program, the objective of the Kiwi test series was to develop and refine the proof-of-concept reactor technology and design (Schreiber 1958:70). The ground-based Kiwi reactor, appropriately named after a flightless New Zealand bird, would become the basic design for the NERVA engine to be flight-tested in the RIFT (Reactor in Flight Test) vehicle (AEC 1963:168, 1965:111). The RIFT vehicle would then be developed for an upper stage on an advanced Saturn rocket that was capable of putting large payloads on the moon for lunar-based missions. As planned, the module would also be used for manned missions to Mars or Venus (AEC 1967:181).

NRDS, Economics, and Social Change

The years of 1961 and 1963 were relatively flush times for the nuclear rocket program, with the largest budget appropriations it would ever receive flowing into reactor and engine development and expanding the NRDS facilities (U.S. Congress 1960, 1961, 1962, 1963a). The Kennedy Administration's support for the space program, including nuclear rocket technology, helped preempt some of the inevitable congressional budget cuts. Aerojet General and Westinghouse won the NERVA design and development contract in 1961. Both expanded their Southern California facilities to accommodate the increased workflow (Dewar 2004:81-83). During this period, Congress also appropriated funds for the E-MAD facility, ETS-1, upgrades of the control point, and expanded NRDS support facilities.

Billions of dollars were added to the nation's economy over the course of the nuclear propulsion rocket program. Across the country, federal agency offices sprang up, development laboratories were expanded, and new laboratories and manufacturing facilities were created. Money flowed to university and college campuses to prepare the much-needed nuclear engineers, physicists, chemists, and designers who would develop and operate the reactors and engines, and ultimately test them at Nevada's Jackass Flats complex. Because Nevada had a small population, the effects of the construction of the NRDS and its nearly 18 years of operation on the state and its local economies should not be underestimated. More than $140 million dollars were awarded for the nuclear rocket ground testing facilities at the NTS. Although many of the awards went to out-of-state companies, a significant portion of the NRDS funding circulated through the Nevada economy. Local businesses garnered a sizeable share of the construction work for both the buildings and the infrastructure associated with the complex.

In September 1961, the AEC and NASA awarded a $6 million design and engineering contract for the E-MAD facility to the Vitro Engineering Co., a division of Vitro Corporation of America based in New York City (Missiles and Rockets [M&R] 1961a:12, 1961b:46, 1961c:47, 1961d:47, 1962a:42). Established in the early 1900s, the Vitro Corporation evolved from a small, Pittsburgh-area chemical manufacturing company specializing in coloring agents for ceramics and glass to become a major supplier of uranium to the government during the war years. Like many World War II suppliers, Vitro pursued government contracts in the increasingly lucrative military-industrial-technology arena of the early Cold War era, growing its capabilities by snapping up other companies including the Kellex Corporation, an industrial engineering and design firm, in 1950 (Kellex Corporation 1951). The addition of Kellex's expertise—derived from its development of major facilities at Oak Ridge and Hanford during the Manhattan Project—allowed Vitro to expand beyond its main uranium ore processing operations into the industrial development of atomic energy and eventually its successful bid for the E-MAD design work. By the early 1960s, Vitro had become one of NASA's top fifty contractors in project award dollars (M&R 1963a:24).

Once the AEC and NASA accepted the initial design and engineering plans, bids were opened for construction of E-MAD and several other facilities. The award was announced in February of 1962, with the Catalytic Construction Company of Philadelphia named to build a group of structures at the NRDS in Nevada. A joint AEC-NASA announcement indicated the firm would be responsible for administration, coordination, and inspection of the construction of facilities for the Rover and NERVA programs. Construction included the erection of a complex of facilities, including engine and stage assembly and disassembly buildings (E-MAD), engine and stage test stands, and various other structures. "It is expected," the announcement said, "that the Catalytic Construction Co. will coordinate and supervise six to eight contracts totaling $15 million" (M&R 1962b:11). Although the company provided all management and oversight for the erection of the E-MAD facility and ETS-1, as well as key structural engineering and supervisory personnel, a significant portion of the construction work, including the major 1965-1966 expansion of Test Cell C, was performed by other companies. Chicago Bridge and Iron (CB&I), specializing in pressure vessels and storage tanks and a major participant in nuclear and industrial construction, built the new pair of enormous liquid hydrogen storage tanks and many of the additions at Test Cell C (M&R 1964a:199). Catalytic Construction also entered into subcontracts for construction services at the other NRDS facilities with local southern Nevada firms, awarding various tasks to at least two, and probably more, Las Vegas businesses, including Ralph Engelstad Construction Co., Inc., and the Louis Miranti-owned American Homes Construction Co. (M&R 1965a:88). Catalytic Construction had a long history of industrial facility and AEC projects, but the company's work on the NRDS complex would lead to additional successful bids on space-related projects. By 1964 Catalytic Construction, the originator of the critical path method (CPM) of project management, was also providing construction oversight for the Apollo/Saturn V launch vehicle facilities in Florida (M&R 1964b:42; Tonchia 2018:124).

In his testimony for the annual Senate hearing on NASA appropriations for fiscal year (FY) 1969, Milton Klein (successor to Harold Finger), manager of the Space Nuclear Propulsion Office for NASA/AEC, noted that the NERVA program capitalized heavily on the strong industry-government relationship that had developed over the last decade (U.S. Congress 1968:879-880). Evidence of this is reflected in the promotional materials private businesses distributed to their congressional representatives and other government agencies. Participation in the nuclear rocket propulsion program was a point of pride for the companies involved in all aspects of its development. Many used their roles in the Rover and NERVA programs and their specific efforts in the construction of the NRDS facilities to enhance their marketing campaigns (Figures 4 and 5). Catalytic Construction smartly ran a series of advertisements touting their work on the Rover program facilities in Nevada (Figure 6) in popular-press magazines such as *Newsweek* and *Time*, as well as in industry and trade publications. Chicago Bridge and Iron, a company that played a significant role in the 1960s and 1970s space industry, would also leverage its participation in the construction of the NRDS and Test Cell C facilities in its promotional campaign (Figure 7).

The existing southern Nevada workforce was not sufficient to fill the many openings for construction and maintenance workers, skilled technicians and engineers, and scientists, which created employment opportunities and brought workers from across the country to take up residence in Clark, Nye, and Lincoln Counties. Companies involved in the development of the Rover and NERVA reactors and engines—such as LASL, Aerojet, and Westinghouse—began recruiting personnel to relocate to Nevada for the ground-testing phase starting in the early 1960s. Additional recruiting efforts were implemented as the E-MAD facility neared completion of its Phase 1 component (*Boston Globe* June, 1962:28; *Cincinnati Enquirer* August, 1963:127; *Los Angeles Times* October, 1964:15; *Pittsburg Press* December, 1962:2; *San Francisco Examiner* May, 1965:75).

Beyond population growth, the influx of people started to shift the social fabric of the community. The establishment and expansion of the NRDS complex combined with the evolving nuclear-testing activities brought individuals and families from across the United States with more diverse backgrounds and interests to southern Nevada. Although tourism, gambling, and the service and hospitality industries would continue to dominate the economy and community focus, the NTS and the NRDS rocket programs would provide much of the impetus for increased residential development, the establishment of fledgling cultural programs, and expanded educational opportunities for all southern Nevadans in the 1960s (Moehring 1989:112-115).

It was pressure from the NRDS workers making the daily commute from Las Vegas that finally tipped the scales, leading to the widening of the road between Las Vegas and Camp Mercury from the two-lane "widow-maker" to a four-lane highway (*Reno Gazette-Journal* October, 1962a:15; October, 1962b:11). As documented in congressional testimony (U.S. Congress 1963a:935-936; 1963b:25-27), the long commute from Las Vegas and an expected increase in the NRDS workforce to almost 2,700 once the E-MAD facility became operational led the AEC to consider building an "atomic city" in Nye County. The city was planned for a location near Mercury but outside the boundaries of the NTS. The AEC and NASA administrators argued that eliminating the two-plus hour commute between Las Vegas and Mercury would make it easier to recruit the technically skilled personnel they needed for the growing nuclear rocket program (U.S. Congress 1963b:19-25). At one time, estimates for the size of the community were as high as 12,000 based on the anticipated increase in the nuclear-testing schedule and the build-out of the NRDS facility, which would include four additional engine and stage test stands and numerous ancillary shops (Dewar 2004:89; *Reno Gazette Journal* July, 1962c:9; U.S. Congress 1963a, 1963b).

Initial committee support and public enthusiasm for Nevada's own "atomic city" was cut short by a changing political climate and budget woes. The Kennedy assassination in November 1963, mission creep in Southeast Asia, civil rights concerns, and budget pressures resulted in a realignment of the Rover program that would shelve any test site community plans by early 1964 (M&R 1964c:13-14). Instead, a temporary trailer encampment known as Boyerville was established at the Control Point to fill at least a portion of the housing needs on the NRDS (Dewar 2004:32).

Changing Fortunes

In late 1963, the Rover program was revised, emphasizing ground-based research, engineering, and design. That left the Kiwi project unchanged and work continued on the NERVA engine technology, but the planned RIFT stage—just awarded to Lockheed in 1963—was cancelled (AEC 1964:110).

Fortunately, the nuclear rocket program and the NRDS test facility had shrewd and influential political supporters in both Congress, with Senators Anderson (D-New Mexico) and Kerr (D-Oklahoma), and in the White House with President Lyndon B. Johnson. All three men had been elected to the Senate in 1948 and formed an immediate bond. Although different in style and temperament, they shared a deep appreciation for wide-open spaces born out of their common rural upbringings. Paired with their mutual interests in education and science and a shared adeptness at dealmaking, the group gravitated toward issues concerning atomic energy and the fledgling space efforts from the beginning of their tenure in the Senate, and they stayed committed to these causes throughout their political careers (Anderson and Viorst 1970; Dewar 2004:25-27: Goodwin 1991).

However, even the most noble of endeavors can create rivalries and generate territories that must be defended, and so it was with the space program. Competing domestic and foreign concerns intensified in the annual budget fight after 1963. Anderson used his congressional seniority and traded on his friendship with President Johnson to keep his legislative priorities afloat in the turbulent political waters. The RIFT component of the Rover program was the first casualty of the dueling interests within NASA and the AEC, when delays created by issues with the Kiwi reactors caused significant postponement in the flight-test schedule (Dewar 2004:108-109). To ensure the Rover reactor development and testing component continued, SNPO Manager Harold Finger coordinated with sympathetic allies such as Senator Anderson, chair of the Senate Committee on Aeronautics and Space, to minimize the effect of upfront funding cuts in the initial annual budget negotiations. In some cases, they were able to partially restore the dollars on the backend when the actual congressional appropriates were made. That tactic enjoyed limited success for a couple of budget cycles (for example, see U.S. Congress 1963c:241-243; 1964; 1965:381-386; 1966: 1968: 1969:738-753). Although the strategy did not save all of the NRDS funding from the chopping block, it did allow the build-out of the E-MAD Phase II post-mortem cell addition to continue and ensured installation of the internal operating systems that were crucial to the facility's post-test analytical capabilities. Additions and modifications to Test Cell C and ETS-1 were also allowed to continue (M&R 1964d:172-178, 1965b:40; 1965c:10; U.S. Congress 1965, 1966).

Aerojet, the NERVA program prime contractor, assumed full responsibility for E-MAD operations in 1966 and oversaw the gradual transfer of functions previously performed at the R-MAD facility (*Santa Fe New Mexican* April, 1966:13). The E-MAD Cold Bay was first used for the NERVA XE engine assembly test in December 1967, but the R-MAD facility still performed the post-firing analytics for that test. Delayed by the complicated installation of the remotely operated manipulator and handling systems, the E-MAD Hot Bay did not become fully operational until the second quarter of 1968 (Dewar 2004; U.S. Congress 1968).

The fight for appropriations would continue to plague the Rover and NERVA nuclear rocket development programs as the deadline for NASA's primary mission—Project Apollo and the challenge to land astronauts on the moon before the end of the decade—drew closer. This was especially noticeable after Congress passed the Revenue and Expenditure Control Act in 1968, when the legislation and other budgetary constraints limited funding for the nuclear rocket program (U.S. Congress 1969:728). However, successes with the nearly complete Rover test series, ongoing NERVA engine ground tests, and good diagnostic data coming from E-MAD operations underscored the technical strength of the program. Funding, albeit well below the amount requested, was secured to allow the programs to continue in FY1970 and FY1971 (U.S. Congress 1969:1970).

An Abrupt Ending

The Nixon Administration had no particular affinity for the Space Program, especially for programs without underlying defense applications. With failing health and many of his most powerful allies gone, except for Nevada Senator Howard Cannon, Senator Anderson could not muster enough support to battle the opposition. He even tried to trade on his friendship with Nixon, which began in the 1950s, by providing advice and strategy on several key administration-sponsored defense bills to no avail. Early in 1972, the NERVA project was cancelled (AEC 1973:25). By the time

Anderson's final Senate term ended as the new Congress took office in January 1973, the program was a mere shadow of itself, existing mainly on limited funding from the AEC budget appropriation. On January 5, 1973, NASA announced the end of its portion of the nuclear rocket program (Dewar 2004:192- 203). The entire NRDS program was phased out at the end of the fiscal year. Management responsibility and upkeep for the NRDS area was assumed by the Nevada Operations Office (AEC 1974:23; Miller 1984:5).

Despite this somewhat abrupt ending, the significant technological advances made during the Rover program demonstrated the feasibility of nuclear-propelled vehicles and constituted the primary building blocks for future space explorations in the twenty-first century (Angelo and Buden 1985:194; Porta 1995; Watson 1994). The United States' retreat from interplanetary exploration can be attributed to a lack of vision, spiraling budget deficits, congressional intransigence, and public apathy borne of war fatigue and civil unrest. However, the program's abrupt demise without ever boosting a rocket into flight does not negate its unparalleled contributions in advancing space propulsion technology. It accomplishments were many and extremely valuable, unique in the history of our country. Overall, the program can be considered a successful pioneering achievement in the space program of the United States.

Lasting Impact

The significance of the economic and scientific benefits of NASA's Cold War-era nuclear rocket propulsion program and the NRDS facility should not be underestimated. As James Dewar and others have noted, the program's scope and duration have continued to affect the nation into the twenty-first century (Buden 2011:117-133; Dewar 2004:212-215: Kramer 2017). The Rover and NERVA programs were part of the larger post-war military-industrial-scientific complex that Eisenhower had both marveled at and warned of (Brinkley 2001). Comprised of government agencies, defense contractors, and academicians, the technological juggernaut of the defense and space programs would drive the American economy far more effectively than the pent-up consumerism fueled by the austerity of the Great Depression and World War II.

Although only a fraction of the $1.4 billion dollar Rover/NERVA budget was spent in Nevada, the economic and social ripples that spread across the state were momentous (Dewar 2004:212-221). Over two hundred million dollars were expended on the facilities and workforce that built and staffed the NRDS complex in the 18 years it was an active component of the nuclear rocket propulsion research program. A good portion of those "space program" dollars circulated through the Nevada economy, supporting everything from education to infrastructure. Combined with the economic boost from the nuclear testing program, southern Nevada and Las Vegas in particular reaped the benefits of an influx of more skilled and highly paid workers transforming the city by pushing it beyond its ranching, gambling, and tourist destination roots. Las Vegas expanded to become more economically and socially diverse, growing from a population of approximately 47,000 in 1957 when NRDS was established to a community of over 150,000 by 1973 when the Rover and NERVA programs were mothballed (World Population Review 2019).

Over the intervening 45 years since the original nuclear rocket efforts ended, small groups of researchers have made limited attempts to revive the nuclear propulsion program for space exploration. All of these endeavors have used the data generated by the tests conducted at NRDS to inform their research. Some are even adapting Rover and NERVA reactor and engine designs as the foundation for their own variations of nuclear rocket propulsion systems for the twenty-first century. Calling it "game changing" technology, NASA's own website acknowledges that spacecraft powered by nuclear fission are a viable and powerful option to explore Mars and other destinations (NASA 2018). On May 22, 2019, the U.S. Congress included $125 million in its NASA appropriation to fund the development of a nuclear thermal propulsion system (Foust 2019). The time for a revival of nuclear propulsion for interplanetary travel may be upon us once again…

Test Cell C

The following historic summary of Test Cell C revises and expands on the 2000 Historic Properties Inventory Form for Test Cell C Building 25-3210 (Drollinger, Goldenberg, and Beck 2000a). The report also contains a table of most of the experimental tests conducted at Test Cell C (Appendix A). Although this table has been revised and updated for the current project based on additional sources, the table remains incomplete because sources consulted sometimes did not distinguish at which test facility a particular experiment was located.

The primary purpose of Test Cell C was to test the nuclear reactors being developed for the propulsion of rockets for the United States space program. The original configuration of Test Cell C was built between 1960 and 1961. The facility was an advanced version of the Test Cell A facility and was capable of larger and more powerful tests. Unlike its earlier counterpart, which was limited to gas propellants, Test Cell C was designed to use both gaseous and liquid hydrogen (Figure 8) (Space Nuclear Propulsion Office 1969:66-67).

Even in its first iteration, Test Cell C was an impressive facility with a pair of 50,000 gallon LH2 storage tanks; a massive concrete, three-floor test cell; hundreds of feet of specially designed jacketed cryogenic piping linked to the horizontal tank farm; and a towering flare stack for burning off excess hydrogen. It became a favorite stop on official tours of the NRDS. In 1961, President John F. Kennedy toured the AEC facilities in New Mexico and Nevada to receive briefings on the Rover program and at the NRDS, he inspected the R-MAD compound, Test Cell C, and the early stage construction effort at ETS-1 (AEC 1963:172) (Figure 9). At the R-MAD facility, he witnessed a portion of the disassembly of the Kiwi-B4A reactor. This event marks the only time a president of the United States visited the NTS.

All experiments at Test Cell C were designed to be executed remotely from the Reactor Control Point, located approximately 2 miles to the south, where personnel would congregate during "hot" tests (Space Nuclear Propulsion Office 1969:101). The Local Control Room in Building 25-3220 was often occupied during at least some phases of "cold" tests. Cold tests involved operation of the reactor without the fissionable material aboard. Cold test runs were typically completed weeks, or even months, in advance to ensure the various systems were working as expected and to allow time for any adjustments or repairs prior to adding the nuclear fuel element. During both hot and cold tests, the reactors, which were staged on a railroad car to transport them between facilities, were exhausted skyward. In contrast, the later and more advanced engine designs such as the XE (eXperimental Engine) exhausted downward. ETS-1, which was constructed in 1966, was built specifically for the purpose of testing the proto-type engine and reactor combinations in a downward-firing position replicating a launch configuration (AEC 1969:161; Space Nuclear Propulsion Office 1969:68). In the latter experiments, the engine was placed in the stand and not attached to a railroad car. Effluent exhausted from these reactor tests contained radioactive materials in various quantities, based on the amount of power generated, that rose thousands of feet above the ground (Bernhardt et al. 1974; Friesen 1995:7). Most of the heavy particles, including solid pieces of nuclear fuel from the reactor core, tended to drop out within a few thousand feet of the test, but the smaller radioactive particles could drift with the plume and range tens of miles, or even a couple hundred miles, before decaying and dissipating. The Los Alamos lab group developed the Kiwi, Phoebus, and Pewee reactors and the Westinghouse Astronuclear Laboratory in Large, Pennsylvania, developed the NERVA Reactor Experimental (NRX) and XE reactors. Aerojet General's plants in Sacramento and Santa Suzanna, California, designed, engineered, and fabricated the rocket engines for the Westinghouse reactors (AEC 1961:69, 1966:142, 1968:164; Dewar 2004:118; Friesen 1995:6)

The first reactors tested, initially at Test Cell A and later at Test Cell C, were the Kiwi series (Appendix A). The Kiwi-A was the first full-power reactor and it provided fundamental information on fuel element design and reactor control (Friesen 1995:5). Objectives of later designs in this series were "to explore a somewhat different problem and incorporated advances made from the preceding ones" (AEC 1964:110). For example, Kiwi-B, 1B and B4A reactors demonstrated the use of liquid hydrogen as a coolant at power levels and temperatures for space missions (AEC 1963:169; Friesen 1995:5); the Kiwi-B4A, B4A-CF, B2A, and B4B reactors tested engineering and design changes to eliminate core damage from the flow vibrations of liquid hydrogen (AEC 1964:110; Friesen 1995:5); and the Kiwi-B4E was the first reactor fueled by uranium carbide beads (Friesen 1995:5). In 1965, a safety test known as the Kiwi Transient Nuclear Test was conducted on a railroad trestle just west of Test Cell C and a Kiwi reactor was deliberately destroyed by subjecting it to a very fast power increase (AEC 1966:146; Friesen 1995:5; Miller 1984:5). The aim of the experiment was to determine the potential effects of a nuclear reactor explosion under launch conditions (Figure 10).

Phase II of the Rover program was NERVA, an Aerojet General/Westinghouse effort to provide the technology for a complete nuclear rocket engine capable of flight based on the Kiwi reactor design and technology (AEC 1966:142, 1968:169). Test Cell C was used to test NERVA reactors, whereas engine system testing was conducted at ETS-1. The tests at Test Cell C included the NRX reactors (AEC 1964:113). In 1966, the NRX A4 EST was the first test that consisted of all the engine components, although they were arranged in a breadboard design for test convenience. It was also the first to bootstrap or self-start, demonstrating that a nuclear-powered rocket could start and operate on its own power (Friesen 1995:6). The XE Prime was tested at ETS-1 and it was the first engine to be tested in the correct flight configuration (i.e., all the parts were put together in the proper sequence). In 1967, the NRX A6 operated at full power for one hour.

Continuing with the post-Kiwi research aspect of the Rover reactor program, in contrast to the NERVA engine program, were the Phoebus reactors, which were named after the Greek sun god, and the Pewee reactors, which were small test-bed reactors designed to use fewer fuel elements and still operate at full power and temperature (AEC 1970:166; Friesen 1995:6). The Phoebus reactor was designed to be more powerful (Watson 1994:20). In 1965, the first Phoebus test was conducted at full power at Test Cell C, but the liquid hydrogen coolant to cool the reactor was exhausted during shutdown because of a gate malfunction in the fuel storage tank and the reactor core was damaged from overheating (AEC 1966:146). In 1966, modifications to the test cell were completed for further testing of the Phoebus reactor series (AEC 1967:193). Major improvements were the addition of two 500,000-gallon liquid hydrogen storage dewars; an emergency pressurized liquid hydrogen storage dewar to supply hydrogen coolant to a reactor in the event of a feed system failure; and the NFS 3B, a high capacity liquid hydrogen feed system. The Phoebus 2A was the most powerful reactor ever developed and it was capable of reaching 5,000 megawatts. In 1968, it successfully operated at full power for twelve minutes with over 4,000 megawatts generated and intermediate power for twenty minutes (AEC 1969:159; Friesen 1995:6).

In 1968, the test cell was again modified to handle the testing of the Pewee reactor. These changes consisted of adding a new liquid-hydrogen feed-system turbopump and minor alterations to various lines and valves to accommodate reduced flow requirements (AEC 1969:160). The Pewee reactor program was implemented to check corrosion of the fuel element for the NERVA engine (AEC 1970:166). In contrast to the larger reactors, this small reactor used only a few fuel elements, and therefore its use was largely an economical decision. The greatest effect on a fuel element during reactor operation is corrosion of the graphite by hot hydrogen. The higher the temperature, the greater the corrosion. The program essentially consisted of improving fuel element coatings to resist corrosion. The last of the nuclear reactors tested at Test Cell C was Nuclear Furnace in 1972. Nuclear Furnace, which was also used to evaluate fuel elements, was designed and built at LASL (AEC 1971:176; LASL 1973). The turnaround time was quicker than the Pewee reactors, so more experiments could be conducted. It also holds the record for total time at full power of 109 minutes (Watson 1994:24).

The major events in the construction and use history of Test Cell C can be summarized as follows. The facility was designed by Air Products, Inc., of Allentown, Pennsylvania (*Albuquerque Journal* February 21, 1960:8; AW 1960d:37). Construction began in 1960. Okland Construction Company of Salt Lake City, Utah, won a $1.1 million building contract for the first phase of the test cell proper. Okland Construction was responsible for building the heavily reinforced concrete test cell (Building 25-3210) and a propellant fill station building (25-3220 AR-3219), furnishing and erecting two prefabricated metal buildings (Buildings 25-3230 and 25-3232), constructing a cooling tower (Bldg. 25-3220 AR-3203) and outdoor power substation (25-3233 AR-3215), and installing the utility systems within the test cell complex (M&R 1960a:77; 1960b:52-53). Although the initial contracted work was completed by 1961, small additions and modifications continued. Figures 11 and Figure 12 show various iterations of the Test Cell C facility. Although it was fully operational in 1963, technical changes delayed the first test until 1964. Even before the initial test, a contract had been issued for architectural and engineering services to C.F. Braun of Alhambra, California, for additional modifications to Test Cell C, which focused on increasing liquid hydrogen storage capacity and cryogenic capabilities (M&R 1963b:48).

On June 24, 1965, a Phoebus 1A reactor expelled large amounts of reactor component when one of the existing liquid hydrogen storage tanks accidently ran dry during the experiment, causing the reactor core to overheat (Dewar 2004:164-165). The debris took months to clean up (Sanders 1967). This event occurred while an extensive expansion project was underway. Much of the concrete foundation work had been completed for the new structures, but fortunately the structural components of the dewars were undergoing partial assembly outside the test cell complex and were not damaged. Construction of the new facilities was not significantly affected by the incident and subsequent decontamination activities, but the testing schedule slipped by nearly a year.

Following the cleanup in 1965, the planned expansion work continued. Although the core 1960 to 1961 components remained, the additions were extensive and they significantly altered the complex's visual appearance by increasing the horizontal extent and density of the footprint within the fenced area. Alteration of the facility's vertical profile was achieved principally by the installation of a pair of massive 500,000-gallon steel dewars and a labyrinth of piping to the west of the main test cell building. With a combined capacity of a million gallons, the gigantic liquid hydrogen storage tanks were the work of CB&I. The company developed a new field-welding technique specifically for the Test Cell C Hortonsphere tanks (M&R 1963c:37). This method, with its superior strength characteristics, allowed the rapid on-site assembly of the double-walled aluminum and carbon steel vessels, which ensured that they could withstand the exacting high-pressure and cryogenic requirements. Other enhancements at that time included the Operations Building and Warehouse. The last test at the facility was of the Nuclear Furnace in 1972. Figure 13 shows the complete buildout of the facility, including modifications for the Nuclear Furnace. Demolitions and equipment removals occurred after testing ceased, often without documentation. The greatest amount of demolition work occurred between 2005 and 2011.

IV. TEST CELL C RESOURCES

Figure 13 shows the historic resources recorded at Test Cell C. A practical problem that needed to be addressed was the identification of Principal and Accessory Resources. The original form completed during the recording of Building 25-3210 implied that it was, in effect, the Principal Resource and that all other buildings and components were Accessories, although that form clearly states that only the building was being recorded and evaluated. In addition, the terminology related to Principal and Accessory Resources had not been introduced by SHPO at that time.

During field recording, it soon became clear that the complexity and function of the other resources mandated the designation of several Principal Resources to meet present SHPO standards. This would require recording and evaluating Test Cell C as a historic district. Upon consultation with SHPO staff, it was determined that this was the appropriate course to take.

Because this area is not divided into lots, such as found in urban surveys, the assignment of Principal Resources and the boundaries of their resources is, of necessity, somewhat arbitrary. It was decided to make every standing building and every resource physically separated from the main compound a Principal Resource. In addition, foundations of major buildings were also designated Principal Resources. The entire compound was then divided into contiguous lots around all of these Principal Resources. In many cases, these lots encompass Accessory Resources with an obvious functional link to the Principal Resource. However, bearing in mind the interconnectedness of the various elements throughout Test Cell C, quite a few are related to the Principal Resource only by relative proximity. In this regard, the initial approach would have had merit. For any cases in which functional association to a building was unusually strong, the lot was extended to encompass it even though another Principal Resource happened to be closer. A good example of this is the Air Intake Building Foundation. Although the foundation is physically closer to building 25-3220, it was recorded as an accessory to 25-3210 because the two are connected by a large underground air duct. In summary, it is best to regard the assignment of Principal and Accessory Resources and lot boundaries as recording conveniences. These resources, many of which are individually significant, have more meaning when considered as part of the Test Cell C Historic District as a whole.

More detailed descriptions, particularly of individual rooms, and additional photographs are provided in the forms in Appendix C.

Test Cell C Historic District, 25-3200 (SHPO Resource No. D346)

The Test Cell C Historic District encompasses the fenced compound and the adjoining resources around the outside of the fence line. It extends outward to include discontiguous resources such as the three Camera Bunker sites, the Kiwi-TNT test stand, and the full extent of the Dosage Measurement Trolley. Figure 13 shows the boundaries of the district. Its general background and history are discussed above. Test Cell C as a whole has NNSS facility number 25-3200. All resources, including Accessory Resources, are listed in Table 2.

Table 2. Summary of Primary and Accessory Resources in the Test Cell C Historic District.

SHPO #	NNSS #	NAME
D346	**25-3210**	**Test Cell C Historic District**
B2444	**25-3210**	**Test Cell C Primary Building**
AR-3205	25-3205	Air Intake Building Foundation
AR-3206	25-3206	Reactor Pad
AR-3212	25-3212	High Pressure Gas Tank Farm Foundations
AR-3218 A&B	25-3218 A&B	LH2 (liquid hydrogen) Dewars 1 and 2
AR-3218 C	25-3218 C	Turbine Energy Source/Exchanger
AR-1		Concrete Standpipe
AR-2		Drain to Topopah Wash
AR-3		Rectangular Concrete Pad
AR-4		LH2 Unloading Ramp
AR-5		Deluge Pit #3
AR-6		Dosage Measurement Aerial Trolley
AR-7		Camera Station Pedestal
AR-8		Vault
AR-9		Nuclear Furnace Cleanup System
AR-10		Camera Station Pedestal
AR-11		Railroad Spurs
AR-12		Metal Ground Panels
AR-13		Runoff Channel
AR-14		Tile Field
AR-15		Radioactive Wastewater Vault
AR-16		Radioactive Wastewater Vault
AR-17		Electrical Vault
AR-18		Deluge Pit #1
AR-19		Flare Stack and Flume
AR-20		Tank Farm Extension Foundations
AR-21		Meteorological Station
AR-22		Tower
AR-23		JATO Area
AR-24		Relocated Tank
AR-25		Perimeter Fence and Gates
AR-26		Exterior Lighting System
AR-27		Water and Fire Suppression System

SHPO #	NNSS #	NAME
B18109	**25-3214**	**Shed Drive Funicular Railroad**
AR-1		Track and Drive Cable
B18110	**25-3220**	**Equipment Building**
AR-3203	25-3203	Cooling Tower
AR-3207	25-3207	Borated Water System
AR-3208	25-3208	Conditioned Water System
AR-3209	25-3209	Moderated/Processed Water Tank
AR-3217	25-3217	Substation #6
AR-3219	25-3219	Gas Unloading Area (original LH2 Fill Station)
AR-1		Process Water Heater
AR-2		Water Conditioner
AR-3		Propane Storage Area
AR-4		Telephone Vault
AR-5		Electrical Vault
AR-6		Rest Room Foundation
B18111	**25-3226**	**North Camera Bunker**
B18112	**25-3228**	**Warehouse Foundation**
AR-3216	25-3216	Substation #5
AR-1		Southern Fence and Parking Area
AR-2		Radiography Compound
AR-3		Southeastern Fence
B18113	**25-3229**	**Operations Building Foundation**
AR-1		Southwest Parking Lot
AR-2		Main Entrance Road (Road J)
B18114 Includes:	**25-3230-32** 25-3230 25-3231 25-3232	**Cryogenics Building** Motor Drive Building Cry Pump Room Cryogenic Evaluation Lab
AR-3213 A&B	25-3213 A&B	LH2 Dewars 4 & 5
AR-3223	25-3223	Liquid Nitrogen Dewars 6, 7, and 8 Foundations
AR-3224	25-3224	Rest Room Foundation
AR-1		Deluge Pit #2
AR-2		Southern LH2 Vaporizer Foundation
AR-3		Utility Gantry
AR-4		Northern LH2 Vaporizer Foundation
AR-5		Concrete Pad
AR-6		Health Physics Portable Building

Table 2. Summary of Primary and Accessory Resources in the Test Cell C Historic District (continued).

SHPO #	NNSS #	NAME
B18115	**25-3233**	**Powerhouse**
AR-3215	25-3215	Substation #4
S2287	**Kiwi-TNT**	**KIWI-TNT Reactor Test Stand**
AR-1		Railroad Track Alteration

SHPO #	NNSS #	NAME
Elements Formerly in District (Noted but not Formally Recorded)		
N/A	N/A	West Camera Bunker No longer exists. Area bladed. Only displaced concrete remains.
N/A	N/A	Northeast Camera Bunker Not Visited. Aerial photo shows superstructure gone. Concrete bunker may still be in place.
N/A	N/A	Waste Water Treatment Facility No longer exists. Contaminated area bladed and fenced.
N/A	N/A	Super Tank No longer exists. Contaminated area bladed and fenced.

Building 25-3210 was located adjacent to the functional center of the complex, which was the Reactor Pad (AR-3206). Arranged around these central resources are (or were, since some demolitions have occurred) a multitude of buildings and structures related to test control and monitoring, fuel supply (mainly liquid hydrogen), supplemental gasses, administration, communications, electrical power, radiation control and monitoring, water supply, device assembly, security, lighting, and disposal of liquid and gaseous wastes. Transport on the site was complex and included roads, parking places, and gas unloading docks for automotive vehicles, two spurs from the Jackass and Western Railroad, a funicular (cable) railroad, and even a miniature aerial tramway. Much of the area north and northeast of the Reactor Pad was open space.

In addition to the visible aboveground resources, there is a maze of underground resources that are mentioned here but not formally recorded. Extensive engineering drawings and construction-era photographs exist to document these resources, which include basements, equipment access pits, pipelines, conduit, cableways, and a large air duct. Only a sample of the many hydrants, standpipes, vaults, and manholes accessing this underground world were recorded as Accessory Resources.

Most of the complex is on a bladed terrace on the east bank of Topopah Wash (Figures 14 and 15), which is normally dry, but subject to seasonal flash floods. An outlying test stand (Kiwi-TNT) is in the wash itself, and a radiation monitoring tramway crosses the wash to terminate on its west bank. Three outlying Camera Bunkers once existed. The one on the west bank of Topopah Wash (Figure 16) no longer exists. The bunker northeast of Test Cell C no longer has its surface component, but the underground portion may still exist. This bunker was not visited in the field because nothing was seen in that direction, but aerial photos inspected since then suggest the underground element may have survived. The northern Camera Bunker (25-3226) still exists and was recorded as a separate Primary Resource.

Test Cell C is accessed from the south via paved Road J (AR-2 of 23-3229) after passing through the location of the former NRDS Guard Station and the NRDS Control Center. Nuclear reactors and associated engine components were transported to the site by rail from the E-MAD building to the southwest or the R-MAD building to the southeast. This rail line passes north of Test Cell C and continues eastward to the older Test Cell A complex. Two spurs curving southward off of the main rail line (AR-11 of 32-3210) transferred equipment to the Reactor Pad (AR-3206). After completion of a test, the components were returned by rail to the E-MAD facility for disassembly and analysis of the equipment, which had become highly radioactive.

Test Cell C Primary Building, 25-3210 (SHPO Resource No. B2444)

Confusingly, this building is often referred to as Test Cell C, even though the exact same term is also used for the entire complex. In this report, the distinction is maintained by reserving the name of Test Cell C for the complex and always identifying 25-3210 as the Primary Building or Test Cell C Primary Building. This is a new term, but a necessary one. For example, it appears that when NNSS personnel were informed that "Test Cell C has been mitigated," this was misunderstood to mean the entire complex, when in fact only the one building had been subjected to mitigation measures. This led to the removal of additional buildings and structures without formal recording, evaluation, and mitigation.

This resource encompasses the remains of the principal test building at Test Cell C (25-3210) and most of the other resources within the northern half of the Test Cell C complex. Building 25-3210 (Figure 17) was located adjacent to the functional center of the complex, which was the Reactor Pad (AR-3206). Much of the area north and northeast of the Reactor Pad was open space that was either paved with concrete or left as bare earth because it was downwind of the test under normal conditions, and, therefore, there was a high risk of radioactive contamination of the area.

Although the building was torn down in 2010 or 2011, there are some remnants that can be used to establish its exact location in relation to surrounding elements. The main part of the building is marked by a recent concrete slab (Figures 18 and 19). This slab caps the basement, which was backfilled with radioactive debris from the building rather than disposed of off-site. The foundation and concrete floor slab of the Propellant Pump Room addition at the west end of the building survived because it was not highly contaminated, nor was it over the basement. The base of the thick northern shield wall adjacent to the Reactor Pad is also visible on the surface.

Building 25-3210 is the only building described in any detail by the trio of 2000 survey, evaluation, and mitigation documents. Construction details can be found in the site form for 26NY11258 and the Historic Properties Inventory Form (both in Appendix B) and the Historic American Engineering Record (Drollinger, Beck, and Goldenberg 2000a). Briefly, it was the largest and by far the most complex building at Test Cell C at 63 by 80 feet with a height of 36 feet and two additions comprising a total of 12,180 square feet. It was constructed of reinforced concrete. Most of the building was a tall single story with a complex plan and a flat roof. It had a basement and small penthouse. The tall concrete shield wall between it and the Reactor Pad dominated the north façade.

Much of the rest of the exterior was dominated by a maze of piping. The building served as the interface between the reactor and engine on the Reactor Pad and the rest of the NRDS. Materials needed for the test, particularly liquid hydrogen and other gasses, were regulated and passed through this building. Diagnostics were passed in the opposite direction. All controls of the test either originated in or passed through the building. Some were done within the building itself, but it was also connected to the Local Control Room in Building 25-3220, the Operations Building 25-3229, and the NRDS Control Point.

25-3210 Accessory Resources

AR-3205, Air Intake Building Foundation: Presently, this area is a concrete slab with two large raised-concrete mounts that supported the blower. Kingbolts are present for wall attachment. The building was a 16 by 36 foot rectangular-plan, one-story metal building with a low-pitch gable roof (Figures 20 and 21). It is oriented northwest to southeast in line with the underground air duct running from this building to Building 25-3210. Nearly the entire southeast elevation was filled with louvers for air intake. A steel-panel double door was in the northeast elevation. Small louvered vents were in the gable ends. The building was erected in 1960 and removed prior to 2005.

Drawings made in 1967 exist for modification of the air intake tunnel for improving its utility as an emergency exit tunnel by increasing its height and adding an exit staircase. It appears that this modification was never executed. Presumably, the intake was still regarded as emergency egress, but travel through it would have been slower and hampered by having to exit a manhole near the Air Intake Building.

AR-3206, Reactor Pad: The concrete Reactor Pad, built in 1960, has grooves backfilled with gravel for the removed railroad spur along its center from north to south and parallel rails for the Moveable Shed along the east and west edges (Figure 22). A lead manhole cover is near the center of the pad, and some piping emerges from the concrete. The cellar for the Moveable Shed drive cable sheave is near the north end of the pad. When in use, there were two raised curbs with steel rails on the top surfaces that were used to actually support the test devices (Figure 23). These curbs have been removed. Numerous openings were in the north shield wall of Building 25-3210 adjacent to the Reactor Pad for necessary connections with the test device.

AR-3212, High Pressure Gas Tank Farm Foundations: Presently, this area is a concrete slab with abundant stubs of piping, rebar, and tank foundations all sheared off at slab level. A two-foot-tall concrete wall at the eastern end has many copper grounding pads on its upper surface.

This Tank Farm contained 12 horizontal gas tanks arranged as an array of six mounted over six, four smaller helium tanks arranged two-high in a similar manner, and a small spherical dewar crowned by an equipment shelter (Dewar 3). The large tanks were installed in 1961 and removed prior to 1998.

AR-3218, LH2 Dewars 1 and 2: Each of these dewars has a capacity of 500,000 gallons of liquid hydrogen (LH2), making them the largest in the world at the time they were built in 1965 (Figure 24). The south dewar is Dewar 1, also known as 3218A, and the north dewar is Dewar 2, or 3218B.

Their construction required renumbering the existing smaller dewars. The two dewars are white-painted steel on concrete-clad steel pipe supports. Each has a curved steel stairway to a top mechanical platform that spans the gap between the two dewars. Both are on concrete foundations with the entire area beneath and surrounding them paved with concrete as well.

Plates on the leg of Dewar 1 are marked "HORTON CRYOGENIC VESSEL, 1965" built by CB&I. Steel was treated by the "HORTON PICKLING PROCESS."

AR-3218C, Turbine Energy Source/Exchanger: Built in 1965 along with the two adjacent dewars, this structure exhibits an incredible array of piping on a skeletal steel framework (Figure 25). At the south end, it has the best collection of accordion expansion joints remaining at the facility (Figure 26).

AR-1, Concrete Standpipe: Only the top edge is aboveground in the form of an approximately six-foot-diameter circular curb with a narrow cutout in its north edge for plumbing and a valve. The interior is backfilled with sorted gravel. It was likely constructed around 1965.

AR-2, Drain: Although this drain served to remove surface water, it also served to facilitate the movement of spilled liquid hydrogen into Topopah Wash before it had a chance to vaporize and create an explosive hazard. Pipes within this drain also lead to AR-18, one of the deluge pits. The drain is U-shaped and inset in the concrete slab that covers this portion of the facility. Steel grates were placed over traffic areas. Upon leaving the fenced perimeter, it transitions to an open, concrete-lined channel that drops into Topopah Wash. It was built in 1966.

AR-3, Concrete Pad: This rectangular pad is approximately 6 by 10 feet. Its edges are reinforced with small, galvanized, L-section steel. The construction date is unknown.

The AR-4, LH2 Unloading Ramp: This trailer-unloading ramp served to accurately position the trailer for unloading liquid hydrogen. It is simply a wide, raised-concrete platform with a gently convex top surface. At its highest point, it rises less than two feet off the surrounding pavement. It was built as part of the 1966 LH2 upgrade. The ramp is part of the system of curbs designed to direct any spilled LH2 into Topopah Wash.

AR-5, Deluge Pit #3: In the event of fire or spillage of hazardous materials, the entire complex could be subjected to a major flow of water by the Deluge System, which was controlled from the Local Control Room in Building 25-3220. Principal areas with deluge protection were the liquid hydrogen unloading areas, hydrogen compressor room in Building 3220, liquid hydrogen dewars, high-pressure hydrogen bottles, propane storage area, and Cryogenic (Cryo) Pump and Test Buildings. Water pipes originate at the bottom of the elevated water tank and continue underground throughout the facility.

The complex of valves for the system was distributed in three similar 11-by-25-foot rectangular concrete underground vaults called Deluge Pits that projected to varying heights aboveground (Figure 27). The 7.5-foot interiors hold pipes, many valves, and gauges. Each has an interior ladder formed of individual steel rungs embedded in concrete. All have a rectangular access port near one end and a ventilator and pipe projecting from the top of the opposite end. Adjacent to one end is a smaller rectangular concrete valve box with a metal lid. Deluge Pit #3 rises approximately 2.5 feet above grade. The valve box rises all the way to the top of the main pit.

AR-6, Dosage Measurement Aerial Trolley: A 790-foot-long series of cylindrical steel posts cross Topopah Wash from near the Reactor Pad to the west bank of the wash (Figure 28). These are the most prominent components of the miniature aerial tramway that held a series of radiation monitoring devices at regular intervals. The poles are all different heights, but all terminate at the same level. Frames at the tops of the poles supported the travelling line (now missing), which enabled collection of the devices. Communications lines and powerlines also ran along the bases of the posts. The electric drive motor is located in a small corrugated steel structure at the west end of the tramway. This trolley is closely based on an earlier model installed at Test Cell A. It was designed by Los Alamos in late 1962, indicating construction then or perhaps in 1963.

AR-7, Camera Station Pedestal: Two pedestals (this one and AR-10) providing permanent mounting locations for cameras were installed facing the Reactor Pad and both still exist. Each is a one-foot, five-inch square concrete pedestal standing four feet, eight inches tall. AR-7 faces the Reactor Pad to the southeast (Figure 29). Electrical equipment has been cut off. Electrical sweeps are on the rear of the pedestals. The stations were designed by Los Alamos for use by EG&G and installed in 1962.

AR-8, Vault: This vault is inset into the surrounding concrete slab. It has an open-grid steel cover that is barely visible since it has been backfilled with concrete. The vault was constructed in 1965.

AR-9, Nuclear Furnace Cleanup System: This area did not have a specific function until 1972 when it was used for construction of the complex of machinery used to filter exhaust from the Nuclear Furnace (Figure 30). This was the first attempt to capture and filter out radioactive effluent from a test at Test Cell C. All machinery has been removed, but many fasteners are visible in the concrete along with several machinery outlines where the existing surface of the concrete was chipped away to make solid bedding surfaces. It featured a cascading series of scrubber traps that used water, ice, and a dryer prior to passing the exhaust through charcoal. This system was removed in 2009.

The original triangular structural steel 120-foot tower and an adjacent small building were at the east end of this area and appear to have been removed when the filtering devices were installed. No traces were found of the tower foundation. See Figure 14 showing the tower in the left foreground of the photo in about 1967.

AR-10, Camera Station Pedestal: See AR-7 for a description. This pedestal is located immediately south of the extended concrete apron and faces northwest toward the Reactor Pad.

AR-11, Railroad Spurs: The main line of the Jackass and Western Railroad (site 26NY14637) runs east-west through the northern portion of the testing area centered on Test Cell C. From the west, the railroad enters the Test Cell C Historic District via a cut before crossing Topopah Wash on a large dike. Near the east end of the dike is the concrete pad and other track modifications for the KIWI-TNT test described below (SHPO Resource No. S2287). The railroad grade is deeply incised for the rest of its passage north of Test Cell C. The Jackass and Western Railroad main line is described by Drollinger (2012).

From 1962 through 1967, the Reactor Maintenance and Disassembly (R-MAD) facility to the east provided reactors and engines for testing at Test Cell C. The rail line connecting these two facilities was extended westward from Test Cell A in 1960.

Despite this early association with the R-MAD facility, the main source of reactors and engines for testing came from the E-MAD facility to the west. Construction of the connecting rail line began in 1960, but because of delays, the E-MAD facility did not begin its testing partnership with Test Cell C until 1967. The Railroad Transport System from the E-MAD facility actually passed beyond Text Cell C and continued farther beyond the switch for the spur leading to the Reactor Pad (AR-3206). This was necessary so that the engine could push the reactor car directly to the pad. On the way there, the train passed through Gate 9. Once the tracks reached the concrete apron of Test Cell C, they were inset so the tops of the rails were at the same level as the surrounding slab surface (Figure 31).

A second service spur runs parallel to and immediately east of the spur to the Reactor Pad. This spur entered the compound through its own gate (Gate 8) and ended just east of the Reactor Pad.

Both of these spurs were built in 1960 and are still intact, except that rails within the slab were removed between 2009 and 2011.

AR-12, Metal Ground Panels: This is one of several identical panels found throughout the facility. It is simply a two-foot square of galvanized sheet metal nailed to the ground. The purpose of these panels could not be determined. They are too small to be aerial photo markers. They lack the robust, permanent stake that is expected if they are survey markers. Current RAD SAFE personnel indicated that they have no function in present radiological monitoring of the facility. It appears that these panels, with their uniform size and smooth surface, would have been ideal for collecting radioactive dust or tiny reactor pieces scattered during active testing at the facility, but without documentation, this notion must remain conjectural. It is not known when the panels were installed.

AR-13, Runoff Channel: This shallow, open concrete channel borders the north and east edges of the original Tank Farm (AR-3212) and continues southeast along the northeast edge of the concrete-paved portion of the compound. It was designed to move water and other potential fluids off the concrete area and outside of the fence to the southeast. Between the Air Intake Building (AR-3205) and Substation 4, it passes under a one-lane bridge with concrete curbs via twin culverts. Beyond this point, it continues to pass under the eastern Perimeter Fence, where it ceases to be concrete lined. It is generally 10 feet wide. The channel was built in 1966 and the extension through the Perimeter Fence was added in 1967.

AR-14, Tile Field: Wastewater, some of which was radioactive, was disposed of in three adjacent facilities just outside the East Perimeter Fence. Unlike the main facility, these were oriented northwest-southeast. From north to south, they were the Waste Water Treatment Facility, Tile Field, and Super Tank. Each was surrounded by its own perimeter fence. Only the Tile Field remains. The other two were demolished between 2006 and 2011 as part of the remediation project, and all that remains are cleared gravel areas surrounded by radiation hazard signs. The Tile Field is surrounded by a raised rectangular gravel berm inside a raised barbed wire and chain-link fence with round posts bearing radiation hazard signs. It was built around 1962.

AR-15, Radioactive Wastewater Vault: The vault is a concrete cellar with an aluminum lid. Sweeps are in an adjacent concrete pad. Its position suggests it is associated with the underground radioactive waste waterline. It is in a fenced contaminated area, so it was not closely inspected, but it closely resembles AR-16. The construction date is unknown.

AR-16, Radioactive Wastewater Vault: A concrete cellar with an aluminum lid. A radioactive warning sign is attached to the lid. The construction date is unknown.

AR-17, Electrical Vault: A large concrete cellar with a stepped top and two manhole covers stamped "E." It is located on a large electrical conduit running parallel to the underground air intake duct to Building 25-3210 from the Air Intake Building. The vault was probably built in 1961.

AR-18, Deluge Pit #1: See AR-5 above for a description of the Deluge System. Pit 1 rises a mere four to six inches above the surrounding pavement and the top of the valve box is at the same height as the top of the pit (Figure 32). This system was part of the original design and was likely completed by 1961.

AR-19, Flare Stack and Flume: After a test, all gaseous hydrogen left in the system had to be purged and safely disposed of. This was done by forcing the hydrogen to the eastern edge of the complex, which was normally the downwind side, and igniting it with a propane torch, similar to those found in oil refineries to dispose of natural gas (Figure 33). The gas flume is readily identified by its extremely large diameter compared with all other piping at the facility. The portion of it between the main Test Cell C building and the Cryogenic Evaluation Lab (25-3232) is still intact. From that point, it leaves its skeletal steel supports and is carried on a succession of concrete piers to its terminus at the stack (Figure 34). These piers also carry piping and conduit for a variety of purposes, including electrical and propane functions.

The east end of the Flume entered the vertical Flare Stack, of which only the octagonal concrete footing remains. The system was built in 1960 or 1961.

AR-20, Tank Farm Extension Foundations: Sometime after 1966, an additional area of horizontal high-pressure tanks was installed immediately east of the original tank farm. The remaining components include a concrete slab with a curb along its upslope (north) edge. Raised, chamfered, concrete tank foundations are arrayed on the slab. Steel fasteners have been cut off by torch. There are numerous access pipes cast into the slab. No plans or images of this area were reviewed during the present phase of research.

AR-21, Meteorological Station: A collapsed Meteorological Station is near the Tower (AR-22). It is of typical design, a louvered wood box on a galvanized steel frame, which is still partly attached to a foundation slab. The box was painted white. Its construction date is unknown.

AR-22, Tower: The 420-foot, triangular-plan, skeletal steel acoustic and meteorological tower was located near the center of the open compound northeast of the main complex. The triangular concrete foundation has indentations and installation hardware indicating that the tower was three feet wide on all sides. It had three sets of guy wires. One set extended to just east of the Air Intake Building (AR-3205), another to well outside the northeast perimeter fence, and the final one extended northwest to the Jet-assisted Takeoff (JATO) compound, which was built after the Tower. Anchors survive only for this last series of wires. The standard galvanized-steel anchor fitting can accommodate up to four guy wires, but all of the attachment holes may not have been used. A mid-height anchor with three shackles and cable ends is adjacent to the JATO berm. Another anchor is next to it that has been removed from another location and placed here. The anchor for the topmost series of cables is beyond the JATO compound, nearly to the concrete slab by the railroad entry to the compound. This anchor has been reinforced with concrete. A powerline runs along the ground next to this anchor. The anchor has a fine supplemental ground wire and a three-quarter-inch-diameter braided copper ground cable that leads back to the intermediate anchor. Presumably, such a cable linked the Tower with all of the anchors. See the 1965 overview photo discussed later for a full-height image of the Tower (Figure 87, upper left portion of photo). This Tower was in place by 1963. It was removed sometime between 1998 and 2005.

AR-23, Jet-assisted Takeoff (JATO) Area: This area was the source of a smoke plume used to help track the probable movement of the effluent plume from the reactor. It is just inside the perimeter fence northeast of the Reactor Pad, which was normally downwind of the test device.

Two bundles of 10 standard steel JATO rocket canisters are entrenched in the ground facing downward and at a slight angle away from Test Cell C. When fired, the individual rocket did not move, but its exhaust plume was aimed into the sky and slightly away from the test area.

An earth berm, which is approximately five feet tall, protects the test area from the rocket canisters in case of mishap. An electrical box for rocket firing controls is adjacent to the rocket bundles and protected by a flat-roofed corrugated aluminum shelter with two walls on a steel frame (Figure 35). The entire berm area is surrounded by a T-post and plain wire fence that joins with the perimeter fence. This facility was designed by Los Alamos and probably built in 1966.

AR-24, Relocated Tank: The tank farms (AR-3212 and AR-25) immediately east of the main Test Cell C building were made up of many horizontal high-pressure steel tanks that contained the inert gases (liquid nitrogen and helium) needed for cryogenics and for flushing hydrogen out of the systems. None of these tanks remain in place, but one is stored outside the northern Perimeter

Fence. This tank has a 5-foot diameter and a length of over 65 feet (Figure 36). The ends are convex to handle high pressure and have heavy central fittings. It was moved to this location prior to 1998.

AR-25, Perimeter Fence and Gates: The Test Cell C Perimeter Fence is an eight-foot chain-link fence on galvanized steel I-posts topped by three strands of barbed wire on angled spreaders. Steel signs indicate that the fence was installed by Tholl Fence of Sparks, Nevada. Most of the fence was built by 1961. Later additions and modifications to the fence, particularly along the east and northeast sides of the compound, used round posts. Electrical conduit runs along the base of the fence.

The Main Gate (Gate 1) is in the south fence next to the Operations Building (AR-3229). It, like all other gates, is made of chain link with galvanized steel pipe framing (Figure 37). It ran on rollers next to the Guard Shack, of which no trace remains. By the former Guard Shack location are an electrical panel and status lights. Spaced around the entire irregular perimeter are three double swing vehicle gates, two single swing gates on the two Railroad Spurs that enter from the north, and four personnel Panic Gates. The Panic Gates are equipped with push bars for opening from inside the compound (Figure 38). The opening devices are protected from outside tampering by galvanized steel panels. Panic Gates distant from the main compound lighting system had their own lights.

AR-26, Exterior Lighting System: The principal elements of the exterior lighting system are galvanized steel poles of the kind normally found with cobra fixtures (Figure 39). In this case, they are equipped with multiple floodlights attached to short arms, which were fabricated on-site. These lights are supplemented by floodlights and other incandescent fixtures attached to buildings and other structures. Construction of this system began in 1960, and it was greatly modified during the facility upgrade and expansion in 1965 and 1966.

AR-27, Water and Fire Suppression System: Water mains and turnoff standpipes occur throughout the facility. Fire suppression equipment includes outside hydrants, hoses and hydrants in and adjacent to buildings, portable fire extinguishers, and fire blankets in steel canisters (Figure 40). In addition, the extensive centrally controlled Deluge System could be activated for fire suppression.

Shed Drive Funicular Railroad, 25-3214 (SHPO Resource No. B18109)

A system copied from Test Cell A provided a Moveable Shed on rails that offered shelter when working on the reactor after it was placed on the Reactor Pad, but could be retracted during the test. At Test Cell C, this system was installed on and north of the Reactor Pad (Figure 41). The term "funicular" relates to an object being moved by means of a cable under tension.

The Moveable Reactor Shed (25-3211) was built in 1960 and demolished in 2009. If it still existed, it would be the Principal Resource. Although black and white photos were taken of the building by the previous mitigation team (Figures 42 and 43), the building was barely mentioned in the various survey and mitigation documents and was not formally evaluated. It was a rectangular-plan, steel-frame building clad with corrugated metal with a low-pitch end-gable roof. It stood the equivalent of three-stories tall but was entirely open from floor to ceiling. Wheels in each corner engaged steel rails embedded in concrete. Initially the concrete apron was limited to the immediate vicinity of the Reactor Pad, but it was eventually extended nearly to the Shed Drive Building. The front (south) façade was completely open except for siding in the gable end. The sides were blank except for steel panel personnel doors near the corners adjacent to the front elevation. The rear elevation had centered, paired, steel-panel personnel doors. Above these was a steel balcony supported by large corner brackets, which supported an exhaust stack that emerged from the interior at balcony level and then continued up the side of the building. Additional steel framing on the balcony supported the stack. The interior was illuminated by floodlights. Electric controls and boxes were in the northwest corner. A maintenance balcony with pipe railings ran along the interior of the north wall with access via a caged ladder in the northeast corner. A stack ran from balcony level through the roof just inside this wall. The building had no floor and was open to the concrete pad.

The cable-drive system has several components. The Shed Drive building is the Principal Resource. Only a small T-shaped concrete foundation just inside the northern Perimeter Fence remains of this building (Figure 44). It was a one-story, rectangular-plan, steel-framed building clad with corrugated metal with a low-pitch gable roof. An entry door was in the west elevation. All drive machinery has been removed from this building and gravel has been pushed into the inside of the foundation. A shallow trench continues from the open south end of the foundation.

25-3214 Accessory Resource

AR-1, Track and Cable Drive System: When in operation a continuous three-quarter-inch-diameter twisted drive cable passed through this trench. It too is partly filled with sediment, but the western portion of the cable emerges from the fill to pass over a horizontal roller in a continuation of the trench inset into the northern end of the concrete slab that surrounds the Reactor Pad. The cable then passes by a vertical guide roller before disappearing into a covered passage within the slab. Moving to the Reactor Pad and facing north in Figure 44 from left to right, several system components are visible that were all backfilled with gravel: the western shed rail, a rectangular pit that held the horizontal cable sheave, the two rails of the railroad spur, and the eastern shed rail (which is emerging from the right center). Returning to the sheave pit, on its far (north) side, only a few feet of the concrete-covered slot for the western cable is visible. To the right of the western cable is the continuous gravel-filled slot for the eastern cable. It was open the entire way because the shed drive coupler, which was permanently attached to the cable, emerged from this slot for attachment to the undercarriage of the Reactor Shed. Returning to the north end of the slab, the eastern cable passed by and over an identical sheave and roller, as mentioned above, on its way to the windlass in the Shed Drive building. This is the simplest kind of funicular railroad system to design because no provision was needed for changing cars and the system is on level ground.

A heavy concrete stop with a steel bumper is at the northern terminus of each track. Shed operational controls are in a galvanized steel box next to the eastern bumper (Figure 45).

The entire system was built in 1960 with the exception of the northern portion of the concrete pad, which was enlarged to its full extent after 1966. The Shed Drive building was demolished between 1998 and 2005.

Equipment Building, 25-3220 (SHPO Resource No. B18110)

A variety of functions were housed in Building 25-3220, which was built in 1960 and 1961 as one of the original buildings at Test Cell C and is still standing. This is a one-story, L-plan, 7,493-square-foot building with concrete foundations and concrete slab floors (Figure 46 and 47). The roof is flat except for the shed roof over the Compressor Room at the east end of the building. The building was protected from the Reactor Pad by Building 23-3210 and its thick concrete shield wall, but additional protection was provided by the unpainted concrete north wall of the building with no openings. All other walls are pink-painted concrete block. The roof of the north wing, which was occupied during tests, is also concrete. The east wing roof is built up on a corrugated galvanized steel deck, which is badly corroded. Parts of this decking material are scattered about the interior floors of this wing. Personnel doors are steel panel, some with a single light, which are installed singly and in pairs. Most doors to machinery spaces are larger steel-panel double doors. The two doors in the west end of the Compressor Room are overhead rolled steel.

The building is oriented to the south, facing the Main Gate, with the Gas Unloading Area (AR-3219) located in the exterior corner created by the two wings. The south elevation of the north wing is divided into seven modules by unpainted concrete pilasters. If facing the building looking north, the left three modules of the Compressor Room are taller, with the upper portion of the wall made up of translucent corrugated fiberglass panels. At each corner of this room is a personnel door, with the one at the right elevated on a steel stoop with steel steps and pipe railings. Gas pipes and holes for removed gas pipes enter near the base of the wall between these two doorways. The next three modules are for the Local Control Room, which has double personnel doors at its left end and a single personnel door near its right end. The final module is blank.

The east end of the Local Control Room meets the corner of the building where the east wing begins. This wing has much the same appearance, except that its pilasters are painted concrete block. The first five modules have alternating personnel and large double doors to machinery and shop spaces. The final module is blank.

The narrow south elevation of the east wing has a central double personnel door to the Cryo Bench Lab. At its left is a caged steel ladder to the roof. Above the door and extending nearly to the southeast corner of the building is a steel machinery balcony with pipe railings and angled steel support brackets.

Along the east elevation there is extensive piping outside the Pump Room. A muffled stack is in the wall above the single Pump Room door. To the right of the door is an array of pipes in an area that originally had an outside boiler. Two large louvered vents are in the wall of the Auxiliary Shop.

Finally, there is the pair of large doors to the Electrical Shop. This wall has painted concrete block pilasters.

The north elevation of the east wing is flush concrete with some conduit attached. The concrete west wall continues with the same pattern of concrete pilasters as seen on the south elevation. This wing has abundant conduit, gas pipes, and electrical boxes. Most of the conduit and piping emerge from the walls of the Compressor Room and Local Control Room.

All interior ceilings extend to the underside of the roof deck. Lighting is with suspended incandescent fixtures except where suspended florescent lights are noted. In plan from west to east, the north wing contains the Compressor Room, Local Control Room, Electronic Communications Room, and the Air Conditioning Room. From south to north, the east wing houses the Cryo Bench Lab (later subdivided to include a Clean Room), the large Water Pump Room (later subdivided to create an Electrical Shop, Pump Shop, and Auxiliary Shop) and the Electrical Equipment Room. All of these rooms are described in detail and shown in additional photographs on the ARA form.

25-3220 Accessory Resources

AR-3203, Cooling Tower: The rectangular Cooling Tower has twin redwood tanks above a series of wood slats and baffles (Figure 48). It is mounted in a concrete containment basin with pumps, pipe manifolds, and a sump at its west end. There is a steel cover on the sump and a steel rung ladder inside. The lower part of the tower is clad in corrugated asbestos cement siding, and the top is clad with corrugated galvanized steel siding. It was built in 1960.

AR-3207, Borated Water System: As a neutron moderator, borated water was used at the site principally for radioactive shielding. This system had four components: a boiler (removed leaving concrete foundations), Mixing Tank, Cooling Tower, and Storage Tank.

The Mixing Tank is cylindrical steel, 16 feet in diameter and the same height, and has spray-on insulation (Figure 49). A monorail crane and steelwork platform are on top of the tank, which is accessed via a steel stairway. This crane was used to hoist boric acid salts to the top of the tank by means of a two-ton capacity forklift attachment made by Downs Crane & Hoist Co. of Los Angeles, California. The tank was manufactured and erected by the Pittsburgh-Des Moines Steel Company in 1966. It has REECo property tag #408354.

The rectangular Cooling Tower is mounted at ground level (Figure 50). Its outer shell is plywood. Open ends reveal a network of internal wooden slats. It was likely also erected in 1966.

The 5,953-gallon Borated Water Storage Tank is 50 feet tall with a diameter of 30 feet, and it was also manufactured by Pittsburgh-Des Moines Steel Company (Figure 51). It has rubber sheet insulation painted white, much of which has exfoliated. A caged ladder accesses the top of the tank, which has a pipe safety rail around its perimeter. It has REECo USERDA/NV property tag #408262. This tank was constructed in 1960.

AR-3208, Conditioned Water System: The 150,000-gallon, silver-painted-steel, elevated water tank is one of the dominant features at the facility (Figure 52). Its supporting tower is square in plan with tubular steel legs and a central riser. Supplementary struts are I-beams with steel-bar cross bracing. A caged ladder ascends the southeast leg. There are separate concrete pads for the legs. The riser terminates in a concrete cellar with an access manhole. There is a catwalk around the perimeter of the enclosed tank and another ladder to its top. Water softening equipment is on a concrete pad just south of the tower. Well water for the tank was delivered via the underground six-inch Water Line D. The tank was built in 1960.

AR-3209, Moderated/Processed Water Tank: This is a large (250,000 gallon), white steel, spherical tank on pipe columns and angle-iron cross bracing on a concrete slab (Figure 53). Controls are protected by a partial corrugated metal windscreen. Access to the top of the tank is via a steel staircase with pipe railings. The tank was produced by Westinghouse Pumps. Planned in 1964, it was likely installed in 1965.

AR-3217, Substation #6: This substation was located at the west edge of the facility. It has been demolished. Remains include a single, steel power pole with large insulators; a rectangular concentration of coarse gravel; sweeps leading to a metal electrical box; and a small concrete slab with kingbolts (Figure 54). It was built in 1960.

AR-3219, Gas Unloading Area (original LH2 Fill Station): This facility consists of a paved parking area for backing in gas trailers with a three-foot-tall concrete wall at the rear (north) and sides (Figure 55). There are inset lights and stainless steel pipes emerging from this barrier. An additional concrete apron without a barrier immediately to the west has piping leading directly into the Compressor Room. This concrete apron extends the full width of the unloading area, but only the rear tires would have rested on it. The remainder of the parking area to the south is asphalt, which is now quite decayed.

AR-1, Process Water Heater: The large steel water heater is flanked on the east by a complex of raised steel platforms with pipe ladders and railings, as well as a maze of plumbing (Figure 56). Nestled among the pipes on a concrete slab is the steel operating control cabinet. The structure was painted gray, which has largely eroded away leaving it to rust. The Water Heater was fueled by propane and manufactured by Babcock & Wilson. A plate indicates it was installed in 1968. Planning for its installation began in 1964.

AR-2, Water Conditioner: Displaced and now lying horizontally on the ground, the 680-gallon tank was designed to be installed in a vertical position. It is approximately 20 feet long on three I-beam legs. It was built in 1971 by California Tank & Mfg. Co. of Long Beach, California, for the L*A* Water Conditioner Division of Water Treatment Corporation of City of Industry, California, in 1971.

AR-3, Propane Storage Area: In the southwestern corner of the compound are concrete foundations for two Propane Tanks surrounded by pipe bollards. A concentration of manifolds, valves, regulators, and other related equipment mounted on small concrete pads is associated with this resource (Figure 57). The smaller tank is original to the complex. The larger one was planned in 1964 and likely installed during the facility upgrade and expansion in 1965 and 1966.

AR-4, Telephone Vault: This is a concrete vault with a sign next to it that identifies the vault as having access to a Bell Telephone underground telephone line. The cast iron manhole cover is embossed "SEWER" despite the clear use of the vault for communications. It was probably built in 1961.

AR-5, Electrical Vault: A square iron lid covers most of the top of this concrete cellar. The construction date is unknown.

AR-6, Rest Room Foundation: This 8-by-21-foot concrete pad is adjacent to the southern perimeter fence and was once a bathroom, which has been demolished (Figure 58). It has no sweeps or other attachment hardware. The construction date is after 1960, but prior to July 1965.

North Camera Bunker, 25-3226 (SHPO Resource No. B18111)

This is the sole surviving example of three similar camera bunkers at Test Cell C (Figure 59). They are of a Los Alamos design that was already used at Test Cell A. High-speed photography of the tests was done first by EG&G and later by Pan Am. The cameras were arrayed to view the Reactor Pad. Exact focus points could be refined by adjusting the periscope mirrors. The bunker is located slightly to the northeast of the Reactor Pad, so it is oriented slightly to the southwest with a line of sight at 10 degrees east from the pad. It is 700 feet from the Reactor Pad. It is located in a spot that was often downwind of the tests, which made it essential to have extensive radiation barriers to protect the vulnerable camera films. For ease of description, it is regarded as oriented on the cardinal directions. The exterior of the bunker has three components: the Periscope Gallery, Entry Shed, and Berm.

The **Periscope Gallery** is a one-story, rectangular-plan, wood-framed building with a corrugated-metal shed roof. It is constructed on the concrete top of the subsurface Camera Gallery. The lower halves of all walls are plywood and the upper halves are corrugated metal applied horizontally with the framing on the exterior. Five camera bays are located along the south elevation. These bays contain a total of nine camera periscopes (Figures 60 and 61). When not in use, the bays could be closed with drop-down plywood doors. An additional plywood end door provided maintenance access to the portion of the gallery behind the periscopes. Caged incandescent lights are spaced along the gallery for nighttime maintenance if needed. The periscopes vary slightly in size, but all are in the form of truncated aluminum pyramids that are open on the south sides. An adjustable angled mirror was located inside each periscope, and some mirrors are still in place. Directly below the mirror is the circular metal-lined shaft leading down through the thick concrete roof of the bunker proper to a camera that was positioned below in the Camera Gallery. The inner roof of the gallery is half-inch sheet lead covered by 2.5 feet of earth in bins beneath the outer shed roof. There are wall studs on the exterior walls of this part of the building to resist the outward pressure of this fill.

A **Berm** of local sediments approximately six feet tall covers the portions of the subsurface bunker that are not excavated below the surrounding grade. This Berm slopes outward in all directions from the Periscope Gallery and Entry Shed because it has no retaining walls.

The **Entry Shed** is at the rear of the bunker, providing an access point facing directly away from the Reactor Pad. It is of plywood on 2x6 framing, originally painted white. Plywood extending belowground was covered with tar paper. The wooden door has fallen off. It has a flat roof over a small wooden entry landing. The roof then follows the stairs downward. Roofing above grade is no longer present, but is in good condition below ground level. The stairs are made of 2x12s. Roof rafters are 3x8 and subsurface framing material is 4x8. Interiors are painted white. Lighting is by caged incandescent surface-mount fixtures.

Subsurface Hallway: Upon reaching the bottom of the stairs, a hallway turns right, and then left again for a short distance, before entering the Camera Gallery. Electrical panels are mounted to plywood panels attached to the short west wall of the Hallway.

Camera Gallery: The Hallway enters near the west end of the Camera Gallery. The Gallery is made of concrete poured into steel gabion forms, which were left in place. The floor and ceiling are concrete. The walls are two feet thick and the ceiling is a four-foot-thick concrete slab. The room is dominated by a row of metal stanchions with camera mounts under each port, which each lead through the ceiling to an associated periscope. A remote camera operating console was made by EG&G. It has a USAF/NRDS property label. This area is lit by a row of incandescent overhead lights. Most are installed bare, but one has a white enamel reflector. The room is also equipped with a wall phone and electrical outlets. Its interior dimensions are 7 by 40 feet, whereas the concrete roof is 10 feet, 6 inches by 43 feet.

Warehouse Foundation, 25-3228 (SHPO Resource No. 18112)

This is the concrete foundation and floor slab on a low cut-and-fill terrace for a building that housed a variety of support facilities (Figure 62 and 63). The original northern portion is nearly square in plan. It was occupied mainly by the Maintenance and Supply facility, but it also housed the EG&G Bench Lab. A full-width addition, with its floor approximately one foot lower than the rest, is on the east side of the original building. Concrete steps and stoops also remain. It is surrounded by a gravel parking area. It is located south of the fenced Test Cell C compound and is accessed via Road J immediately to the west.

The original 80-foot-square, one-story metal building had a very low-pitch gable roof. A row of vents was mounted on the ridgeline. The south façade was symmetrical with an 8/4 awning window and a flush door with one light for each corner office and two surface-mounted sliding bay doors. These major openings in the building were oriented to face away from the Reactor Pad. As originally designed in 1964, the warehouse contained large interior Los Alamos warehouse spaces, as well as two offices (one dedicated to Los Alamos), a Pan Am Electrical Shop, Pan Am Store Room, and a Change Room. It is likely the building was constructed in 1965. Later, this part of the building contained an office and the EG&G Bench Lab. The Los Alamos warehouse was later moved into the addition.

The building was removed prior to 1998. Presently, three vacant office trailers dating to the decontamination and demolition period of the early 2000s are stored on the slabs.

25-3228 Accessory Resources

AR-3216, Substation #5: This substation bears the placard 25-5-1201. It gets its power from aboveground lines to the east and is surrounded by a chain-link and wire enclosure. All three substations at the facility were part of the original construction phase in 1960.

AR-1, Southern Fence and Parking Area: The Southern Parking Area is quite large and has been used for materials storage, parking, and positioning of temporary buildings and office trailers since its initial blading in 1960 or 1961. Principal access to this area was via an asphalt driveway at the south end of Building AR-3229. This area is delimited by a three-foot-tall fence made of galvanized steel I-posts with holes drilled in the tops to admit a single strand of barbed wire. This fence extends along the east side of Road J before turning east to Substation 5 (AR-3216), and then proceeding northward toward the Test Cell C compound. The area is partly gravel and partly paved with asphalt, some of which is so decayed that it is almost indistinguishable from the gravel areas. Several concrete tire stops are still in place around its perimeter.

AR-2, Radiography Compound: The Radiography Compound is located south of the main Test Cell C compound. It was surrounded by its own fence that connected it to the south Perimeter Fence on each side of Vehicle Gate 4. This fence no longer exists. Near the south end of this compound is the 25-foot square concrete equipment slab. There are no kingbolts or other attachments on this pad. It was built sometime between 1961 and 1965.

AR-3, Southeastern Fence: From the southeastern corner of the Perimeter Fence, the east fence line continues south a short distance before simply ending. It is assumed that the fence extended around some portion of this southern section of the Test Cell C facility, but has been removed except for this small segment. The fence is made of T-posts strung with three strands of common wire. It is somewhat farther to the east than what is shown in drawings of the eastern fence of the Radiography Compound, but it is possible that the fence did not correspond exactly to plan. In this case, this fence may be a remnant of that compound. It was built in sections from 1961 through approximately 1965.

Operations Building Foundation, 25-3229 (SHPO Resource No. B18113)

This is the foundation and concrete floor slab for the principal administrative building at Test Cell C (Figure 64). Its long axis faced Road J to the west, with parking (AR-21) on the other side of the road. This resulted in an orientation on the fall line. The surrounding ground here is not terraced, so the uphill (north) floor level is barely aboveground and the downhill end forms an impressive plinth. The concrete block foundation rises six courses, which is emphasized by double concrete steps on the centerline. The building is surrounded by a concrete sidewalk interspersed with concrete stoops. A concrete drain parallel to Road J starts in the southwest corner of the building. Decayed asphalt driveways are on all sides of the building. The Test Cell C Perimeter Fence abuts the north end of the building, which is adjacent to the Main Gate, allowing entry from the building directly into the fenced compound.

This was a 40-by-134-foot, rectangular-plan, one-story concrete block building with a flat roof (See Figure 62). Continuous metal awnings protected windows along the east and west elevations, both of which were composed of five approximately 13-foot-wide modules on each side of a narrow central module separated by block pilasters. Typically, each module had a centered three-light sliding window. The south end had one-light double doors at the top of the centered staircase. The north end also had a double door, but it was protected by a block shield wall and a flat roof. A typical window was at each side of the north entrance. These windows were equipped with lead shutters.

The building was arranged as a row of rooms on each side of a full-length central corridor. A shorter corridor branched off to access the central western entrance that faced the main parking lot. In addition to doorways at each end of the main corridor, there was an off-center door at the rear (east elevation). It was designed in 1966 by Bryant, Jehle & Associates Architects & Engineers based in El Centro, California, and construction was completed at least by early 1967. Aerial photos indicate the building was demolished between 2005 and 2006.

AR-3229 Accessory Resources

AR-1, Southwest Parking Lot: This is the principal formal parking lot for the Operations Building. Its asphalt paving is now very decayed. A concrete surface drain is at the south end. Three cargo containers are now stored on the lot. The Guard Shack, which no longer exists, was located at the northeast corner of the lot. The north end of the Parking Lot is bordered by the Perimeter Fence. It was probably completed in 1967.

AR-2, Main Entrance Road (Road J): Access to Test Cell C from the NRDS Control Point and all outside areas is by taking Road F northward toward Test Cell A and the R-MAD facility. Road J turns off Road F first to the west, and then north to reach Test Cell C. This is a 24-foot-wide asphalt road with a generally raised bed and center striping. It is still in good condition. The road passes the Operations Building (AR-3229) and ends at the Main Gate. The road was built in 1960.

Cryogenics Building, 25-3230-3232 (SHPO Resource No. B18114)

This complex building was devoted mainly to conveying and monitoring cryogenic gasses, principally LH2 from storage dewars (double-skinned insulated containers) to Building 25-3210 just to the north for use at the Reactor Pad. It is still standing and consists of three linked rectangular-plan buildings that were all constructed at the same time (Figure 65). Although they are combined into one building, they are sufficiently distinctive in design and function, and therefore are described here under their separate facilities numbers. Together, they create a complex plan. At the center is the smallest element, the concrete Cryo Pump Room (25-3231). Adjoining it to the west is the much larger Motor Drive Building (25-3230) and to the north is the Cryo Evaluation Lab Building (25-3232). Both of the latter steel buildings incorporate the concrete walls of the Pump Room into their own walls.

Following removal of Building 25-3210, this building now dominates the central portion of the Test Cell C complex. A large concrete apron extends to the west and southwest of the building. A narrow paved alley separates it from Building 25-3220 to the south. The space between it and Building 25-3210 to the north is full of pipes. Immediately to the east is a gas storage area, which includes most Accessory Resources associated with this building. These are dominated by two large spherical liquid nitrogen dewars. Other dewars and equipment in this area have been removed, but their former locations are marked by distinctive foundations.

This building and its large dewars were a prominent part of the first phase of construction at Test Cell C from 1960 to 1961.

25-3230, Motor Drive Building

This is a one-story, 56-by-60-foot, rectangular-plan, prefabricated, galvanized corrugated steel building on a concrete foundation and floor. It has a low-pitch corrugated galvanized end-gable steel roof with six large mushroom vents along the ridgeline. There is also a large offset rectangular vent. The drive shaft from the large motor in this building extends directly into the Pump Room.

Specifications for construction required it to be built by Stran-Steel Corporation of Detroit or by another company adhering to Stran-Steel's standards. Because the similar Cryo Evaluation Lab was built by INLAND, it is almost certain that INLAND prefabricated the Motor Drive Building as well.

The front of the building faces west (Figure 66). It has a central, overhead, steel, rolled bay door flanked on each side by translucent green fiberglass panels. At each corner below the fiberglass is a louvered vent where filtered air was brought into the building. These vents have been sealed and the filters removed, their function taken over by the south filter plenum. A four-light steel panel door is to the right of the bay door. Electrical boxes and sweeps are at the left corner of the building.

The south side was originally designed with a continuous band of fiberglass panels along the top third of the wall. Some of these were replaced with metal siding when the metal Filter Room was constructed. Although this room looks like an addition, it was built at the same time as the rest of the building. The entire south wall of this 253-square-foot-shed addition is composed of a louvered metal vent. Entry is via a two-light flush steel door.

The north side had the same fiberglass panel arrangement, but all have been removed and replaced with corrugated aluminum siding. A four-light steel panel door is in the northwest corner. It and the front door have an incandescent light over the top of the doors. Electrical sweeps are attached to this wall.

The south half of the east wall has the typical band of fiberglass panels and an identical door and light arrangement in the southeast corner. The door has concrete steps. The north half of the wall is formed by the concrete west wall of the Pump Room (Figure 67).

The interior of the building is a single large room. All walls have abundant attached piping and control boxes. All metal walls and the roof have aluminum foil/fiberglass insulation, except for the translucent panels and aluminum replacement panels. Roof insulation is kept in place by means of chicken wire. Vents have been added to the south wall adjacent to the addition. The western vents are blocked on the inside.

The northeast corner of the building is occupied by a double concrete pit, approximately seven feet deep, beneath the foundations for the massive pump motor, which has been removed. Kingbolts for the motor remain attached to the concrete. The drive shaft is still in place where it penetrates the concrete wall of the Pump Room, which has two shielded windows. The drive shaft passes through a generator prior to entering the wall.

The center of the room is dominated by a 1750 kw, 5,000 amp Allis-Chalmers (Milwaukee) DC generator (Figure 68). A large maintenance cellar is located under this piece of equipment.

At the south end of the room is a bank of GE electrical cabinets.

The shed addition contains two large blowers. The entire interior of the south wall is covered with frames for air filters. In effect, the entire addition comprises a filter plenum.

25-3231, Cryo Pump Room

This is a 24-by-34-foot, rectangular-plan, one-story, unpainted concrete building with a low-pitch side-gable roof (Figure 69). Its west and north walls are incorporated into the walls of the Motor Drive Building and the Cryo Evaluation Lab. It was built on-site at the same time as the other two prefabricated buildings. Operations within this building were clearly hazardous. Protection for workers and equipment in the adjoining buildings was provided by the concrete walls of the Pump Room, penetrated only by shielded windows through the common walls.

The principal façade faces south. It has a steel panel personnel door with four lights and large flush steel double doors. Electrical conduit is attached to the outside of the wall. The left corner is attached to the Motor Drive Building with a wide galvanized metal flashing over the joint.

The southern portion of the west elevation can only be viewed from inside the Motor Drive Building. It has the pass-through for the pump drive shaft flanked by shielded, fixed, one-light windows with steel frames. The upper part of this wall is nearly covered by attached piping. Below the windows are a number of electrical boxes. The northern portion of the west elevation is visible between the Cryo Evaluation Lab and the Motor Drive Building. It also has attached equipment and piping that runs along the wall between the two metal buildings.

The north wall can only be seen from inside the Cryo Evaluation Lab. This wall also has a shielded window and is penetrated by several pipes.

The east wall is entirely obscured from the south by the maze of piping between this building and Dewars 4 and 5 (AR-3213 of 25-3210). The drive shaft continues straight through the Pump Room to penetrate this wall. A shielded window is near each corner.

The roof is of corrugated galvanized steel with flush gable ends covered with flashing and narrow eaves. It has a large mushroom vent. A raised steel platform with pipe rails has been erected on the roof.

Interior walls are unpainted concrete with many attached pipes, conduit, and boxes (Figure 70). The interior ceiling is the underside of the metal roofing with exposed galvanized steel rafters. There are many suspended pipes. A control cabinet and a manifold for a multitude of small stainless steel tubes are also present in the building. A 1.5-ton monorail crane with a curved track is over the drive shaft. The pump has been removed, although the concrete foundation remains in place.

In addition to the explosive hazard posed by the liquid hydrogen in this enclosed space, there was the danger of suffocation if the building was entered while the pipes were being filled with inert gas to purge them of LH2. A placard on the personnel door warns, "DO NOT OPEN ROOM SEALED FOR INERTING."

25-3232, Cryogenic Evaluation Lab

This is a one-story, 42-by-42-foot, square-plan prefabricated galvanized corrugated steel building on a concrete foundation and floor (Figure 71). It has a low-pitch corrugated galvanized steel end-gable roof with five large mushroom vents along the ridgeline, which is supplemented with additional mushroom vents near each of the four roof corners. Structurally, this building is nearly identical to the Motor Drive Building, which was prefabricated at the same time by INLAND. It is the northernmost of the three linked buildings. Although only a single-story, the walls rise to a height equivalent to two stories, allowing abundant overhead space for structures supporting a maze of interior piping. The original design included ribbons of translucent fiberglass panels high on all the walls, similar to those installed on the Motor Drive Building. The building was prefabricated with these panels, but upon installation, it was decided to omit them all. The openings are covered with metal sheets that do not quite match those of the rest of the building. From the inside, there is no trace of the sheets because they are covered by the spray-on insulation that is over all metal interior surfaces.

The front elevation, which faces to the west, has central flush double steel bay doors. A four-light steel panel personnel door is near the southwest corner. An INLAND manufacturer's logo is attached to the end of the ridgeline.

The north side of the building is largely obscured by piping in a steel framework, including the large-diameter horizontal flue of the Hydrogen Flare System. Prior to its demolition, the primary Test Cell

C building (25-3210) stood immediately north of this framework. Many of the pipes connected the two buildings.

The lower half of the rear (east) elevation is also largely obscured by piping and by a liquid hydrogen dewar (AR-3213 of 25-3210) and its access staircase.

The lower portion of the south wall is concrete, which incorporates the north wall of the Cryo Pump Room. A shielded window opens into the Pump Room, and many pipes run through the wall between the two buildings. From the outside, only a small portion of the western end of this wall is visible in its entirety, including an additional shielded window. The metal upper portion of the wall is visible above the roof of the Cryo Pump Room.

The interior is illuminated by suspended incandescent lights. Six parallel pipes for water and gasses are attached to all walls except the west wall. The building is equipped with a two-ton bridge crane.

The north wall has valves spaced in the pipelines for six workstations, which have been removed. The south wall had an additional ten workstations. A large rotary dial phone is mounted next to the southwest entry.

A large amount of stainless steel piping for liquid hydrogen and equipped with accordion expansion joints occupies much of the floor space in the south half of the building (Figure 72). Piping continues upward in this area on an array of steel supports and cable trays. Labels identify various gasses within pipelines, including liquid hydrogen, nitrogen, and helium. Throughout the building, instrumentation and associated cables have been removed.

25-3230-32 Accessory Resources

AR-3213, LH2 Dewars 4 and 5: Installed in 1960 (Figures 73 and 74), these were the primary liquid hydrogen dewars prior to 1965. They are spherical and supported by steel frameworks on hexagonal concrete foundations. A steel access stair is to the north of the dewars, which are connected at the top by a steel bridge. A cryogenic line leads from between the two dewars west into the adjacent Cryo Pump Room (25-3231).

AR-3223, Liquid Nitrogen Dewars 6, 7, and 8 Foundations: This entire area is covered by a concrete slab, which held concrete foundations that supported the ends of each horizontal dewar. All of the tanks have been removed. Stainless steel piping is still in place at the north ends of each dewar's location. Planned in 1964, this set of three cylindrical steel liquid nitrogen dewars was likely installed in 1965 or 1966.

AR-3224, Restroom Foundation: A rectangular concrete slab surrounded by the stub of a concrete block foundation broken off to match the surrounding concrete level. The restroom is divided into two parts by a raised concrete partition that rises approximately one foot above general floor level. Plumbing for three commodes is spaced along the south side of the partition.

This was a rectangular-plan one-story concrete block building that was 14 feet, 6 inches by 17 feet, 4 inches with a flat concrete roof. Wall block was laid stacked with tooled joints for a gridiron shadow effect. Entry was via a flush louvered steel door near the north end of the west façade. At the rear was a heat pump mounted on its own concrete pad and an exhaust fan near the top of the wall in the southeast corner. The concrete divider noted above supported an air plenum and pipe chase. In addition to the three commodes with partitions along the south side of the divider, there were two sinks and two urinals along its north side. Planned in 1965, this building was likely erected in 1966 during the major upgrade of the facility. The restroom was demolished prior to 2009.

AR-1, Deluge Pit #2: In the event of fire or spillage of hazardous materials, the entire complex could be subjected to a major flow of water by the Deluge System, which was controlled from the Local Control Room in Building 25-3220. The principal areas with deluge protection were liquid hydrogen unloading areas, the hydrogen compressor room in Building 3220, liquid hydrogen dewars, high-pressure hydrogen bottles, the propane storage area, and the Cryo Pump and Test Buildings. Water pipes originate at the bottom of the elevated water tank and continue underground throughout the facility.

The system of valves for the network was distributed in three similar 11-by-25-foot rectangular concrete underground vaults called Deluge Pits, which projected to varying heights (Figure 75). The 7.5-foot interiors hold pipes, many valves, and gauges (Figure 76). Each has an interior ladder formed of individual steel rungs embedded in concrete. All have a rectangular access port near one end and a ventilator and pipe projecting from the top of the opposite end. Adjacent to one end is a smaller rectangular concrete valve box with a metal lid. Pit #2 rises approximately 2.5 feet above grade. The top of the valve box is only a few inches above the surrounding grade, and the top cover is pierced for a large valve handle.

AR-2, Southern LH2 Vaporizer Foundation: Two concrete foundations, approximately eight feet square with small perimeter kingbolts, supported the Vaporizers. The northern one (AR-4) was original and the southern one was added later, perhaps around 1965.

AR-3, Utility Gantry: A variety of gasses had to be transferred from the Compressor Room in Building 25-3220 to the north portion of the facility. Similarly, an abundance of communication lines needed to go in the same direction from the Local Control Room in the same building. This was complicated by a vehicular access route between these two areas. The problem was solved by means of a structural steel gantry that spanned this route behind Building 25-3220. Once past the driveway, the pipes and conduit dropped down to continue north on a series of low concrete piers. The awkward gantry and the barrier of the adjoining pipe runway (Figure 77) were installed because it was preferable to locate the piping aboveground wherever possible. In the event of explosive gas leakage, the gas could dissipate until repairs could be made instead of collecting in dangerous concentrations. The Gantry was constructed in 1961.

AR-4, Northern LH2 Vaporizer Foundation: This is comprised of three very decayed concrete pads with kingbolts. The foundation is entirely surrounded by later installations. The Vaporizer was constructed in 1960 or 1961.

AR-5, Concrete Pad: Its purpose and construction date are unknown. The pad is approximately 6 by 16 feet with no fasteners or plumbing.

AR-6, Health Physics Portable Building: This rectangular-plan building is constructed on steel I-beam skids with large shackles at all four corners. It has white textured aluminum panel siding and a very low-pitch shed roof (Figure 78). There is a one-light flush metal door at each end. Continuous ribbons of fixed windows span both sides. In faded stencils the trailer is labeled "HEALTH PHYSICS" and "V TUNNEL." Site personnel identified the use of this unit as a control building during the remediation work in the 2000s. The interior has drop-panel ceilings and panel walls. Safety equipment is still inside the building, which appears to be fully serviceable. It has DOE property tag #202143. Despite the lack of wheels, this is the kind of building regularly called a "trailer" on the NNSS. It was recorded because, based on its degree of weathering, it could be associated with Cold War projects elsewhere on the site. The construction date very roughly appears to be in the 1970s. It was not placed at the Test Cell C facility until sometime between 2006 and 2011.

Power House, 25-3233 (SHPO Resource No. B18115)

The Power House is a small, one-story, rectangular-plan, tan building constructed mostly of concrete block with a flat roof. It was built adjacent to existing Substation 4 near the east end of the Test Cell C compound and is still standing.

The south wall is mostly occupied by a rolling steel overhead door with a light above its upper right corner (Figure 79). A concrete retaining wall begins at half height and continues to the east, tapering downward and ending within a few feet next to the berm it supports. A steel ladder topped by a pipe railing ascends the retaining wall adjacent to the building.

The north wall is essentially the same, including the retaining wall, except it has a personnel door in the northwest corner and lacks a ladder. This and the western door are flush steel with small concrete stoops.

The lower half of the east façade is buried beneath a gravel berm between the two retaining walls mentioned above. Between the tops of the walls adjacent to the building is a concrete gutter that also serves as a walkway to a short steel ladder to the roof. The buried portion of the wall is concrete and the top is concrete block with two windows or ventilators that are now covered with galvanized steel patches.

The west wall has three blocked ventilator openings with galvanized steel hoods. A personnel door is to the left of the row of openings.

The flat concrete roof protrudes slightly on all sides. A steel frame for removed equipment is on the roof. The roof has steel railings along the south side and part of the west side.

The interior is painted tan, including the ceiling. The floor is concrete with a raised pad for a generator. Steel-covered utility chases are embedded in the floor by the pad. A rectangular domed skylight above the motor mount presumably replaces an exhaust stack. Lighting is by suspended incandescent fixtures. Conduit and electrical boxes are attached to the walls.

Engineering drawings of this building were not inspected, but it appears that it was constructed around 1970.

25-3233 Accessory Resource

AR-3215, Substation #4: The Power House forms most of the east perimeter of this substation (Figure 80). The rest is a seven-foot chain-link fence with galvanized steel I-posts. Gates are in the north and south sides of the enclosure. Corrugated aluminum panels have been attached to the northern fence.

Substation #4 is at the northern terminus of two parallel powerlines, known as Powerlines M and N. In Test Cell C layout maps from the early 1960s, it was labeled as Substation 1.

Equipment includes an Allis-Chalmers transformer, miscellaneous Westinghouse equipment, and two banks of steel electrical boxes on steel pads.

KIWI-TNT Reactor Test Stand (SHPO Resource No. S2287)

The Kiwi-TNT (Transient Nuclear Test) was the only reactor test at Test Cell C not conducted on the Reactor Pad. This was a test to determine the effects of a runaway reactor explosion in order to safely design launch facilities for nuclear-powered rockets. Although this would not create a nuclear explosion, it would still result in a fairly powerful detonation that would damage the Test Cell C complex and cover the facility with radioactive reactor debris, which would require a lengthy cleanup period. Therefore, a single-purpose test stand was built on the Jackass and Western Railroad grade 630 feet from Test Cell C (Figure 81). The distance was well judged because the only damage to Test Cell C was a broken window. The blast was equivalent to 200 to 300 pounds of black powder. This was enough to completely destroy the reactor on its railroad flatcar, but no damage was done to the test stand, which remains in excellent condition today. Because it did not interfere with railroad traffic, there was no need to remove the test stand.

Fairly level ground was desired for measuring fallout from the radioactive cloud. Therefore, it was necessary to locate the test to the west of Test Cell C, where there was open ground to the southwest all the way to the Amargosa Desert. A northeast wind was also required for the test, which was the opposite of the optimal wind direction for other tests. The test is described in detail by Dewar (2004:279-286).

Despite the tremendous importance of the test, the physical structure needed for it was remarkably simple because control and monitoring infrastructure were already present at the nearby Test Cell C facility. The concrete pad for this test is on the main line railroad grade near the east end of the dike crossing Topopah Wash. Large attachment points are embedded in the edges of this structure, which does not impede use of the tracks. Concrete aprons extend from the top of the grade down both sides of the dike to the wash bottom, encompassing a square culvert.

A series of radiation monitoring stations on poles was installed along the north side of the railroad tracks running westward. These poles were removed following the test.

A number of graded alignments were bladed outward from the test structure to create zones for guiding cleanup of radioactive debris following the test (Figure 82). No trace of these temporary cuts was found in the midst of the other extensive ground disturbance around Test Cell C or in the active erosional area of Topopah Wash.

The test structure and surrounding area have restricted access because of radioactive contamination resulting from the test, despite an extensive cleanup program. The facility was built late in 1964, and the test was conducted on January 12, 1965.

Kiwi-TNT Accessory Resource

AR-1, Railroad Track Alteration: Concrete covers the portions of the ties between the rails starting at the test pad and continuing eastward nearly to the switches for the Test Cell C spurs (Figure 83). The purpose of this concrete fill is unknown.

Discussion: Character Defining Features

Simplicity

Test Cell C exemplifies the tenet of many theorists and practitioners of modern architecture who felt, like Mies van der Rohe, that “less in more.” The great concrete edifice of Building 25-3210 was unpainted and no effort was made to hide form marks. There was not the slightest attempt anywhere to adorn this or any other building with any decoration other than painting the concrete block. This same regard for functional simplicity extends to the interior, where bare walls and ceilings have exposed plumbing and fixtures nearly everywhere.

Cryogenics

Moving and storing supercooled cryogenic liquid gasses, particularly liquid hydrogen and liquid nitrogen, dominates the architectural landscape of Test Cell C. The spherical and cylindrical insulated dewars for storing the material, specialized unloading docks, and the maze of vacuum-jacketed stainless steel pipes are so abundant that vehicular traffic was impossible from north to south in the central portion of the compound, and east-west traffic was only possible because of the construction of a special gantry to create a way to drive under a portion of the piping (Figure 84). Special techniques had to be developed for field welding the exotic steel alloys used for the dewars and pipes. Constant quality control inspections were needed to locate and correct failures, an example of which is shown in (Figure 85). Because of the temperature extremes, the piping throughout is characterized by abundant accordion expansion/contraction sections to keep them from tearing themselves apart.

Moving the liquid hydrogen about the facility required special high-pressure pumps, a concrete room to safely contain them in, and a surprisingly large motor to drive them. This accounted for the large size and complexity of the group of three connected buildings related to cryogenics. Testing and improvement of these pumps was a critical aspect of testing operations.

Radiation Control and Monitoring

As shown on (Figure 86), the reactor tests deliberately released a plume of radioactive exhaust. Measures for the control and monitoring of radiation is concentrated in and immediately adjacent to the Reactor Pad, but were undertaken to a lesser extent everywhere in the facility. In addition, a series of roads circled Test Cell C for the purpose of radiation monitoring. Farther afield, monitoring was done in the air of the moving exhaust plume and by regional and national monitoring systems already established for weapons testing.

Control measures included designed shielding materials, such as thick concrete walls, ceilings, and floors. The thickness of this material and the composition of the concrete were carefully calculated prior to construction with this function in mind.

Personnel monitoring was ongoing, using film badges or personal dosimeters supplemented as needed by whole-body counts at Mercury.

Radiation monitoring was also done with a variety of portable devices where needed. A separate fenced compound was set aside for radiography that was well away from and upwind of the Reactor Pad. Monitoring continues to the present day on a regular basis.

The reactors typically lost portions of their radioactive cores during tests. This problem became severe when a Phoebus 1A reactor expelled much of its core on June 24, 1965, contaminating much of Test Cell C to the extent that it could not be used (Figure 87). This created a major cleanup problem. Remote cleanup systems failed, so it was necessary to resort to manual cleanup by crews whose exposure time was carefully limited (Figure 88).

Security and Safety

Security was enforced by a contractor, Wackenhut Security, Inc. (WSI). During the period of active use, security concerns were far less pressing than they became later in the wake of numerous incursions by protestors, which started in the 1980s, and present concerns over the threat of terrorism. At the time, the WSI force in their neat white uniforms resembled a small-town police force, totally unlike today's elaborate security operations. With the presence of nuclear reactors on-site and records and equipment related to numerous technological innovations, security was important, but even more important was safety during ordinary operations. Principally, this involved keeping unauthorized people out of dangerous areas.

The southwest perimeter of the NNSS was merely a line on the map. The principal road from Mercury had a full-time security checkpoint. Another manned security gate was at the main entrance to NRDS on the Mercury Highway. The road from Lathrop Wells was barricaded and staffed only part time as needed.

As noted in the historic context, isolation of the Test Cell C facility from neighboring facilities on the NNSS and surrounding communities was an essential aspect of radiation safety. In addition, the careful dispersion of the various testing and support facilities on the NRDS was done for safety purposes to minimize risks from accidental explosions or radiation hazards.

The Test Cell C compound is surrounded by a chain-link and barbed wire perimeter fence with controlled gated access for automotive vehicles and trains. The Main Gate, vehicle gates, and personnel safety exits are spaced around the perimeter. These exits could only be opened from the inside. Presently, they are chained shut. The Security Hut next to the Main Gate was the most visible security presence.

These various measures were highly successful in terms of both site security and keeping the workers safe in often challenging conditions.

With such immense quantities of explosive gasses distributed all over the facility, there was great concern of fires and explosions. There was the usual array of firefighting equipment and hydrants, which was supplemented by a facility-wide emergency deluge water system. The most important safeguard was prevention, because one mishap could easily remove the facility from the face of the earth (hence its separation from surrounding facilities). An incident with one of the electrical boxes is an example of the importance of such a preventive measure. A small explosion in one of the boxes led to the realization that the lighter-than-air hydrogen, which was so common throughout the facility, could be trapped in the tops of the boxes, and then exploded by the electronics inside. Holes were immediately drilled in the tops of all of the potential hydrogen traps to eliminate this problem (Benjamin McGee, *personal communication* 2019).

Remote Control of Complex Technical Systems

Operations at Test Cell C were characterized by a very high level of remote control. Centralized control was primarily concentrated in a room dedicated to Test Cell C at the Reactor Control Point. Closer at hand, the reactor systems were also controlled from within Building 25-3210 and from the Local Control Room in Building 25-3220. Following tests, the radioactive reactor and engine components were removed using a remotely operated locomotive and transfer car.

Space Specialization

Much of Test Cell C is organized by activity throughout the compound. All of these components, and the supporting equipment needed to conduct the tests, occupy discrete areas that were sometimes multiplied as the facility expanded.

Use zones can be identified moving from south to north. When approaching from the south, one first reaches large parking areas with the Operations Building and the large Warehouse, which always housed various support functions and provided storage. Passing through the Main Gate, there is immediate access to propane tanks and both gas unloading docks. A generalized Support Building is immediately encountered, which provided a variety of services to the testing process, such as pumping gas from one of the gas unloading docks (the only one prior to 1966), pumping water throughout the facility, and supplying electricity. It also contained the Local Control Room. Farther north is the large Cryogenics Building, which was devoted almost entirely to providing liquefied gasses to the reactor via extremely powerful pumps. To the north is the central building of the complex, 25-3210, with the Reactor Pad on its north side. The area north of the Reactor Pad facilities was dedicated almost entirely to monitoring experiments.

Railroad/Automotive Interface

Test Cell C existed to test nuclear rocket components, but it depended entirely on railroad and automotive ground transportation to function. Nearly all construction materials and equipment were transported to the site via paved roads connecting it to the national highway system. After the railroad spurs were completed, equipment could also be transported to the facility from the R-MAD or E-MAD facilities. A separate railroad spur was built for this purpose. The railroad also served as the only means of transporting test reactors from either facility to Test Cell C.

While in operation, liquid hydrogen was the major commodity needed for testing purposes, and it was transported in special trailers. Two gas unloading docks were built at Test Cell C for transferring this material to on-site dewars. Large amounts of liquid nitrogen, helium, and propane also had to be trucked to the facility in advance of each test.

Movement of personnel was entirely by automobile, so large parking lots were always part of the facility.

VI. NATIONAL REGISTER ELIGIBILITY

In the following discussion, the Test Cell C Historic District is discussed first and in the most detail. Many parts of that discussion, including Areas of Significance and Themes, apply to the following individual Principal Resources and will not be repeated there. This section concludes with a brief consideration of the proposed Nuclear Rocket Development Station Historic District.

Test Cell C Historic District, 25-3200 (SHPO Resource No. D346)

Because of the intricate interconnectedness of the resources, the most appropriate level of National Register evaluation is the Test Cell C Historic District. All of the recorded resources, with the exception of one Accessory Resource (25-3230-32 AR-6), contribute to this district. In addition, five of the nine Principal Resources within the district are individually eligible to the National Register. Eligibility is summarized in Table 3 and further discussed below.

Table 3. Summary of Eligibility Recommendations for Resources in the Test Cell C Historic District.

RESOURCE			Individually Eligible: CRITERION				Contributes to Test Cell C Historic District **
SHPO #	NNSS #	NAME	A	B	C	D	
D346	25-3210	Test Cell C Historic District	X	?	X	X	
B2444	25-3210	Test Cell C Primary Building*	X		X		X
B18109	25-3214	Shed Drive Funicular Railroad					X
B18110	25-3220	Support Building	X		X		X
B18111	25-3226	North Camera Bunker	X		X		X
B18112	25-3228	Maintenance/Warehouse Foundation					X
B18113	25-3229	Operations Building Foundation					X
B18114	25-3230-32	Cryogenics Building	X		X		X
B18115	25-3233	Powerhouse					X
S2287	Kiwi-TNT	Reactor Accident Test Stand	X		X	X	X

?-Unevaluated at this time but eligibility under Criterion B is considered likely with further research.

*-Building 25-3210 has previously been evaluated as individually eligible under Criteria A and C (Drollinger, Goldenberg, and Beck. 2000a). It has been demolished, so individual eligibility of this resource now is based on Accessory Resource AR-3218.

**-All Principal and Accessory Resources are evaluated as contributing to the Historic District with the sole exception of 25-3230-32 AR-6. In addition, the Test Cell C Historic District is a contributing element of the proposed Nuclear Rocket Development Station Historic District.

Areas of Significance

Test Cell C closely relates to four Areas of Significance as defined by the National Park Service.

Engineering: Test Cell C was integral to the successful development of one of the marvels of modern engineering, a nuclear rocket engine capable of reaching the outer planets at much greater speed and ultimately less cost than conventional rockets. In addition to the rocket components themselves, a large number of specialized handling and analysis devices had to be developed as part of the program. Outstanding examples of this are the two half-million-pound capacity liquid hydrogen dewars, which were the largest in the world at the time and involved many advances in welding technology, metallurgy, and design. Many of the engineering developments explored at Test Cell C have been adapted to subsequent space exploration programs. The program was cancelled for political and fiscal reasons, not because of technical problems. The nuclear rocket engine was ready for flight test when the program was suddenly cancelled.

Transportation: Of all the many modes of transportation that are reflected in the architectural record, none are more exotic than the nuclear rocket. Architectural resources related to the development of this mode of transportation are extremely rare and Test Cell C is one of the premier buildings related to its development.

Architecture: Test Cell C is highly significant under this theme because it involved the creation of building types, the most important of which was 23-3210, which was specifically designed based on the requirements of testing nuclear rocket engines.

Health/Medicine: Like several other major facilities at NRDS, Test Cell C is an outstanding laboratory for the long-term study of the interface between architecture and radiological hazards. This area of inquiry will be discussed further below under Criterion D.

Themes

The NRDS, including Test Cell C, is specifically discussed in Tlachac's (1991a:25-6) contribution to the *Nevada Comprehensive Preservation Plan* under the Nuclear Testing Theme. In addition, Test Cell C relates closely to the Federal Government and Transportation Sub-Themes as defined in the plan. It also relates to the Military Sub-Theme because the program would not have come into being at all if it was not for the Cold War arms race between the United States and the Soviet Union regarding the design and testing of rapidly changing new generations of ballistic missiles and potential space-based weapons systems. Initially, the U.S. Air Force was one of the partners in nuclear rocket development, though it soon abdicated this role, preferring to concentrate on conventional missiles.

There is one additional historical theme that is directly applicable to Test Cell C and the other NRDS structures. In recognition of the historical significance of human space exploration, Congress passed Public Law (P.L.) 96-344 in 1980. The legislation directed the Secretary of the Interior to embark on a study of the events and locations associated with America's space efforts. Under the "Man in Space" Theme, the NPS was charged with identifying places, components and features representing this historic endeavor. Rocket engine and development test facilities were specifically noted as important to capturing the diverse technological and engineering innovations of the twentieth century to illustrate the story of the early U.S. space program (Butowsky 1987).

Period of Significance

The Period of Significance for Test Cell C extends from initial construction in 1960 through its last test of the Nuclear Furnace in 1972.

Criterion A

The Test Cell C Historic District is recommended eligible to the National Register under Criterion A. The principal building at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under this criterion through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg and Beck 2000a). Test Cell C was determined significant for its role in the Space Program in forwarding the concept of nuclear rocket propulsion. As the core building of this highly integrated district, these comments and evaluations apply equally well to the district as a whole.

The massive, iconic structure of Test Cell C captures the technology of the beginnings of space travel in the last half of the twentieth century and its companions in conventional space travel, such as the launching gantries at Cape Canaveral or the Vehicle Assembly Building in Houston, which owes its great height to being designed to accommodate a nuclear-powered upper stage (Benjamin McGee *Personal Communication* 2019).

The Test Cell C complex remains a touchstone for the American space program because it marks the beginning of U.S. efforts to harness the power of the atom for interplanetary travel. To walk the Test Cell C Historic District is to journey back in time—to stare in awe at the towering steel and concrete creations unique to the country's only field-testing area for nuclear propulsion technology. It was a bold concept, confidently pursued by hundreds of scientists, engineers, and technicians cognizant of the obstacles and challenges that lay ahead, but driven by the age-old human desire to explore and excel.

The structures of Test Cell C continue to embody the hopes and aspirations of the first nuclear rocketeers and provide inspiration for their twenty-first-century counterparts with a dream of climbing aboard nuclear-propelled launch vehicles to orbit Mars, fly past Mercury and Jupiter, and travel on to the outer reaches of the solar system.

Criterion B

The Test Cell C Historic District is not recommended eligible to the National Register under Criterion B at this time. The critical aspect of National Register eligibility under Criterion B is that the resource be directly associated with an important aspect of the career that makes that person's achievements worthy of note.

Most of the individuals important at the national level to the nation's nuclear programs or other programs that were tested or developed at what is now the NNSS had far more important ties elsewhere, such as at the Los Alamos or Lawrence Livermore National Laboratories. Although many of these individuals spent time at the test site, it was often for short visits to monitor test results. The contributions and careers of some of these individuals, such as Senator Clinton Anderson and Los Alamos physicist George Grover, the Rover program inventor of the "heat pipe," are closely tied to the NRDS as a whole so that significance is best considered in relation to the proposed NRDS Historic District rather than in relation to the various elements of that district, such as Test Cell C.

It is likely that individuals of importance to specific operations at Test Cell C, particularly at the more local level, could be identified with further research. If so, they are most likely to be associated at the level of the Test Cell C Historic District rather than with one of its components.

Criterion C

The Test Cell C Historic District is recommended eligible to the National Register under Criterion C. The principal building at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under this criterion through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg, and Beck 2000a). Test Cell C was determined significant under this criterion as a representative example of the type of structure used for conducting research with nuclear reactors. As the core building of this highly integrated district, these comments and evaluations apply equally well to the district as a whole.

Test Cell C's architecture is characterized throughout by strict functionalism. As McGee (n.d.) has noted, Test Cell C functioned "…much like an unpacked rocket system laterally unfurled into a series of buildings and external tanks." This is seen in its extremely rational layout and even more obviously by its striking exterior design and materials of Building 25-3210 which exhibit the Brutalist Style of architecture in its purest form. Selection of Brutalism in this case, as is the case with many industrial or military buildings, was largely mandated by lack of funds to attempt anything beyond pure function. It happens that the materials and requirements of interior room distribution and shapes essentially self-organized into a Brutalist creation with none of the inappropriate excesses in this direction for the sake of appearances that sometimes mar architect-designed buildings. Regarding the stark massing of industrial elements that comprises the entire complex, Constructivism is starkly recalled. In many ways the complex is also a Futurist fantasy brought to life in the desert. The various parts of the complex are tied together by bewildering amounts of pipes, all of which had to be subjected to extreme quality control measures, particularly the vacuum-jacketed cryogenic pipes.

Its functional character is largely influenced by the fact that it was almost entirely designed by engineering firms or laboratories. The original complex design was by Air Products, Incorporated. The firm of C.F. Braun of Alhambra, California, provided architectural and engineering services for some of the 1965 to 1966 modifications focused on increasing propellant storage capacity and cryogenic capabilities. Many of the subsequent upgrades and modifications were made by Los Alamos Scientific Laboratory. Other elements were designed by firms such as the Cosmodyne Corporation and EG&G. Chicago Bridge and Iron was responsible for the design and installation of most of the spherical dewars positioned throughout the test cell, and ACF designed and built the turbine energy source and much of the distribution piping associated with the later reactor tests. The only building designed by an architectural firm was the Operations Building (25-3229) by Bryant, Jehle & Associates, Architects & Engineers, of which only the foundations now exist.

Criterion D

It is rare for an architectural resource to warrant eligibility for its research potential, but a strong case can be made for Test Cell C. This facility was initially designed with the intention of containing high levels of radiation while still allowing personnel to safely work in close proximity. The success of this design has been exhaustively documented because of the intensive radiological monitoring conducted during its periods of active use. Monitoring, including personal dosimetry of all workers potentially exposed to radiation, has continued to present and also includes radiological surveys of the surround areas.

Test Cell C also presents many decades of research findings and ongoing investigation of methods and the efficacy of such methods for decontamination. The advantage of such an extended duration study is that decontamination efforts that appear to be effective in the short term can be far from successful in the long term because deeply penetrated radiation sometimes re-contaminates surfaces that were thought to be fully decontaminated. A recent study by McGee (n.d.) exploits this research potential by using Test Cell C as a test case for using gamma-ray spectrometry to assess radioactive contamination at abandoned nuclear testing facilities.

Questions regarding radioactive containment are important in relation to the various medical and industrial uses of atomic energy. Decontamination issues could become critical in the case of nuclear engineering accidents, or in this age of nuclear weapon proliferation, the intentional detonation of a nuclear device or intentional contamination with nuclear materials.

With the exception of Kiwi-TNT, this research potential is best considered at the level of the Test Cell C Historic District because all portions of the facility are involved to some extent, although the radioactive contamination is most highly concentrated at the Reactor Pad and surrounding concrete apron.

Integrity

In the earlier discussion of the condition of the various components of the Test Cell C Historic District, it is clear that it has severe problems of many kinds. Several of the most important components have been removed, including the Principal Test Cell C Building, Operations Building, Warehouse, Reactor Shed, and many tanks and other small elements.

Despite these integrity issues, the complex overall retains all seven aspects of integrity sufficiently to convey its significance to the observer. It is in its original location. No major design changes have taken place since the period of significance. The setting of the entire NRDS area of Jackass Flats is practically the same as it was during the period of significance. Additional construction of support facilities for the Yucca Mountain waste management project are some distance away and are of a designs similar to those constructed to support the NERVA program. The sense of feeling remains, but the stripped interiors of several key rooms has somewhat reduced this aspect of the complex's integrity. However, the importance of the various integrity issues at Test Cell C is reduced because it is a unique facility at the only testing ground for a unique program, and therefore it is the best surviving example of its type. This is even more the case since its prototype, Test Cell A, has largely been demolished.

Test Cell C Primary Building, 25-3210 (SHPO Resource No. B2444)

The Principal Resource at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under Criteria A and C through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg, and Beck 2000a). Test Cell C was determined significant for its role in the U.S. Space Program and as a representative example of the type of structure used to conduct research with nuclear reactors. With demolition of this building, only enough remains to consider it a contributing element to the district rather than individually eligible.

However, Accessory Resource AR-3218, the gigantic pair of liquid hydrogen dewars added to the facility in 1966, fully takes the place of the Principal Resource as warranting individual significance under these two criteria. The tanks, which are in excellent condition, tower over the surrounding landscape and are visible from many miles away and epitomize the scale and ambition of the space program under Criterion A.

Under Criterion C their construction presented unprecedented problems in engineering and metallurgy. A new metallurgical process (the Horton Pickling Process) and a field-welding technique were patented for making steel that would withstand the incredible pressures of half million gallons of liquid hydrogen in a single tank in addition to the strains involved in storing such large amounts of cryogenic liquid. In terms of representing a structure on a scale never seen before, these dewars were among the largest in the world at the time.

Shed Drive Funicular Railroad, 25-3214 (SHPO Resource No. B18109)

Foundations and remnants of the cable drive system survive to the extent that this resource easily qualifies as a contributor to the Test Cell C Historic District. Demolition of both the Reactor Shed and the Shed Drive Building has reduced its integrity of Design, Materials, and Workmanship to the extent that this resource is not individually eligible.

Equipment Building, 25-3220 (SHPO Resource No. B18110)

This is one of the premier buildings at Test Cell C. It is mission related, housing a variety of specialized operations, particularly the Compressor Room for moving liquefied gasses and the Local Control Room, which retains much of its original equipment. In addition to contributing to the Test Cell C Historic District, it is individually eligible under Criterion A for its importance in nuclear rocket testing operations and under Criterion C as one of the few examples of a major building designed for nuclear rocket testing. Of special importance in this regard is the incorporation of the solid concrete north wall and roof of the west wing for radiation shielding. Despite the removal of much interior equipment and the poor condition of the east wing roof, it retains all aspects of integrity.

North Camera Bunker, 25-3226 (SHPO Resource No. B18111)

This is one of the premier buildings at Test Cell C. It is mission related, supporting EG&G's famous photography of various nuclear tests through the means of extremely fast interval photography.

In addition to contributing to the Test Cell C Historic District, it is individually eligible under Criterion A for its importance in nuclear rocket testing operations and under Criterion C as one of the best examples of a photographic bunker designed for close-up documentation of nuclear rocket testing. Apart from minor structural decay, the bunker is in excellent condition and retains all seven aspects of integrity to a high degree.

Maintenance/Warehouse Foundation, 25-3228 (SHPO Resource No. B18112)

Demolition of the warehouse and the relatively minor nature of its associated resources precludes individual eligibility. The resource does contribute to the Test Cell C Historic District.

Operations Building Foundation, 25-3229 (SHPO Resource No. 18113)

Demolition of the Operations Building and the relatively minor nature of its associated resources preclude individual eligibility. The resource does contribute to the Test Cell C Historic District. Even if the building were still standing, it would be individually eligible at most at the local level. Although designed by the architectural firm of Bryant, Jehle & Associates Architects & Engineers of El Centro, California, it was not one of their more creative designs. In fact, the interior arrangement of central hallway with offices along both sides and service areas in the center is exactly the same as that of the very first wooden dormitories built on the NNSS. The similarity is so complete that even placement of all four doorways is exactly that of the Letter Dormitories in Mercury (Reno et al. 2018).

Cryogenics Building, 25-3230-3232 (SHPO Resource No. B18114)

With demolition of Building 25-3210, the Cryogenics Building is now the premier building in the Test Cell C Historic District. In addition to contributing to the District, it is individually eligible under Criteria A and C.

The building is completely mission related and typifies construction related to the development of the nuclear rocket under Criterion A.

Although the exterior of the building is, for the most part, a simple prefabricated structure, its interior held several key components of the test complex, all of which are represented by the foundations and remaining equipment inside the three major modules. The Motor Drive Building has foundations indicating the tremendous size and power of the motor needed to drive the turbopump for liquid nitrogen and also has a large generator. The Cryo Pump Room has shielded concrete construction, indicating the dangerous and powerful forces being handled there. It also retains a sample of the elaborate piping and part of the pump drive assembly. Rocketdyne had to create new turbopumps capable of providing such large amounts of liquid hydrogen to the engine. The pumps in the Cryo Pump Building were all of entirely new design. Finally, the Cryogenic Evaluation Lab building retains an abundance of internal piping, although other interior equipment has been removed.

The two large spherical dewars (AR-3213) contribute heavily to this significance. They are imposing structures even though they suffer from comparison with their immense neighbors. These dewars are also the original liquid hydrogen storage facility for Test Cell C.

Powerhouse, 25-3233 (SHPO Resource No. B18115)

The Powerhouse is a contributor to the Test Cell C Historic District. It is not individually eligible for the National Register because it is a late and relatively minor addition to Test Cell C. It has no architectural distinction and it served in a purely support role that was not directly connected with specific testing requirements.

KIWI-TNT Reactor Test Stand (SHPO Resource No. S2287)

This test stand, which is little more than a concrete pad on a railroad grade, is a splendid example of how a resource can have significance far beyond anything imaginable from looking at the material remains themselves.

In addition to contributing to the Test Cell C Historic District, it is individually eligible not only under Criteria A and C, but also under Criterion D.

It is of importance nationally under Criterion A as the only example of a test designed to explore the results of a reactor excursion or meltdown in a nuclear rocket engine. As such, it provided information needed for the safe design of launch pads and for gauging the likely impacts of an in-flight accident while still within proximity to the earth. The test literally blasted its way to international importance. To quote Dewar (2004:285):

> The test caused an international incident. The Soviet Union alleged the United States violated the LTBT [Limited Test Ban Treaty], claiming KIWI-TNT was an above-ground nuclear explosion. The U.S. denied the allegation, stating it was a reactor rather than a nuclear explosive because it lacked a nuclear yield and had no fission products detected outside the United States. Later the State Department blasted the AEC and its "TNT" designation, which implied an explosion, as it had wanted to charge the Soviets with a LTBT violation but found their effort blunted.

The Kiwi-TNT Test Stand is eligible under Criterion C as the only facility ever built to deliberately test the self-destruction of nuclear rocket reactor. It is in amazingly good condition. With re-installation of monitoring equipment, it could be used for the same purpose today. It fully retains all aspects of integrity.

Kiwi-TNT is also eligible under Criterion D for the information it has provided and its potential to continue to provide information on radioactive contamination following a nuclear reactor accident. During the test, radiation and the dispersion of contamination were thoroughly monitored. The extent of contamination was investigated during an extensive cleanup campaign. This area was subjected to follow-up monitoring of radiation levels, which continues to the present. Therefore, it provides an extensive body of data and it continues to provide data on both short- and long-term management of radioactive contamination related to reactor incidents because the place is still contaminated.

The Potential Nuclear Rocket Development Station Historic District

The fact that the collection of closely related historic resources found in the NRDS area meet all qualifications for a highly focused National Register district of national significance has been recognized by cultural resources professional researchers studying the area, starting with Tlachac's (1991a) contribution to the Nevada Comprehensive Preservation Plan. Specifically, she regarded the area as contributing under Criterion A (1991b:25-17). In addition, Drollinger et al. (2002:62, 64) recommended the NRDS as a historic district in the *Cultural Resources Management Plan for the Nevada Test Site.*

In the 2000 Historic Properties Inventory Form, Carey & Co. evaluated the nearby E-MAD facility and found the resource a "contributor to NRDS District."

The case for a NRDS District is unusually compelling because practically every cultural feature in sight, with the exception of some support buildings for the Nevada Nuclear Waste Storage Project, was constructed specifically as part of the Rover program, including the roads, water wells, water tanks, the Jackass and Western Railroad, the Control Center, the two MAD buildings, the two test cells, and the Engine Test Stand. The distances between these major facilities, ranging from approximately 1.5 to 2 miles apart, is a key aspect of the district because this separation was mandated by the special safety issues created by handling near-critical masses of radioactive materials and deliberately venting radiation to the atmosphere during reactor and engine tests, which sometimes scattered portions of radioactive cores onto the immediate surrounding landscape. A very important aspect of the testing of these engines was a progressive reduction of such releases through improved filtering systems and the improved engineering of core and engine components.

The NRDS is a rare example of what Gorman (2009) calls a "designed space landscape" that includes common elements such as remoteness, ties to ground transportation systems, and specialized structures designed specifically for rocket development.

The Test Cell C Historic District comprises one of the most important activity centers in the proposed NRDS District and is one of its key contributors.

VII. FINDING OF EFFECT

This report documents the condition of the Test Cell C facility during a January 2019 recording. The facility has not been used for its original purpose of testing nuclear reactor components since 1973, when it was placed into long-term moth ball status. During the early and mid-1990s some support buildings were used as office space, and the area has periodically been utilized since then for nuclear incident training and to practice infiltration and urban warfare tactics (Drollinger, Goldenberg, and Beck 2000a). Since 1997, Test Cell C has been maintained under the decontamination and decommissioning surveillance and maintenance program. The fenced portion of the Test Cell C District (D346) no longer contributes to the NNSS mission.

As described in this report, a small number of buildings and structures and one of the primary buildings were removed in 2010 and 2011 to carry out radiological remediation activities. However, the remaining Principal and Accessory Resources are unique and retain a high level of integrity. These attributes clearly convey their significance to observers and association with the NRDS program.

EM NV anticipates FFACO environmental restoration activities and demolition for closure of CAU 572 within the fenced portion of the district. Two of the contributing Principal Resources that are still standing (25-3220 and 25-3230-32) and 49 of the 60 Accessory Resources that contribute to the district are inside this fenced area. Proposed removal of property, hazardous material remediation, and demolition supports a finding of adverse effect to historic properties. These activities will have an adverse effect not only to the Test Cell C Historic District but will also have an adverse visual and cumulative effect to the unrecorded NRDS historic district.

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Photos credited to "RSL" are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

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IX. REPORT FIGURES

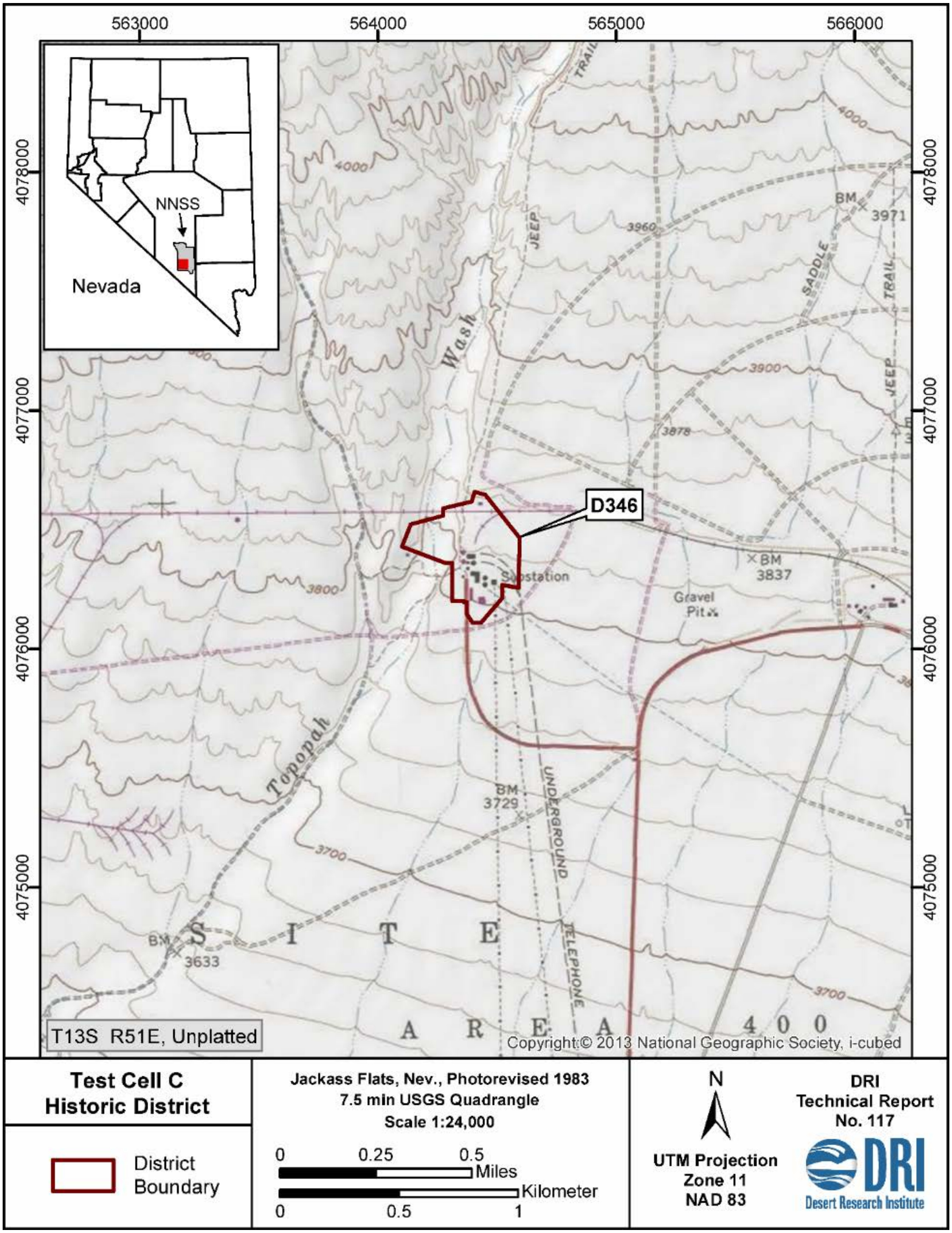

Figure 1. Map showing the location of the Test Cell C Historic District.

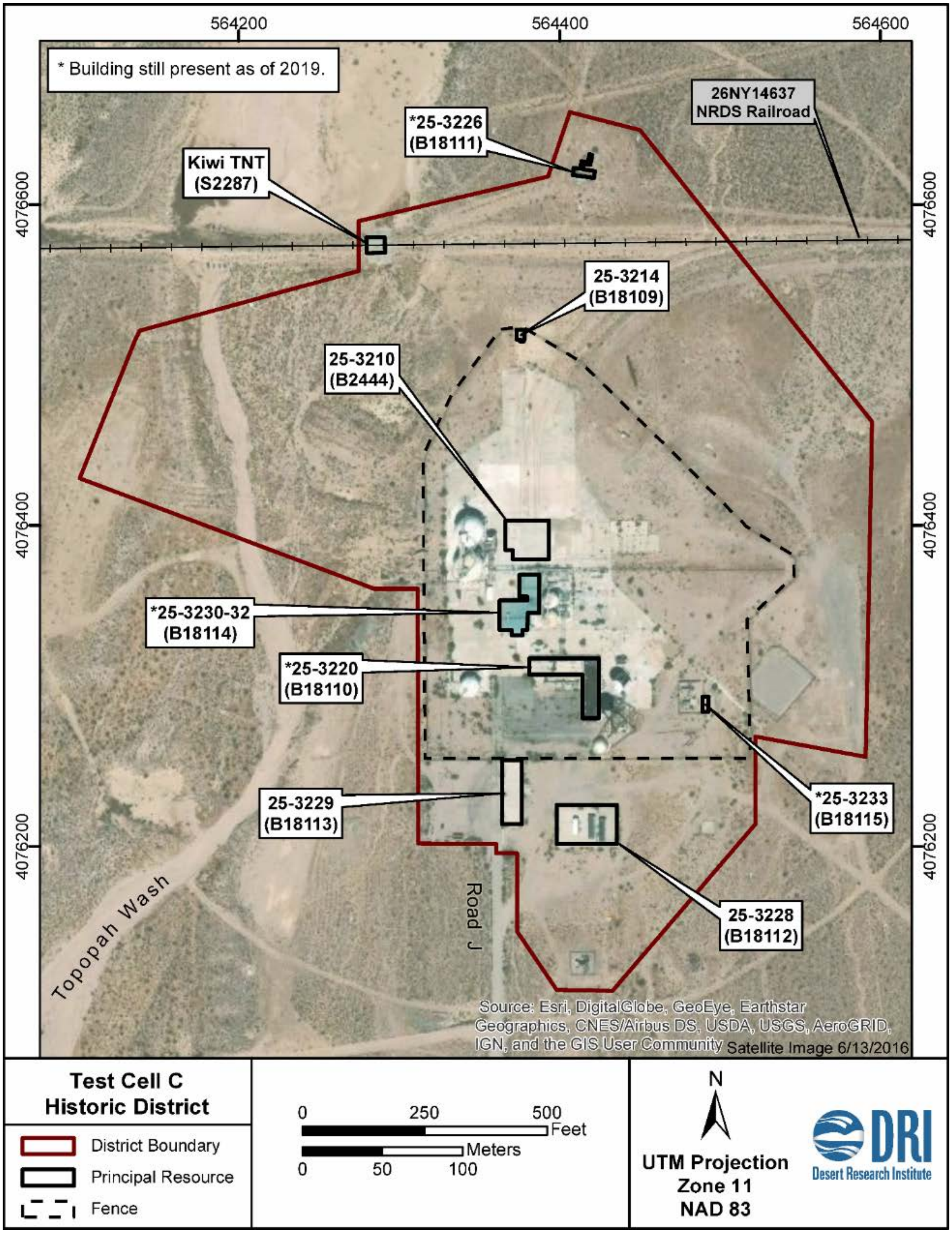

Figure 2. Map of the Test Cell C Historic District.

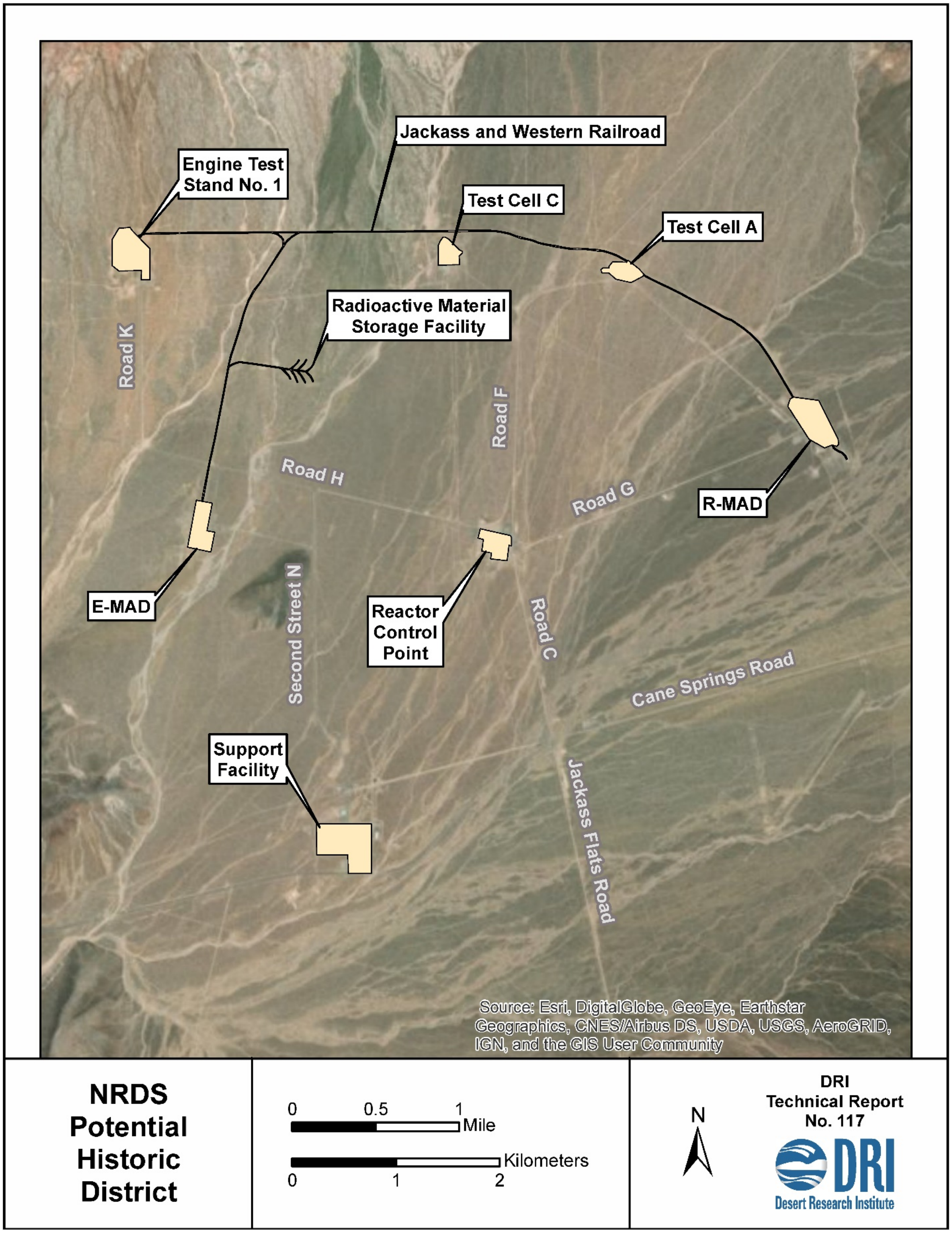

Figure 3. Map of the major facilities within the Nuclear Rocket Development Station.

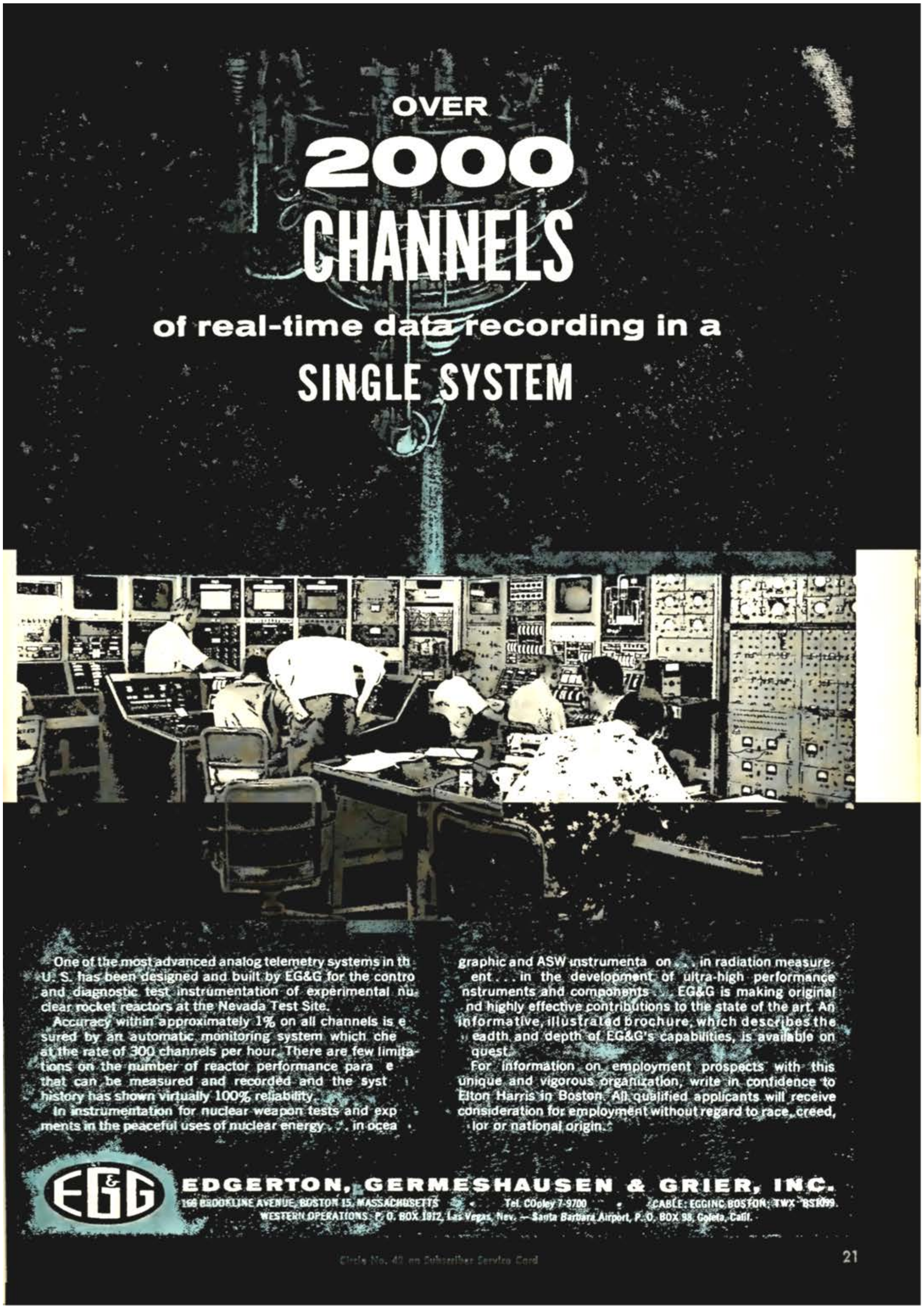

Figure 4. Advertisement from the March 26, 1962, issue of the trade publication *Missiles and Rockets* highlighting the advanced analog telemetry system EG&G designed and built in one of the NRDS facility control rooms (from M&R 1962c:21).

Figure 5. The Vitro Corporation integrated their award for the E-MAD design and engineering contract into a spring 1962 advertising campaign (from M&R 1962d:8).

Figure 6. In 1965, the Catalytic Construction Company engaged artist John Falter to produce a series of illustrations comparing their construction projects with iconic historic architecture. Catalytic's Rover and Apollo projects representing their space program work appeared with the Tower of Pisa. The ad copy notes Galileo's use of the tower for his 17th century astronomy and physics research. The ad series ran in *Newsweek* in early 1966 (print from the John Falter collection, History Nebraska image: museum #10645-2273).

Figure 7. Chicago Bridge and Iron promotional campaign regarding its construction activities at the NRDS and Test Cell C facilities featured in an August 1963 trade journal (from M&R 1963c:37).

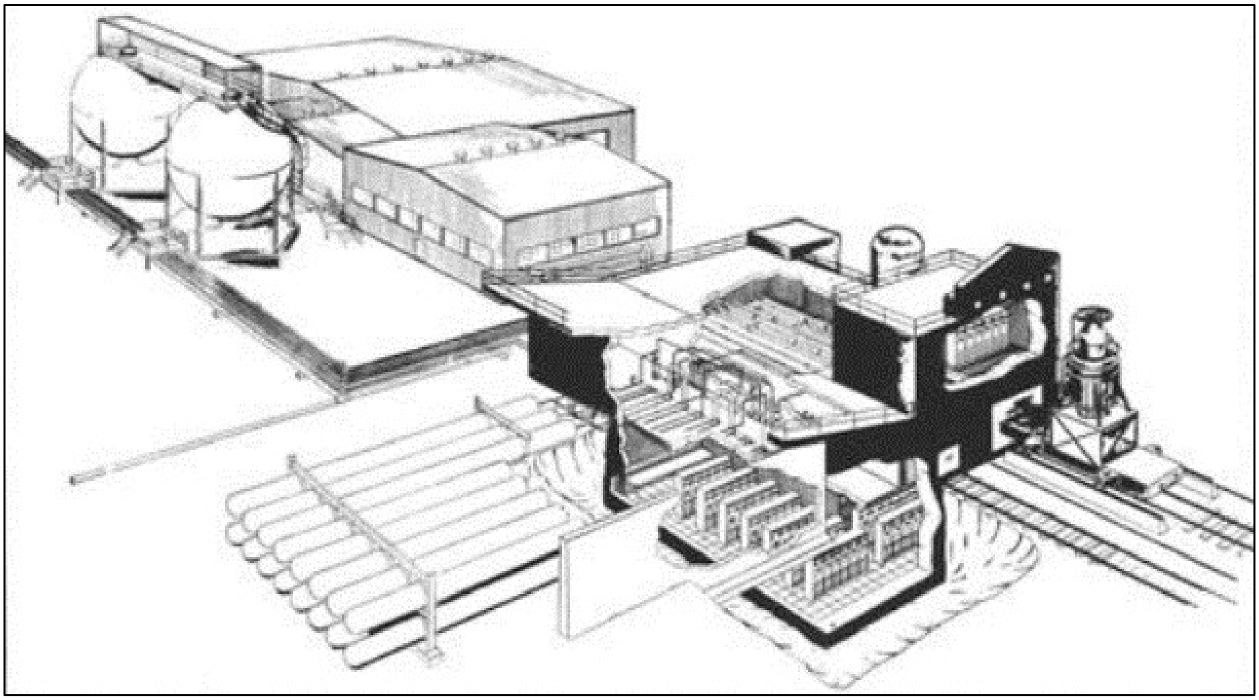

Figure 8. The initial (1960-1961) layout of the central structures of Test Cell C (detail from AW 1960e:89).

Figure 9. President John F. Kennedy departs from the Nuclear Rocket Development Station after a brief inspection visit on December 8, 1962. At the President's left are: Dr. Glenn T. Seaborg, Chairman of the U.S. Atomic Energy Commission; Senator Howard Cannon, (D-NV); Harold B. Finger, Manager of the Space Nuclear Propulsion Office; and Dr. Alvin C. Graves, Director of test activities for the Los Alamos Scientific Laboratory (Los Alamos National Laboratory).

Figure 10. The Kiwi Transient Nuclear Test, Test Cell C facility at right (NASA 1965).

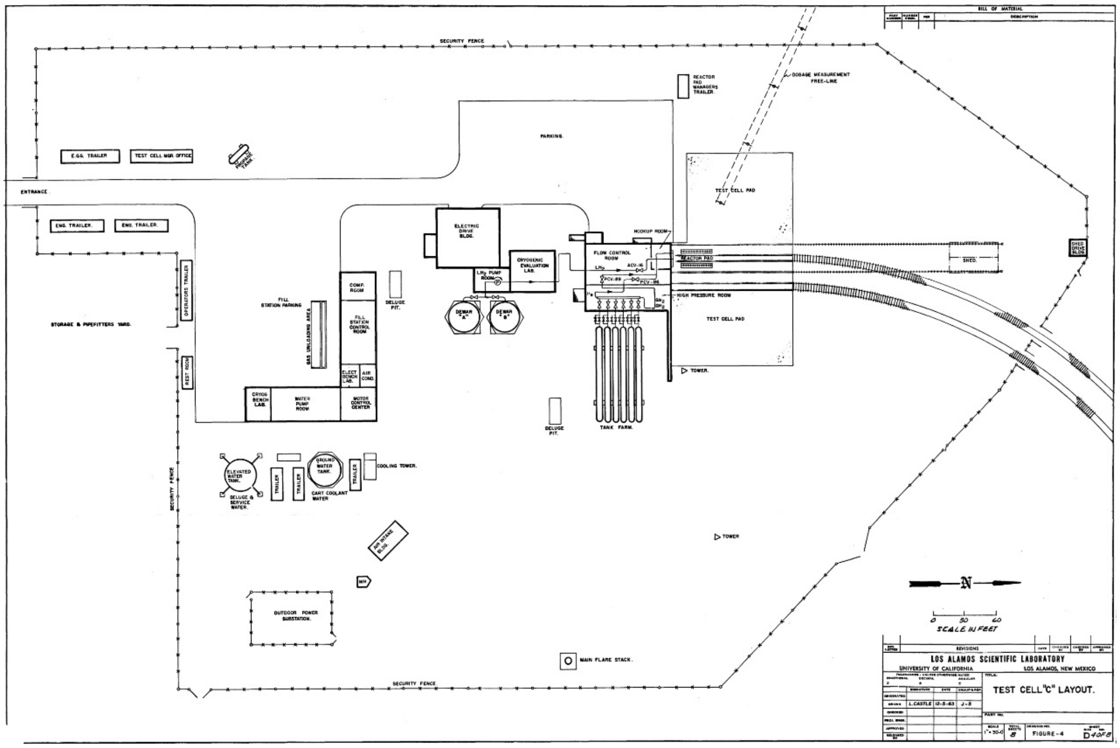

Figure 11. Plan of Test Cell C in 1963 (detail from Los Alamos Scientific Laboratory drawing Test Cell "C" Layout, Drawing No. SK-169 J-5, Sheet 4 of 8, 1963).

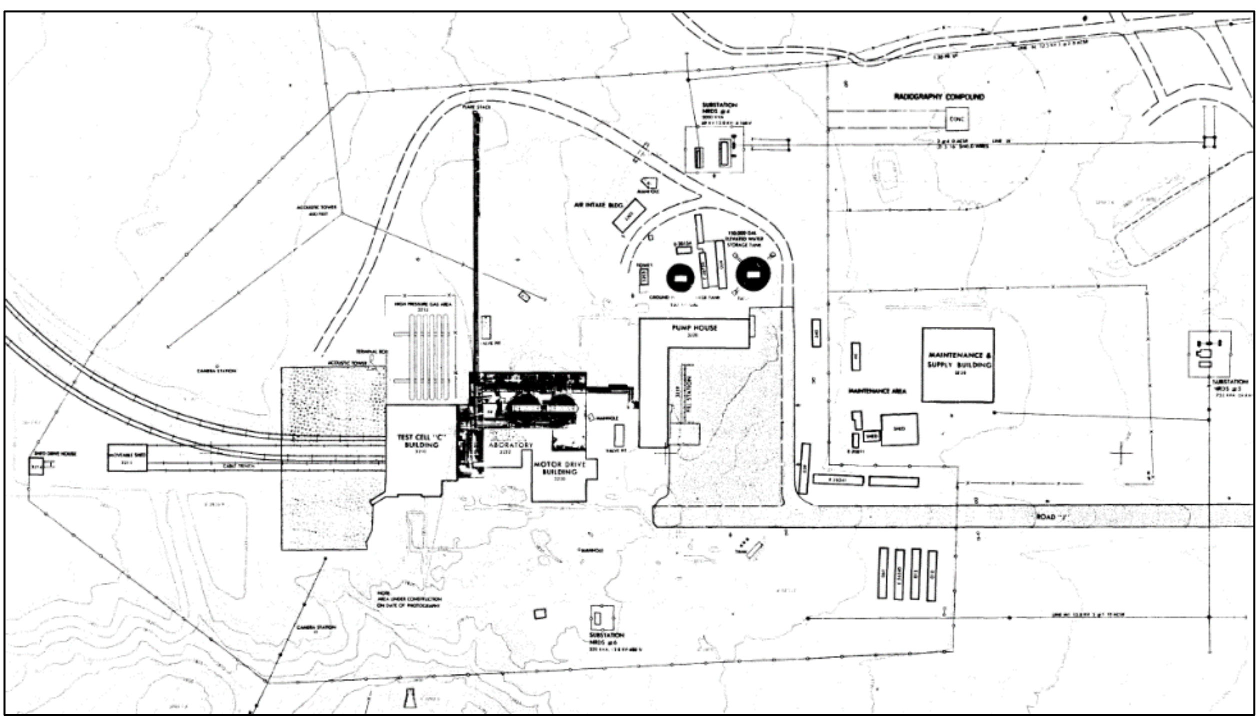

Figure 12. Plan of Test Cell C in early 1965 prior to the major expansion (detail from Koogle & Pouls Engineering Drawing NRDS-SF-M/C 6 (file 112716), 1965).

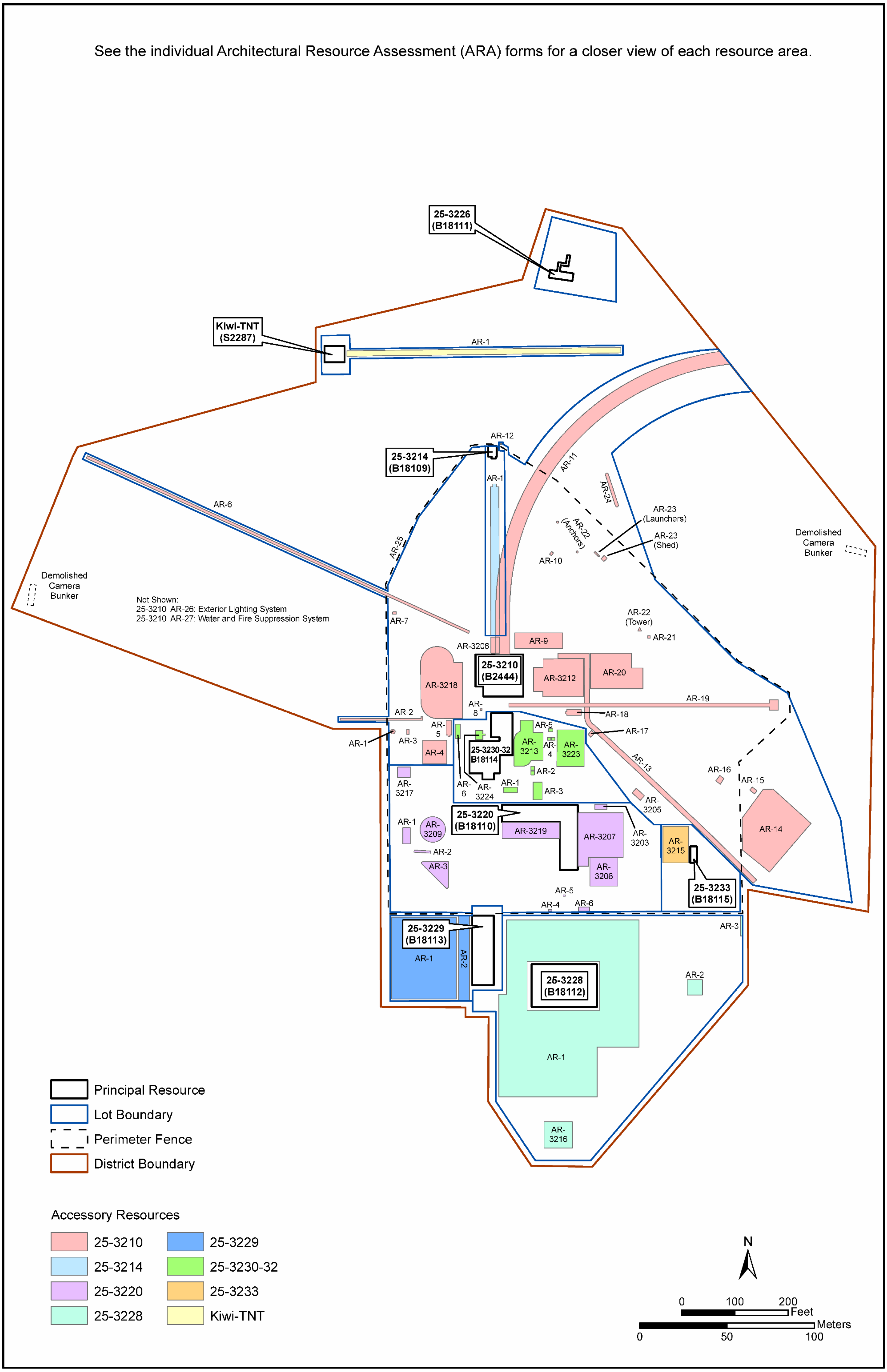

Figure 13. Plan of completed Test Cell C showing the recorded resources (based on Los Alamos Drawing SK-125-D Rev. H (file 108269) 1966 rev. 1972).

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Figure 14. Overview of Test Cell C, circa 1967, facing south (RSL c. 1967).

Figure 15. Overview of Test cell C in 2000, facing southeast (RSL 2000).

Figure 16. West Camera Bunker remnants, facing northwest (DRI 2019, Photo 181).

Figure 17. Oblique view facing southeast of the north and west elevations of 25-3210 circa 1967 (RSL c. 1967).

Figure 18. A current view facing southwest of the concrete slab at the former location of 26-3210 (DRI 2019, Photo 446).

Figure 19. A current view facing south of the concrete slab at the former location of 26-3210 (DRI 2019, Photo 448).

Figure 20. AR-3205 (25-3210), Air Intake Building, now demolished, facing south and west (REECo, details from Photo 892-5 at left, 1960, and Photo 892-9 at right, 1961).

Figure 21. AR-3205 (25-3210), Air Intake Building foundation, facing northeast (DRI 2019, Photo 666).

Figure 22. Remnant foundation and gravel-filled rail paths of 25-3210/AR-3206, the Reactor Pad (DRI 2019, Photo 458).

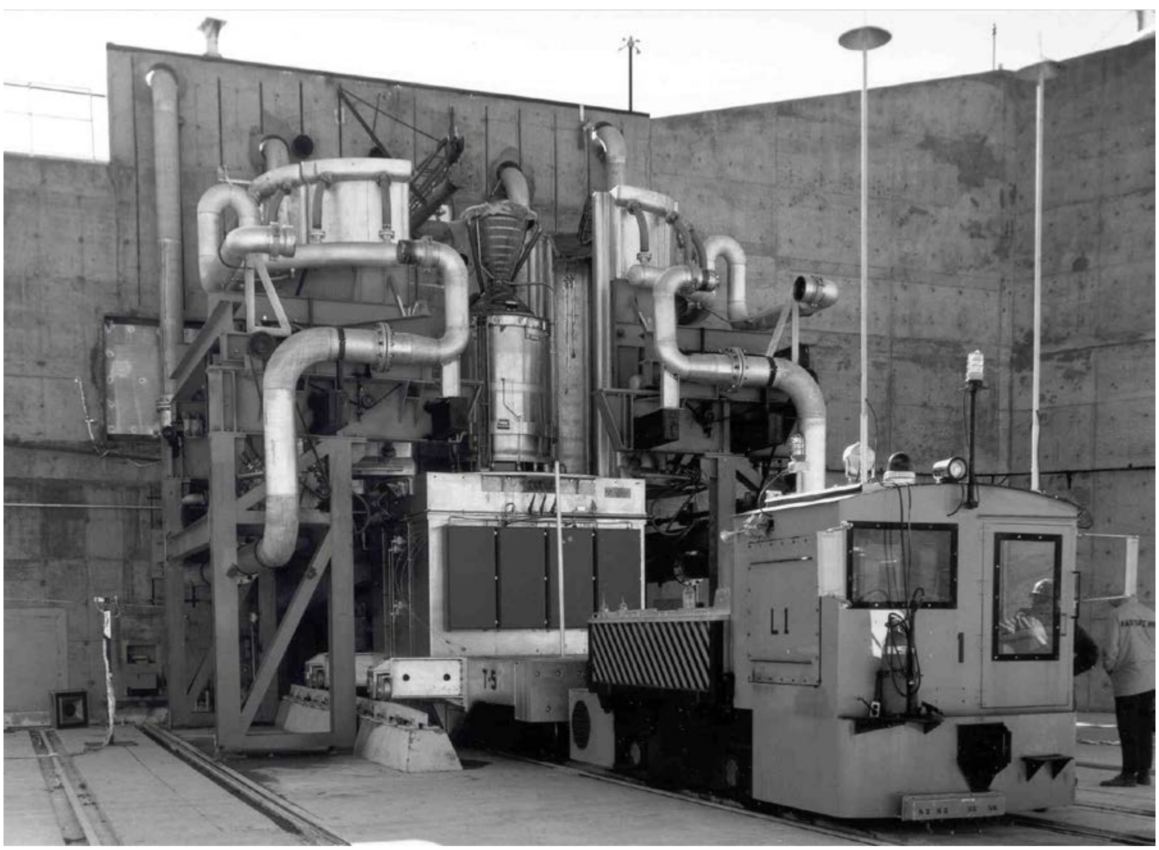

Figure 23. Phoebus 1B nuclear test vehicle being placed on the Reactor Pad (25-3210/AR-3206) against the shielding wall by Engine L1 (RSL, 1967).

Figure 24. AR-3218A and B (25-3210), LH2 Dewars 1 and 2, facing southwest (DRI 2019, Photo 452).

Figure 25. AR-3218C (25-3210), the Turbine Energy Source/ Exchanger, facing south, showing connections with the west wall of Building 25-3210 at left (RSL 2009, Photo 2009-28).

Figure 26. AR-3218C (25-3210), current detail of expansion joints of the Turbine Energy Source/Exchanger, facing northwest (DRI 2019, Photo 486).

Figure 27. AR-5 (25-3210), Deluge Pit #3, facing northwest (DRI 2019, Photo 350).

Figure 28. AR-6 (25-3210), Dosage Measurement Aerial Trolley, poles across Topopah Wash, facing northwest. Nearest pole inside the perimeter fence has trolley bracket at top and communications/ electronic lines below (DRI 2019, Photo 372).

Figure 29. AR-10 (25-3210), Camera Station Pedestal, facing southwest toward Reactor Pad (DRI 2019, Photo 532).

Figure 30. AR-9 (25-3210), Nuclear Furnace Cleanup System, facing southwest (RSL 2009, Photo 2009-5). The equipment was removed and the shielding wall in the background was demolished.

Figure 31. AR-11 (25-3210), Railroad Transport System delivering the PEWEE nuclear test vehicle to the Reactor Pad (RSL, 1967).

Figure 32. AR-18 (25-3210), Deluge Pit #1, facing east (DRI 2019, Photo 430).

Figure 33. AR-19 (25-3210), Flare Stack, now removed (REECo 1961, Photo 1065-7).

Figure 34. AR-19 (25-3210), skeletal steel supports and concrete piers, remnants at the east end of the flume and Flare Stack footer shown above (DRI 2019, Photo 564).

Figure 35. AR-23 (25-3210), JATO Area, facing east, showing berm, rocket canisters, and control shed (DRI 2019, Photo 536).

Figure 36. AR-24 (25-3210), Relocated Tank stored outside of the northern perimeter fence, facing north (DRI 2019, Photo 90).

Figure 37. AR-25 (25-3210), Main Gate, facing north (DRI 2019, Photo 44).

Figure 38. AR-25 (25-3210), Interior side of Gate 3, an example of a typical panic gate, facing south (DRI 2019, Photo 256).

Figure 39. AR-26 (25-3210), typical poles and floodlights (DRI 2019, Photo 364).

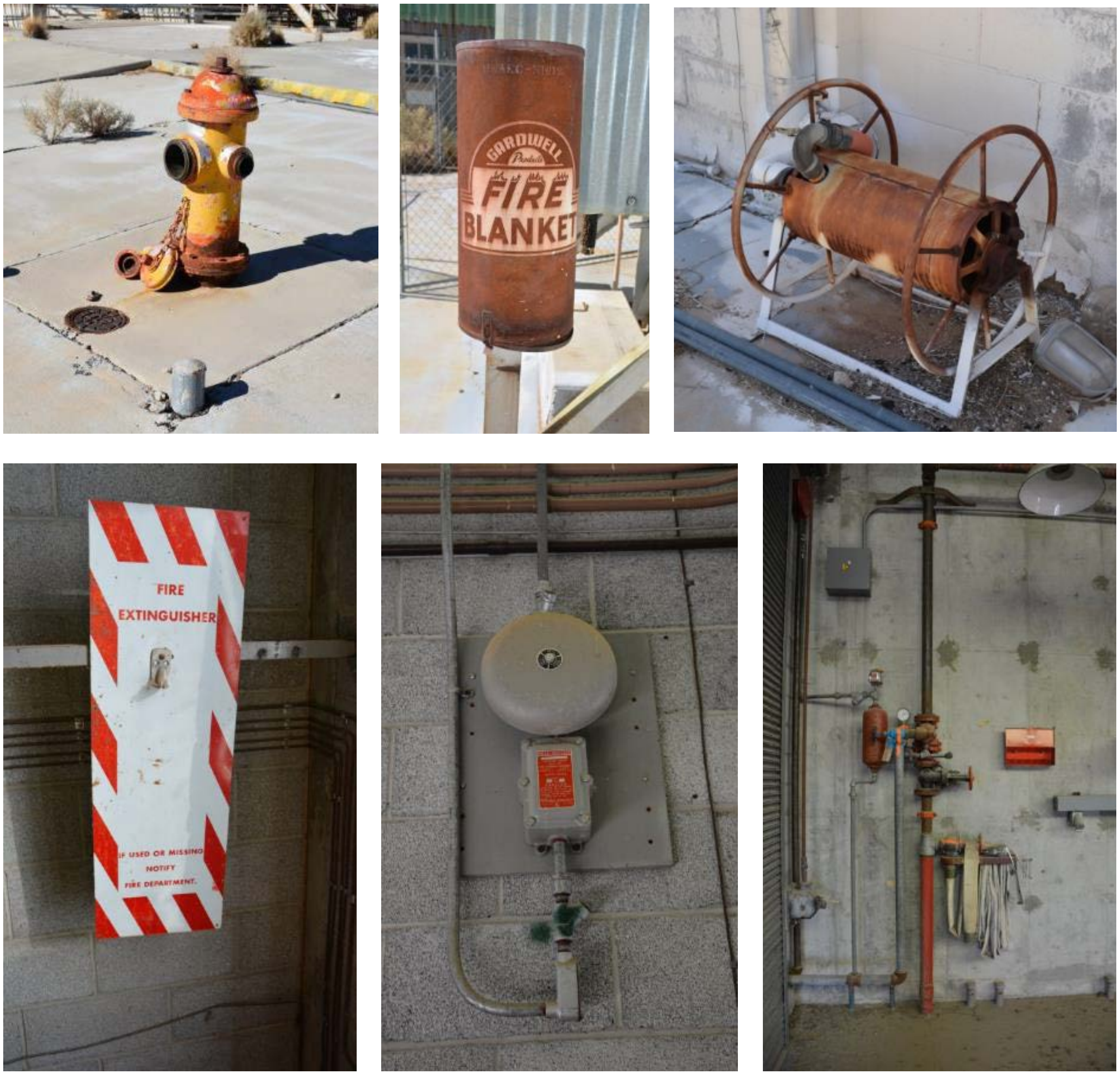

Figure 40. AR-27 (25-3210), details of Water and Fire Suppression System (DRI 2019, Photos moving clockwise starting with top left: 614, 618, 612, 682, 692, 690).

Figure 41. Reactor Shed Funicular Railroad, facing southeast (Detail, RSL 2000). Two phases of slab construction are evident. Both gabled buildings have been demolished.

Figure 42. Reactor Shed 25-3211, front (south) elevation, facing north. The building no longer exists (RSL, Photo 2009-3, 2009).

Figure 43. West and north elevations of the former Reactor Shed, facing southwest, with the Building 25-3210 shield wall in the left background (RSL, 2009-4, 2009).

Figure 44. Shed Drive Building foundation in foreground facing south, with Track and Drive Cable system (25-3214/AR-1) in background. (DRI 2019, Photo 168).

Figure 45. AR-1 (25-3214), Stop blocks at the north end of the tracks and the control box, facing northwest (DRI 2019, Photo 500).

Figure 46. Seen top to bottom: south elevation of Support Building 25-3220, with Fill Station area at left, facing north; east and north elevations facing southwest; and north and west elevations facing southeast (DRI 2019, Photos 206, 224, 234).

Figure 47. Aerial view of Support Building 25-3220 (below arrow), facing south (RSL c. 1967).

Figure 48. AR-3203 (25-3220), rectangular Cooling Tower, facing northeast (DRI 2019, Photo 284).

Figure 49. AR-3207 (25-3220), Mixing Tank with overhead crane for Borated Water System, facing west (DRI 2019, Photo 288).

Figure 50. AR-3207 (25-3220), Cooling Tower for Borated Water System, facing southeast (DRI 2019, Photo 598).

Figure 51. AR-3207 (25-3220), Borated Water Storage Tank, facing west (DRI 2019, Photo 276).

Figure 52. AR-3208 (25-3220), elevated water tank for the Conditioned Water System, facing northeast (DRI 2019, Photo 101).

Figure 53. AR-3209 (25-3220), Moderated/Processed Water Tank, facing northwest (DRI 2019, Photo 210).

Figure 54. AR-3217 (25-3220), remains of Substation #6, facing southwest (DRI 2019, Photo 356).

Figure 55. AR-3219 (25-3220), Gas Unloading Area (original LH2 Fill Station), facing northeast (DRI 2019, Photo 398).

Figure 56. AR-1 (25-3220), Process Water Heater, facing northwest. The base of the once vertical Water Conditioner (AR-2) is in the foreground (DRI 2019, Photo 378).

Figure 57. AR-3 (25-3220), manifolds, valves, regulators, and other Propane Storage Area related equipment mounted on small concrete pads, facing southwest (DRI 2019, Photo 380).

Figure 58. AR-6 (25-3220), concrete foundation of a restroom, facing east (DRI 2019, Photo 578).

Figure 59. AR-3226, overview of the North Camera Bunker, facing northwest (DRI 2019, Photo 116). Visible on the surface are the Periscope Gallery (left), Entry Shed (right), and Berm.

Figure 60. AR-3226, camera bays along the south elevation of the North Camera Bunker, facing north (DRI 2019, Photo 114).

Figure 61. AR-3226, detail of periscopes in westernmost bay of the North Camera Bunker (DRI 2019, Photo 154).

Figure 62. A period view of Warehouse 25-3228 at left, Operations Building 25-3229 at center, with Guard Hut and Main Gate to right of the center building on Road J, facing south (detail from RSL c. 1967). The Southwest Parking Lot is at right.

Figure 63. 25-3228 Warehouse concrete foundation, facing northeast (DRI 2019, Photo 12). Presently three vacant office trailers dating to the decontamination and demolition period of the early 2000s are stored on the slabs.

Figure 64. 25-3229, TCC Operations Building foundation, facing southwest (DRI 2019, Photo 22).

Figure 65. A period aerial view, facing south, of 25-3230-3232 – the Cryogenics Building (detail from RSL c. 1967). Horizontal dewars at left have been removed.

Figure 66. 25-3230, west and southern elevations of Motor Drive Building with Filter Room at right, facing northeast (DRI 2019, Photo 318).

Figure 67. 25-3230, south and east elevations of Motor Drive Building, facing northwest. Adjoining Cryogenic Pump Room (25-3231) is at right (DRI 2019, Photo 408).

Figure 68. 25-3230, Motor Drive Building motor pit, with generator and electric boxes in background, facing southwest (DRI 2019, Photo 946).

Figure 69. 25-3231, south elevation of Cryogenic Pump Building, facing north (DRI 2019, Photo 412).

Figure 70. 25-3231, interior equipment of Cryogenic Pump Building, facing northwest (DRI 2019, Photo 1004).

Figure 71. 25-3232, west elevation of Cryogenic Evaluation Lab, facing east (DRI 2019, Photo 332).

Figure 72. 25-3231, interior of the Cryogenic Lab, facing southwest (DRI 2019, Photo 1020).

Figure 73. This photo of Dewar 4, 25-3230-32/AR-3213 under construction shows its double-wall construction (REECo 1960, Photo 888-10).

Figure 74. AR-3213 (25-3230-32), Liquid Hydrogen (LH2) Dewars 4 and 5, facing southwest (DRI 2019, Photo 426).

Figure 75. AR-1 (25-3230-32), Deluge Pit #2, facing east (DRI 2019, Photo 302).

Figure 76. AR-1 (25-3230-32), view into Deluge Pit #2, facing down and northwest (DRI 2019, Photo 300).

Figure 77. AR-3 (25-3230-32), Utility Gantry, facing south (DRI 2019, Photo 227).

Figure 78. AR-6 (25-3230-32), Health Physics Portable Building, facing northeast (DRI 2019, Photo 346).

Figure 79. 25-3233, Power House Building, facing northwest (DRI 2019, Photo 266).

Figure 80. 25-3233, Power House, is on the right. Substation 4 (AR-3215) is in the foreground, facing northeast (DRI 2019, Photo 262).

Figure 81. The Kiwi-TNT Reactor Test Stand (SHPO Resource No. S2287), facing northeast (DRI 2019, Photo 202). The North Camera Bunker is in the background.

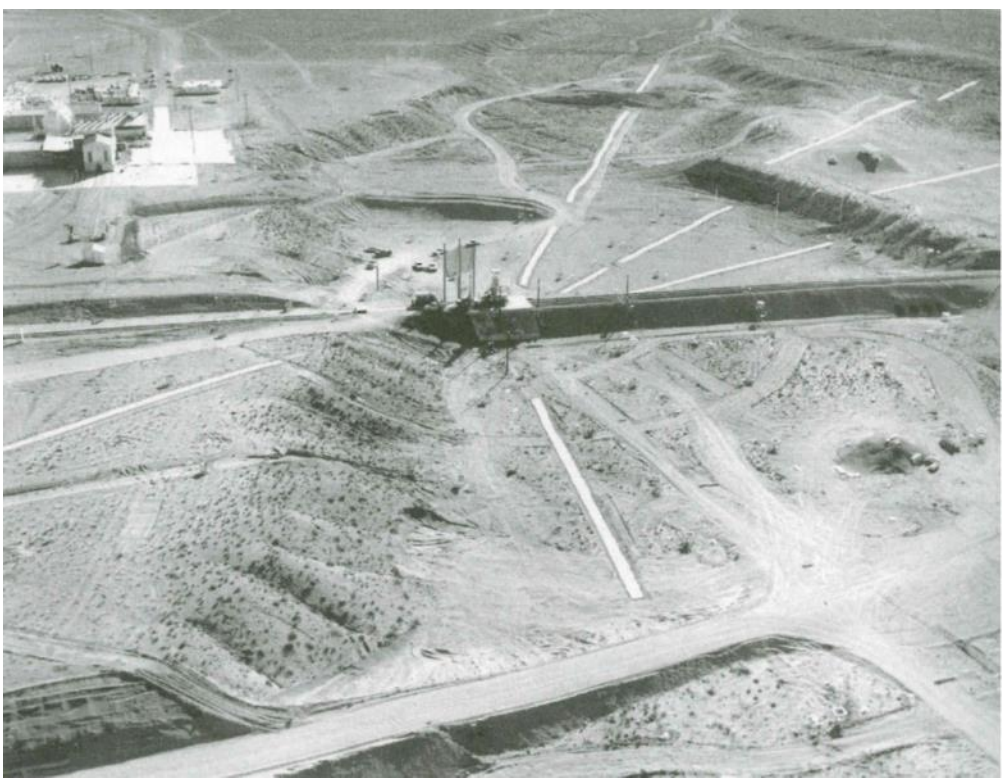

Figure 82. KIWI-TNT overview immediately prior to the test showing the bladed alignments radiating out from the test stand, facing south (photographer: Los Alamos Scientific Laboratory, reproduced from Dewar 2004:284).

Figure 83. The Kiwi-TNT Reactor Test Stand on causeway over Topopah Wash, facing west. Concrete-filled railroad bed (AR-1) is in foreground (DRI 2019, Photo 164).

Figure 84. A maze of pipes viewed from the roof of Building 25-3210 facing the southeast (RSL 2009-31).

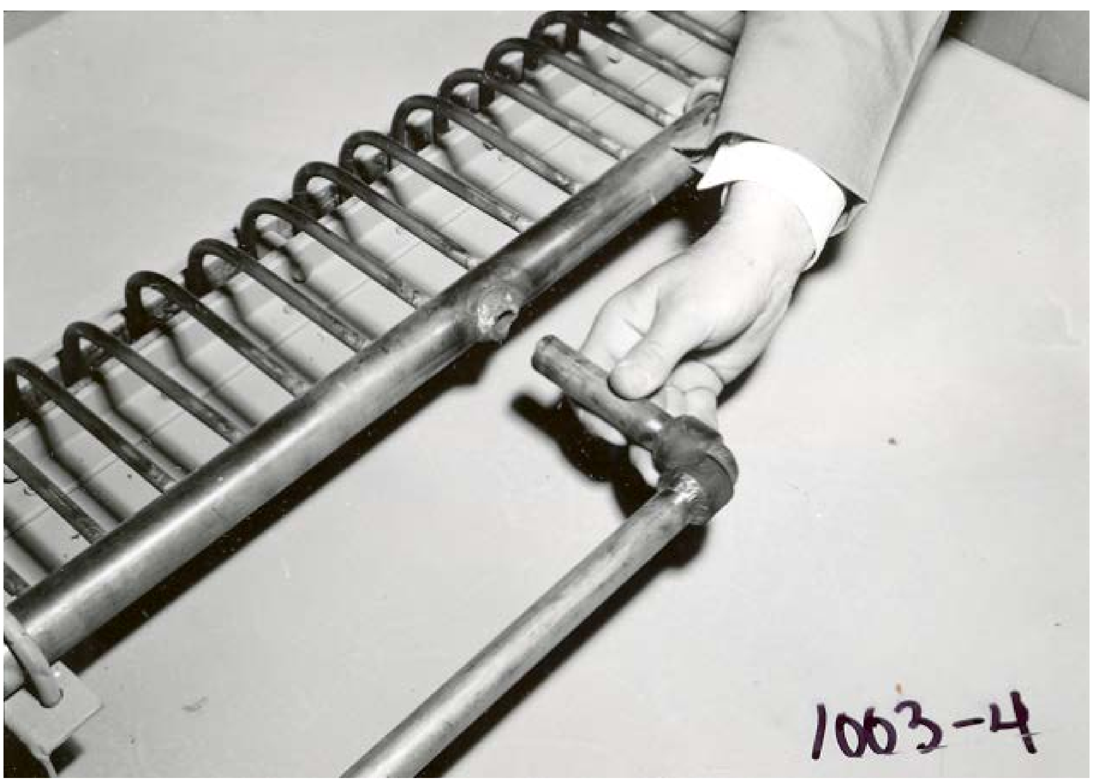

Figure 85. A welding failure (REECo 1003-4).

Figure 86. Test of the Phoebus 2A reactor at Test Cell C, June 28, 1968 (NASA). This southeast-facing image shows only the visible exhaust plume, but gives an indication of the radioactive plume released by each test. At the far left, excess hydrogen gas is being burned off at the Flare Stack (Los Alamos Scientific Laboratory).

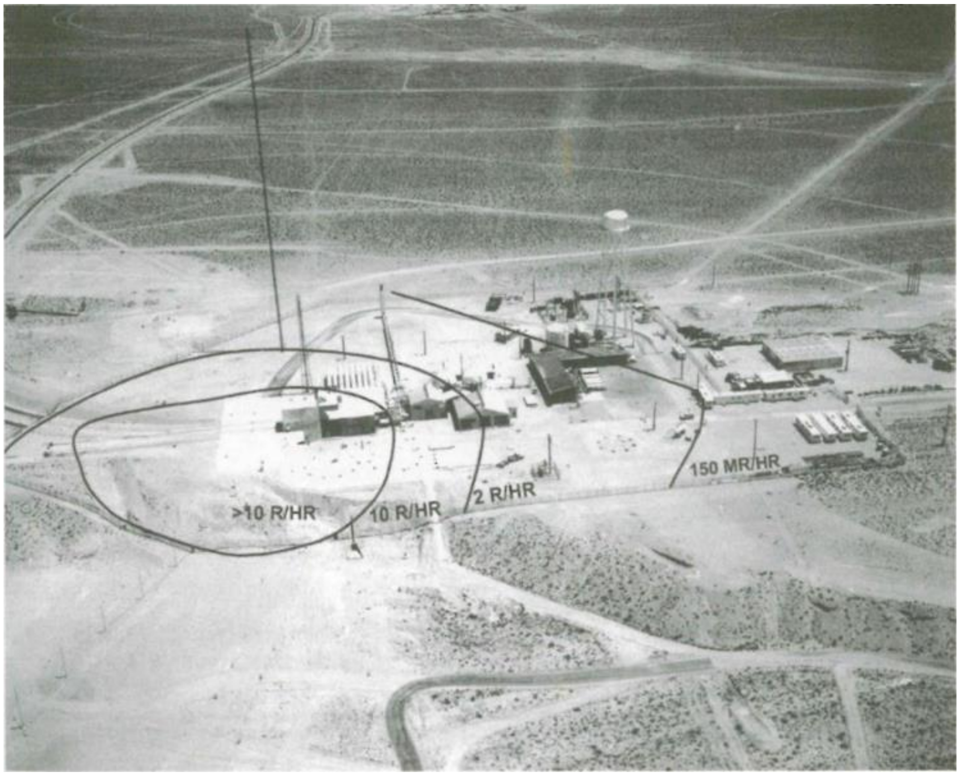

Figure 87. Test Cell C, facing east, showing radiation dose contours after the Phoebus 1A reactor incident of June 24, 1965 (photographer: Los Alamos Scientific Laboratory, reproduced from Dewar 2004:129).

Figure 88. Manual decontamination at Test Cell C using a truck-mounted vacuum and a lead-shielded dolly (photographer: Los Alamos Scientific Laboratory, reproduced from Dewar 2004:130).

APPENDIX A

REACTOR TESTS AND EXPERIMENTAL PLANS

CONDUCTED AT TEST CELL C

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Appendix A. Table 2. Reactor Tests and Experimental Plans conducted at Test Cell C

Run Date	Device	Experimental Plan No.	Test Cell	Purpose
12/14/62	Cold Flow	1	C	PCV-85' and PCV-89 checkout.
01/10/63	Cold Flow	2	C	Dewar pressurization test.
01/23/63	Cold Flow	2/A	C	Dewar pressurization test.
02/19/63	Cold Flow	3	C	NPS-1 electric drive test.
02/21/63	Cold Flow	3/A	C	NPS-1 electric drive test.
03/06/63	Cold Flow	3/B	C	NPS-1 electric drive test.
03/14/63	Cold Flow	3/C	C	NPS-1 electric drive test.
03/28/63	Cold Flow	4	C	LH, flow startup test.
05/22/63	Cold Flow	5	C	Cart LH, piping.
06/20/63	Cold Flow	1	C	Cold flow.
07/10/63	KIWI B-2NCF	2	C	Cold gas flow and LH, run.
07/12/63	KIWI B-2A/CF	3	C	Cold gas flow and LH, run.
07/19/63	KIWI B-2NCF	4	C	Cold gas flow and LH, run.
08/08/63	KIWI B-4B/CF	1	C	Facility checkout.
08/21/63	KIWI B-4B/CF	2	C	Gas and LH, run.
08/21/63	KIWI B-4B/CF	3	C	Gas and LH, run. Mixing chamber.
11/06/63	Cold Flow	1	C	NFS-2 turbopump checkout.
11/21/63	Cold Flow	2	C	Facility checkout (Hadley Valve Test).
12/06/63	CEL	1	C	Facility checkout (Hadley Valve Test).
12/13/63	CEL	2	C	Acoustic, checkout (high flow test).
01/08/64	High Flow	1	C	High flow test
01/31/64	KIWI B-4D/CF	1	C	Gas and LH, run
02/13/64	KIWI B-4D/CF	2	C	Gas and LH, run
02/13/64	KIWI B-4D	3	C	Facility checkout.
04/10/64	KIWI B-4D-202	1	C	Core instrumentation check.
04/22/64	KIWI B-4D-202	1/A	C	Reactor calibration.
04/30/64	KIWI B-4D-202	2	C	Reactor calibration.
05/02/64	KIWI B-4D-202	2/A	C	Reactor calibration.
05/05/64	KIWI B-4D-202	2/A	C	Scaled down full power run. Full power run.
05/08/64	KIWl B-4D-202	3	C	Gas and LH, run.
05/13/64	KIWI B-4D-202	4	C	Gas and LH, run. Mixing chamber.
06/04/64	Cart Valve	1	C	Elimination Study
06/18/64	Cart Valve	2	C	Elimination Study
07/02/64	Cart Valve	3	C	Elimination Study
07/08/64	Cart Valve	4	C	Elimination Study
08/06/64	KIWI B-4E-301	1	C	Facility checkout
08/12/64	KIWI B-4E-301	2	C	Core calibration check
08/20/64	KIWI B-4E-301	3	C	Reactor calibration
08/26/64	KIWI B-4E-301	4	C	Scaled down full power run
08/28/64	KIWI B-4E-301	5	C	Full power run
09/10/64	KIWI B-4E-301	6	C	Power restart run

Run Date	Device	Experimental Plan No.	Test Cell	Purpose
09/24/64	NRX-A2	4	C	Verify steady state design analysis for power operation.
10/29/64	CEL	3	C	Rocketdyne flow meter calibration
11/19/64	CEL	4	C	Rocketdyne flow meter calibration
01/12/65	KIWI	TNT	C	Transient Nuclear Test (nuclear safety experiment)
03/26/65		1	C	Heat exchanger
04/15/65		2	C	Heat exchanger
04/15/65		2/A	C	Heat exchanger
04/20/65		3	C	Heat exchanger (turbine bootstrap)
04/29/65		4	C	Heat exchanger (turbine bootstrap "Hex Reverse Flow")
05/27/65	PHOEBUS 1A-321	1	C	Facility checkout.
06/10/65	PHOEBUS 1A-321	2	C	Reactor calibration.
06/23/65	PHOEBUS 1A-321	3	C	Scaled down full power run.
06/25/65	PHOEBUS 1A-321	4	C	Full power run.
11/23/65	CEL	5	C	Invar heat transfer studies and cryogenic coupling evaluation.
12/09/65	CEL	6	C	Invar heat transfer studies and turbine flow meter calibration.
12/21/65	CEL	7	C	Heat exchanger studies and LH, orifice calibration.
01/01/66	CEL	8	C	Heat exchanger studies with LN,
03/02/66	Local Test	1	C	Process water system checkout
03/02/66	Local Test	2	C	Process water system checkout
03/15/66	Local Test	3	C	Reactor cool-down vaporizer checkout
03/15/66	Local Test	4	C	Reactor cool-down vaporizer checkout
04/13/66	PHOEBUS 1B	1	C	Mixing chamber check
04/22/66	PHOEBUS 1B	2	C	Mixing chamber check
06/22/66	PHOEBUS 1B	3	C	Pressurization and cryogenic line chilldown of Dewars 1 and 2
07/08/66	PHOEBUS 1B	4	C	Turbine energy source checkout
07/15/66	PHOEBUS 1B	4/A	C	Turbine energy source checkout
07/22/66	PHOEBUS 1B	4/B6	C	Turbine energy source checkout
08/31/66	PHOEBUS 1B	6	C	Mark 25 turbopump and high pressure Dewar test
09/02/66	PHOEBUS 1B	6	C	Mark 25 duration run
09/14/66	PHOEBUS 1B	6/A	C	Mark 25 turbopump and high pressure Dewar test
09/15/66	PHOEBUS 1B	6/A	C	Mark 25 turbopump and high pressure Dewar test
09/29/66	PHOEBUS 1B	6/B	C	Mark 25 duration run

Run Date	Device	Experimental Plan No.	Test Cell	Purpose
09/30/66	PHOEBUS 1B	6/B	C	Mark 25 duration run
10/06/66	PHOEBUS 1B	6/B	C	Program check and high pressure Dewar check out
10/18/66	Local Test	7	C	Borated water system check
10/19/66	Local Test	7’	C	Borated water system check
10/19/66	Local Test	7/A	C	Borated water system check with sodium-24
11/03/66	PHOEBUS 1B	10	C	Dummy pressure vessel test
11/17/66	Local Test	7/B	C	Borated water stratification test
12/07/66	PHOEBUS 1B	7	C	Facility checkout
12/09/66	PHOEBUS 1B	7	C	Facility checkout
12/15/66	PHOEBUS 1B	7/A	C	Facility checkout – Mark 25 duration test
01/06/67	PHOEBUS 1B	X/A	C	Facility checkout – Mark 25 green run and high flow
01/18/67	Local Test		C	Shield reactivity worth test
01/20/67	Local Test		C	Rods hydraulic accumulator capacity test
01/25/67	PHOEBUS 1B	1	C	Reactor calibration and gas flow run
01/26/67	PHOEBUS 1B	1’	C	Reactor calibration and gas flow run
02/02/67	PHOEBUS 1B	2	C	Simulation run and thermal instrumentation check
02/03/67	PHOEBUS 1B	2	C	Simulation run and thermal instrumentation check
02/10/67	PHOEBUS 1B	3	C	Startup to intermediate power
02/17/67	PHOEBUS 1B	4	C	Full power run – cancelled
02/23/67	PHOEBUS 1B	4	C	Full power run
04/19/67	NSF-3B	1	C	Initial operation and intermediate speed testing
04/26/67	NSF-3B	2	C	Intermediate and high-speed testing
05/10/67	NSF-3B	3	C	Single mode high-speed pump test
05/25/67	NSF-3B	4	C	High-speed testing and control system response test
05/26/67	NSF-3B	4	C	NRX-A6 startups and stall tests
06/14/67	NSF-3B	5	C	PHOBUS – startups and shutdowns
06/15/67	NSF-3B	5	C	High speed duration run
07/12/67	PHOEBUS 2CF	1	C	Cold flow
07/19/67	PHOEBUS 2CF	2	C	Cold flow
07/23/67	PHOEBUS 2CF	4	C	Cold flow
07/27/67	Local Test		C	Reactor cool-down vaporizer performance
08/17/67	PHOEBUS 2CF	3	C	Cold flow
08/31/67	NRX-A6		C	Local Test #1
09/07/67	NRX-A6	1	C	Facility checkout

Run Date	Device	Experimental Plan No.	Test Cell	Purpose
09/21/67	NRX-A6	2	C	Facility checkout
10/05/67	PHOEBUS 2	1	C	Shutdown studies
10/19/67	NRX-A6	3	C	Facility checkout
11/21/67	NRX-A6	1	C	Initial criticality test
12/06/67	NRX-A6	2	C	System interaction checkout
12/06/67	NRX-A6	3	C	Full power run - aborted
12/07/67	NRX-A6	3	C	Full power run - aborted
12/08/67	NRX-A6	3	C	Full power run - aborted
12/14/67	NRX-A6	3/A	C	Full power run - aborted
12/15/67	NRX-A6	3/A	C	Full power run
01/19/68	PHOEBUS 2A		C	Turbine spin local test
02/14/68	PHOEBUS 2	2	C	Facility checkout –shutdown studies
02/15/68	PHOEBUS 2	2	C	Facility checkout –shutdown studies
02/21/68	PHOEBUS 2	2A	C	Facility checkout –shutdown studies
03/06/68	PHOEBUS 2	2B	C	Facility checkout –shutdown studies
03/20/68	PHOEBUS 2	3	C	Facility checkout –shutdown studies
04/02/68	PHOEBUS 2A		C	Dewar 3 checkout
04/08/68	PHOEBUS 2A		C	Shield annulus borated water system test
04/24/68	PHOEBUS 2A		C	Rods and servo hydraulics system checkout
04/25/68	PHOEBUS 2A		C	Emergency and critical power systems checkout
04/25/68	PHOEBUS 2A		C	Shield annulus and privy roof borated water test
05/07/68	PHOEBUS 2A		C	Thermal spray system test
05/15/68	PHOEBUS 2A		C	Privy inerting checkout
05/16/68	PHOEBUS 2A		C	Shield annulus borate water system
05/17/68	PHOEBUS 2A		C	Thermal spray system test
05/20/68	PHOEBUS 2A		C	GN2 high flow test
05/22/68	PHOEBUS 2A	1	C	Reactor calibration run
05/23/68	PHOEBUS 2A	1	C	Reactor calibration run
05/29/68	PHOEBUS 2A	2	C	Facility interaction test
06/05/68	PHOEBUS 2A	3	C	Intermediate power run – aborted
06/07/68	PHOEBUS 2A	3	C	Intermediate power run - aborted
06/08/68	PHOEBUS 2A	3	C	Intermediate power run
06/26/68	PHOEBUS 2A	4	C	High power run
07/18/68	PHOEBUS 2A	5(A&B)	C	High power run
08/14/68	MARK 25	1	C	Acceptance test
08/21/68	MARK 25	1	C	Acceptance test
09/19/68	MARK 25	1	C	Acceptance test
09/19/68	PEWEE 1	1	C	Facility checkout
10/09/68	PEWEE 1	2	C	Facility checkout
10/17/68	PEWEE 1		C	Emergency power local test

Run Date	Device	Experimental Plan No.	Test Cell	Purpose
10/18/68	PEWEE 1	3	C	Facility checkout
11/05/68	PEWEE 1		C	Borated water local test
11/06/68	PEWEE 1		C	Servo hydraulics system local test
11/06/68	PEWEE 1		C	Supercritical and 28-V battery bank decay tests (conducted through 11/13/68)
11/11/68	PEWEE 1		C	Rods hydraulic system local test
11/12/68	PEWEE 1		C	Borated water local test
11/13/68	PEWEE 1		C	Annulus purge and privy inerting
11/15/68	PEWEE 1	1	C	Reactor calibration run
11/21/68	PEWEE 1	2	C	Interaction check and high power run
12/04/68	PEWEE 1	3	C	Full power run
12/05/68	PEWEE 1		C	Post-criticality attempt
12/06/68	PEWEE 1		C	Post-criticality test
12/11/68	PEWEE 1		C	Post-criticality test
09/17/70	PEWEE 2	I	C	Facility emergency shutdown system checkout
10/08/70	PEWEE 2	II	C	Facility emergency shutdown system checkout
05/24/72	NF-1	IA	C	System check – intermediate power run
05/25/72	NF-1	IA	C	System check - intermediate power run - aborted
06/01/72	NF-1	IB	C	System check – intermediate power run
06/29/72	NF-1	II	C	Intermediate power run – system checkout
07/12.72	NF-1	III	C	Full power run- extended duration - aborted
07/21/72	NF 1	IV	C	Full power run – extended duration - aborted
07/21/72	NF 1	IV	C	Full power run – extended duration
07/27/72	NF-1	V	C	Full power run – extended duration

Note: The table has been adapted from Friesen 1995: and a number of other sources (AEC 1969; LASL 1970:18; LASL 1973). The number of runs and events are based on available data linking specific tests with a test cell location but may not include the entire series of test activities. For example, data on the NRX-A2 and NRX-A3 preliminary test runs could not be located (Friesen 1995:83) and only minimal data is available of the PEWEE facility test runs. No hot runs were ever conducted for PEWEE 2 (Dewar 2004:168-170).

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APPENDIX B

IMACS SITE FORM – 26NY11258, BUILDING 25-3210

HISTORICAL PROPERTIES INVENTORY FORM – TEST CELL C

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IMACS SITE FORM
PART A - Administrative Data

* 1. State No.: 26NY - 011258

* 2. Agency No.: 000725

3. Temp. No.: 021500NG01

4. State: Nevada County: NYE CTY

5. Project: HISTORICAL EVALUATION OF THE TEST CELL C FACILITY, BUILDING ~~3110~~ 3210

* 6. Report No.: SR021500-1

7. Site Name: TEST CELL C FACILITY

8. Class ___ Prehistoric _X_ Historic
___ Paleontologic ___ Ethnographic

9. Site Type: HISTORIC FACILITY FOR NUCLEAR ROCKET DEVELOPMENT

*10. Elevation: 03820 ft

*11. UTM Grid Zone 11 564,440 m E 4,076,200 m N

*12. of of of Section T. 00 R. 000

*13. Meridian: 21-MT DIABLO

*14. Map Reference: JACKASS FLATS 7.5 1983

15. Aerial Photo:

16. Location and Access:

Test Cell C is in Area 25 of the NTS. The facility was part of the Nuclear Rocket Development Station (NRDS) complex and is reached from the town of Mercury, Nevada on the NTS by either the Jackass Flats Road directly or the Cane Spring Road via the Mercury Highway. Both routes are paved and eventually cross at an intersection of the Cane Spring and Jackass Flats roads at the southern edge of the NRDS complex where the 500 Gate for access to the NRDS was located. The route along the Jackass Flats Road proceeds west and northwest from Mercury about 23 miles (37 km) to the intersection, passing through Mercury

16. Location and Access (continued):

and Rock valleys and between Skull Mountain and Little Skull Mountain. The other route is north from Mercury along the Mercury Highway for about 13 miles (21 km) over the Checkpoint Pass and into Frenchman Flat, turning west at the Cane Spring Road turnoff and then proceeding another 17 miles (27 km) past Cane Spring and through Wahmonie Flat and the historic mining town of Wahmonie to the intersection. The Test Cell C facility is then reached from the intersection by going directly north about 2.5 miles (4 km) along Road C and Road F, passing through the Reactor Control Point complex, to the turnoff to Road J and going another 0.8 mile (1.3 km).

*17. Land Owner: OTHER (NEVADA TEST SITE)

*18. Federal Administrative Units:

*19. Management Unit (USFS only)

20. Site Description:

Test Cell C was one of seven separate but interconnected complexes associated with the NRDS in Area 25 of the NTS. The mission of the NRDS was to develop and test nuclear reactors and engines for rockets in the space program of the United States from the late 1950s to the early 1970s. Test Cell C operated from 1961 to 1973. It was second in a series of test locales at the NRDS and reflects the upgrades in construction and technology when compared to the earlier Test Cell A as knowledge was gained over time and improvements were implemented to correspond with the testing requirements of the Rover program. The facility is bounded by a chain link fence, with the main entry from the south where a large paved parking area and the main operations building and maintenance yard are found. Secondary gates in the fence are positioned at the train tracks entering and leaving the facility and at key locales where people can enter or exit through smaller personnel gates from the other cardinal directions. The complex features five dewars, a 150,000 gallon elevated water tower, a surface 150,000 gallon water reservoir tank, several buildings, and abundant piping. A dewar is a double-walled container for holding liquid and gas supplies.

The test cell building, Building 3210, is mostly a high one-story flat-roofed building, with a basement, a small penthouse on top, and a high shielding wall forming its north elevation. Railroad tracks extend northward from its north face, where the nuclear reactors were placed for testing, to a tall, corrugated metal shed, where the reactors were stored from the weather and final adjustments made before the tests. These railroad tracks also connect to the overall railroad system for the NRDS by which test reactors and engines and other equipment were

20. Site Description (continued):

transported between facilities. The reactors and engines were assembled and later disassembled after testing at the R-MAD and E-MAD facilities.

Other buildings within the fenced compound include an air intake building (Building 3205), a pump house (Building 3220), an operations building (Building 3229), a motor drive building (Building 3230), and a cryogenic evaluation laboratory (Building 3232). Building 3228, a semi-permanent, metal maintenance and shop warehouse once located by the operations building has apparently been taken down and removed from the site. Two electric substations are present, one toward the southeast corner of the compound and the second one along the western edge. A secured radiography area is attached at the southeast corner of the facility. Two wooden camera bunkers, one to the west and the other to the north, stand outside the fence across a gully containing railroad tracks.

*21. Site Condition: Good

*22. Impact Agent(s): Currently slated to be demolished under the DOE/NV Environmental Management Deactivation and Decommissioning Program

*23. National Register Status: NATL REGISTER QUALITY-ELIGIBLE

Justify: Test Cell C is recommended to be eligible to the NRHP under criteria a and c, consideration g. Under criterion a, the scientific experiments for the Rover program conducted at Test Cell C were associated with and integral to the development of the space program of the United States and, currently, the technological achievements of this activity are being re-evaluated for application in future space programs for the twenty-first century. Furthermore, because of its location on the NTS there is a similarity between the nuclear reactor tests conducted at the NRDS and the other types of nuclear tests conducted, such as atmospheric and surface nuclear explosions. That is, the NTS was where nuclear devices were being tested. During the nuclear reactor tests at the NRDS there was the possibility of an excursion within the reactor leading to an explosion and the tests did release a radioactive exhaust plume into the atmosphere. Under criterion c, the special qualities of Test Cell C include its method of construction and technology associated with the direct testing of nuclear reactors. It was second in a series of test locales at the NRDS and reflects the upgrades in construction and technology when compared to the earlier Test Cell A as knowledge was gained over time and improvements were implemented to correspond with the testing requirements of the Rover program.

Justify: (continued)

For consideration g, a property must be less than fifty years old, of exceptional importance, and unquestionably historic. The official United States space program is less than fifty years old and buildings associated with its early history have been recognized by the National Register of Historic Places (NRHP) as meeting the requirements of exceptional importance. Test Cell C is one of the significant buildings associated with the development of this program. The Rover program ended almost 30 years ago, establishing a definitive historic time period for the construction and use of the facility. Furthermore, other facilities and objects within the NRDS have been recommended or determined eligible to the NRHP through consultation between DOE/NV and the Nevada SHPO. These are the E-MAD, the R-MAD, Jr. Hot Cell, and the Railroad Transport System. Building 2201 associated with the development of the nuclear ramjet engine has also been determined eligible to the NRHP as a contributing element of a historic property.

24. Photos

25. Recorded by Harold Drollinger

*26. Survey Organization: DESERT RESEARCH INSTITUTE

27. Assisting Crew Members: Colleen M. Beck, Desert Research Institute, Nancy Goldenberg, Carey & Co., Inc. Architects, and Rick Smith, Bechtel/Nevada

*28. Survey Date: 02/15/2000 to 03/16/2000

*29. Slope 04 (Degrees) 222 Aspect (Degrees)

*30. Distance to Permanent Water: ON-SITE WATER SYSTEM
Type of Water Source: DRILLED WELLS

*31. Geographic Unit: FORTYMILE CYN-JACKASS FLATS

*32. Topographic Location
Primary Landform: VALLEY
Secondary Landform: NOT-KNOWN
Describe: SLIGHTLY SLOPING

*33. On-site Depositional Context: ALLUVIUM
Description of Soil: GRAVELLY

34. Vegetation
*a. Life Zone: LOWER SONORAN
*b. Community:
Primary On-Site:
Secondary On-Site:
Surrounding Site:

*35. Miscellaneous Text:

36. Comments/Location of Curated Materials and Records

Photographs and negatives are housed at the Remote Sensing Laboratory, Bechtel/Nevada, Las Vegas, Nevada. Historic Atomic Energy Commission and Department of Energy videos concerning the Nuclear Rocket Development Station are also housed at this facility. Historic engineer drawings are kept on file at the Engineering Records Library, Mercury, Nevada. Field notes and other records are maintained at the curation facility of the Desert Research Institute, Las Vegas, Nevada.

26NY - 011258
IMACS SITE FORM
PART C - Historic Sites

1. Site Type: STRUCTURE RELATED TO U.S. SPACE PROGRAM

* 2. Historic Theme: NUCLEAR ROCKET DEVELOPMENT

* 3. Culture TWENTIETH CENTURY UNITED STATES

* 4. Oldest Date: 1961 Recent Date: 1973
How Determined? RECORDS

5. Site Dimensions: BUILDING 3210 LENGTH 80 ft (24 m), WIDTH 63 ft (19 m), HEIGHT 36 ft (11 m); AREA 12,180 sq ft (1,132 sq m)

*Area: TEST CELL C FACILITY 23 ACRES (9 HECTARES)

* 6. Surface Collection/Method: NONE
Sampling Method

* 7. Estimated depth of fill: APPROXIMATELY 15 FEET
How Estimated PRESENCE OF BASEMENT
(If tested, show location on site map.)

* 8. Excavation Status: UNEXCAVATED
Testing Method

* 9. Summary of Artifacts and Debris
Describe:

*10. Ceramic Artifacts
*a. Estimated Number of Ceramic Trademarks:
Describe:

*11. Glass
Describe:

12. Maximum Density - #/sq m (glass and ceramics)

*13. Non-Architectural Features (locate on site map)
Describe:

*14. Architectural Features (locate on site map)
#: ONE
MATERIAL: CONCRETE
TYPE: MULTI-ROOM STRUCTURE
Describe: TEST CELL C BUILDING 3210

Building 3210 is toward the northern portion of the site. The original building was about 80 ft (24 m) in length, 63 ft (19 m) wide, 36 ft (11 m) high above the ground surface, and with a floor area of 10,350 sq ft (962 sq m). The later addition to the ground floor on the west side of the building added another 1,830 sq ft (170 sq m) of floor space. The walls, with the exception of the north wall, are about 1.75 ft (0.5 m) thick, consisting of reinforced concrete. The north wall, also of reinforced concrete, where the reactor was placed for testing is 5.5 ft (1.7 m) thick. The exterior of Building 3210 is a complex, reinforced concrete mass surrounded and intersected by pipes, ducts, and equipment. The center portion of the north elevation where the reactor was placed for testing includes vertical inset grooves, cylindrical plates, wall-mounted equipment and stainless steel doors. The shielding wall angles forward and up at the west end. The east end is lower, and like the west end, has no building behind it. Low walls project from the eastern section of the wall and equipment, such as tanks and a steam generator, occupy the areas between them. The west elevation seen today is that of the addition to the test cell.. This high, one-story concrete wall features a plywood-enclosed loading door and large pipe penetrations connecting the building to the nearby dewar. The south elevation from west to east includes the later addition to the test cell, the freight elevator, and the original portion of the building, which is at a lower height than the addition. The addition is also set back from the face of the original building. Pipe railing stands at the top of the wall and large ducts and steel plates mounted low are attached to the addition. This elevations also features doors to the flow control room and the high pressure room, stairs down to the basement, and stairs up to the penthouse. The east elevation is mostly one story, with pipe railings along the roof. High, three-light windows are along the top portion of the wall, which features wall-mounted gauges at its lower reaches. A wide roof projection overhangs the wall.

The basement consists of four rooms: a large mechanical equipment room along the entire west and south sides of the building; a narrow electronics room in the northeast corner of the building; a small forward control room; and a small, raised room projecting north and outside from the northeast corner of the main building footprint.

The Mechanical Equipment Room is essentially an L-shaped, concrete-encased room, with a twelve feet high ceiling. Access is made by staircases at the northeast and southeast corners, as well as a freight elevator at the southeast corner. The stairs at the north end have been reconfigured since the original 1960 floor plan drawings and is attributed to modifications for the first floor addition. Three concrete piers supplement concrete

*14. Architectural Features (continued)

bearing walls to support the ceiling and structure above. Plywood form work marks are visible on walls and ceiling. The room is filled with pipes and ducts. Large pieces of mechanical equipment stand along the east wall. Ladder-like metal tracks below the ceiling carry wiring. Lighting fixtures are white metal shades with large glass globes.

The Electronics Room, also L-shaped, features a vinyl-asbestos-tile-over-concrete floor, and concrete walls with horizontal grooves, called out on drawings as embedded unistrut, running entirely around the room, evenly spaced at approximately two feet intervals. A metal track runs overhead, below the ceiling, carrying wiring. The ceiling finish is painted perforated asbestos paneling over mineral wool. Its door, at the south end of room, is approximately three inch thick steel with an enormous panic bar on the inside face that is marked with the name"Pogh." The outside face has a huge handle and rod opener.

The Forward Control Room is a small, nearly square room containing electrical panels and wires. It features floor, wall and ceiling treatments similar to the Electronics Room. This room is also entered by an enormous door identical to that described for the Electronics Room.

The fourth room in the basement is reached by four riser steps. It is rectangular, approximately 10 ft (3 m) wide in the east-west direction by 20 ft (6 m) long in the north-south direction. The room has a concrete ceiling and floor. The concrete walls have vertical unistrut imbeds instead of the horizontal ones seen in the Electronic and Forward Control rooms. A large piece of equipment stands at the center of the room.

The first floor, or ground floor, includes a nearly square original section with four rooms and a one-room addition to the west. Rooms in the original portion include a Flow Control Room, the largest in the building; a small Hookup Room, immediately north of the Flow Control Room; an Experimental Room, north of the Flow Control Room and east of the Hookup Room; and a High Pressure Room occupying the entire east side of the floor plate.

The Addition is on the west side of the building, tucking between the freight elevator and the northern staircase to the basement. The room features a concrete floor, walls, and ceiling. A metal catwalk is near the ceiling. Abundant electrical panels and conduit are mounted on the walls. Three cylindrical tanks topped by meters stand along the west wall. Big, floor-mounted metal equipment stands at the north and south ends. The room entry is from the west, through a large bay, now infilled with wood studs and plywood. Industrial lantern-like fixtures lit the space. A crane is mounted on the ceiling.

*14. Architectural Features (continued)

The concrete-encased Flow Control Room has a lower ceiling than the Addition. Its raised metal-grate floor, at approximately three feet above the concrete slab, runs between large pieces of floor-mounted equipment. Pipes run continuously beneath the floor grate. A metal pipe guardrail edges the platform. A large circular raised equipment mount occupies the southern end of the room. A large assemblage of pipes and ducts occupies the central area at the north end of the room. White metal industrial ceiling fixtures lit the space.

The Hookup Room features concrete floor, walls, and ceiling. Gauges and equipment mount to the walls. A 2 inch thick steel plate door, over a raised 3 1/2 inch high by 16 inch deep threshold, accesses the space from the Flow Control Room. In addition, an approximately 3 ft wide by 8 inch high horizontal opening penetrates the top of the wall separating the Flow Control Room and the Hookup Room. A ladder and ceiling hatch along the western side of the room leads to a space above, off-limits at the time of survey because of radiation. Lighting consists of flush-mounted flat squares in the ceiling, consisting of translucent lenses set into steel frames.

The Experimental Room features concrete floor, walls, and ceiling, and is filled with equipment. It is located east of the Hookup Room and off the Flow Control Room.
The narrow and rectangular High Pressure Room is oriented north-south, along the east side of the building, and has a double door access to the outside on the south wall. The ceiling slopes up to the east. A metal grate platform and two steps ascend to the adjacent Flow Control Room. The stairs occupy the southwest corner of the room. Conduit, equipment, and meters are mounted on all walls. Green-glazed windows, high on the east wall, allow some natural light. The north wall features a posted sign reading “shielded reactor wall.” Table-like equipment runs all along the east wall. At the ceiling are more ducts, pipes, and conduit. Lighting consists of white enameled metal shaded industrial fixtures.

The Penthouse occupies the northern end of the roof, situated directly over the Hookup and Experimental rooms. Inside are two rooms. The east Detector Room is windowless, concrete-encased, and features bays of electrical panels similar to the basement. Metal runs of conduit are above head, but below ceiling height. The west Neutronics Room has concrete floor, walls, and ceiling. A double set of paired steel doors enter the room from the roof in the middle of the south wall. An approximately four inch high raised concrete platform begins at the door. A steel mezzanine occupies the center of the room, with a steel-grate staircase and floor. A ladder-type wire mount attaches to the east wall, higher than the door.

15. Comments:

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HISTORIC PROPERTIES INVENTORY FORM

field/map# N/A

STATE HISTORIC PRESERVATION OFFICE
100 STEWART STREET
CARSON CITY, NEVADA 89710

DISTRICT/SITE/BUILDING/STRUCTURE/OBJECT
(circle one or more)

1. **NAME(S):** **County:** Nye
   Historic: Test Cell C
   Common: Test Cell C

2. **LOCATION:**
   street/road: Road J
   city/town: Nuclear Rocket Development Station, Area 25, Nevada Test Site

3. **USE/FUNCTION:**
   present: None
   original: Testing of nuclear reactors associated with the Rover nuclear rocket program of the United States.

4. **OWNER/ADDRESS:**
   present: Department of Energy, Nevada Operations Office
   P. O. Box 98518, Las Vegas, NV 89193-8518
   original: U.S. Atomic Energy Commission
   occupied or in use: No

5. **PARCEL** 6. **ACREAGE** (approx. of building site): 23 acres (9 hectares)

7. **UTM REFERENCE:** Zone 11 E 564,440 N 4,076,200

8. **PHOTO/SKETCH:** (see attached) 9. **PLAN:** (see attached)

10. **LOCALE/ENVIRONMENT:**

The environmental setting of the Test Cell C facility is in Jackass Flats located towards the northern extent of the Mohave Desert. Jackass Flats is a broad, open alluvial valley, characterized by sand and gravel with various size cobbles on the surface. Elevation ranges from 4,000 ft (1,219 m) in the north to 3,200 ft (975 m) in the south, with the Test Cell C facility toward the northern edge of the flats at 3,820 ft (1,164 m). Jackass Flats opens to the south between Yucca Mountain on the west and southwest and Little Skull Mountain to the south. The Calico Hills are directly north, Mid Valley and Lookout Peak are to the northeast, and Skull Mountain is to the southeast. Skull Mountain reaches an elevation of almost 6,000 ft (1,829 m), while Yucca Mountain approaches 5,000 ft (1,524 m). Fortymile Wash, the major drainage system in the area, meanders along the east base of Yucca Mountain and the west side of Jackass Flats and eventually joins with the Amargosa River to the south. Topopah Wash, about 1,300 ft (400 m) west of the facility, is a smaller drainage that originates in the Calico Hills and bisects Jackass Flats north-south. Dominant vegetation is creosote bush and bursage, followed by blackbrush, Mormon tea, thornberry, and in lesser amounts, other shrubs, grasses, and cacti. Fauna found in the area are kit fox, desert tortoise, western shovelnose snake, the sidewinder snake, speckled rattlesnake, gopher snake, coyote, bobcat, raven, red-tailed hawk, black-tailed jackrabbit, desert and Nuttall's cottontail, long-tailed pocket mouse, kangaroo rat, desert woodrat, white-tailed antelope squirrel, black-throated sparrow, horned lark, Say's phoebe, western kingbird, loggerhead shrike, chuckwalla, side-blotched lizard, and desert horned lizard. Other animals of note in the surrounding region include mountain lion, chukar, Gambel's quail, morning dove, golden eagle, and occasionally, bighorn sheep and antelope. The nearest natural water source is Topopah Springs 13 km (8 miles) directly north at the head of Topopah Wash. However, several drilled NTS wells were the source of water supply for the facility when the Nuclear Rocket Development Station (NRDS) was in operation (Space Nuclear Propulsion Office 1969:145). The first of these, J-11 and J-12, were drilled in 1957 and a third one, J-13, in 1962 when the casing failed on the first well. All were over a thousand feet deep.

11. **DESCRIPTION** (clarify as appropriate):

a. **Exterior Fabric**
Reinforced Concrete

b. **Structural System**
Reinforced concrete
Foundation: Reinforced Concrete

c. **Roofing Material**
Metal struts and concrete

d. **Describe roof type, doors, windows, porches, and any significant exterior and interior features** (use additional sheet if necessary)

The Test Cell C complex, constructed in 1961 (Space Nuclear Propulsion Office 1969:67), is bounded by a chain link fence, with the main entry from the south where a large paved parking area and the main operations building and maintenance yard are found. Secondary gates in the fence are positioned at the train tracks entering and leaving the facility and at key locales where people can enter or exit through smaller personnel gates from the other cardinal directions. The complex features five dewars, a 150,000 gallon elevated water tower, a surface 150,000 gallon water reservoir tank, several buildings, and abundant piping. A dewar is a double-walled container for holding liquid and gas supplies.

Building 3210, the objective of this historical evaluation, is toward the northern portion of the site. The original building was about 80 ft (24 m) in length, 63 ft (19 m) wide, 36 ft (11 m) high above the ground surface, and with a floor area of 10,350 sq ft (962 sq m). The later addition to the ground floor on the west side of the building added another 1,830 sq ft (170 sq m) of floor space. The walls, with the exception of the north wall, are about 1.75 ft (0.5 m) thick, consisting of reinforced concrete. The north wall, also of reinforced concrete, where the reactor was placed for testing is 5.5 ft (1.7 m) thick. Railroad tracks extend northward from its north face, where the nuclear reactors were placed for testing, to a tall, corrugated metal shed, where the reactors were stored from the weather and final adjustments made before the tests. These railroad tracks also connect to the overall railroad system for the NRDS by which test reactors and engines and other equipment were transported between facilities. The reactors and engines were assembled and later disassembled after testing at the R-MAD and E-MAD facilities. The test cell building, Building 3210, is mostly a high one-story flat-roofed building, with a basement, a small penthouse on top, and a high shielding wall forming its north elevation.

Exterior

The exterior of Building 3210 is a complex, reinforced concrete mass surrounded and intersected by pipes, ducts, and equipment. The center portion of the north elevation where the reactor was placed for testing includes vertical inset grooves, cylindrical plates, wall-mounted equipment and stainless steel doors. The shielding wall angles forward and up at the west end. The east end is lower, and like the west end, has no building behind it. Low walls project from the eastern section of the wall and equipment, such as tanks and a steam generator, occupy the areas between them. The west elevation seen today is that of the addition to the test cell.. This high, one-story concrete wall features a plywood-enclosed loading door and large pipe penetrations connecting the building to the nearby dewar. The south elevation from west to east includes the later addition to the test cell, the freight elevator, and the original portion of the building, which is at a lower height than the addition. The addition is also set back from the face of the original building. Pipe railing stands at the top of the wall and large ducts and steel plates mounted low are attached to the addition. This elevations also features doors to the flow control room and the high pressure room, stairs down to the basement, and stairs up to the penthouse. The east elevation is mostly one story, with pipe railings along the roof. High, three-light windows are along the top portion of the wall, which features wall-mounted gauges at its lower reaches. A wide roof projection overhangs the wall.

Basement

The basement consists of four rooms: a large mechanical equipment room along the entire west and south sides of the building; a narrow electronics room in the northeast corner of the building; a small forward control room; and a small, raised room projecting north and outside from the northeast corner of the main building footprint.

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The Electronics Room, also L-shaped, features a vinyl-asbestos-tile-over-concrete floor, and concrete walls with horizontal grooves, called out on drawings as embedded unistrut, running entirely around the room, evenly spaced at approximately two feet intervals. A metal track runs overhead, below the ceiling, carrying wiring. The ceiling finish is painted perforated asbestos paneling over mineral wool. Its door, at the south end of room, is approximately three inch thick steel with an enormous panic bar on the inside face that is marked with the name"Pogh." The outside face has a huge handle and rod opener.

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First Floor

The first floor, or ground floor, includes a nearly square original section with four rooms and a one-room addition to the west. Rooms in the original portion include a Flow Control Room, the largest in the building; a small Hookup Room, immediately north of the Flow Control Room; an Experimental Room, north of the Flow Control Room and east of the Hookup Room; and a High Pressure Room occupying the entire east side of the floor plate.

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Penthouse

The Penthouse occupies the northern end of the roof, situated directly over the Hookup and Experimental rooms. Inside are two rooms. The east Detector Room is windowless, concrete-encased, and features bays of electrical panels similar to the basement. Metal runs of conduit are above head, but below ceiling height. The west Neutronics Room has concrete floor, walls, and ceiling. A double set of paired steel doors enter the room from the roof in the middle of the south wall. An approximately four inch high raised concrete platform begins at the door. A steel mezzanine occupies the center of the room, with a steel-grate staircase and floor. A ladder-type wire mount attaches to the east wall, higher than the door.

e. **Associated Structures** (use/type):

Other buildings within the fenced compound include an air intake building (Building 3205), a pump house (Building 3220), an operations building (Building 3229), a motor drive building (Building 3230), and a cryogenic evaluation laboratory (Building 3232). Building 3228, a semi-permanent, metal maintenance and shop warehouse once located by the operations building has apparently been taken down and removed from the site. Two electric substations are present, one toward the southeast corner of the compound and the second one along the western edge. A secured radiography area is attached at the southeast corner of the facility. Two wooden camera bunkers, one to the west and the other to the north, stand outside the fence.

f. **Integrity** (include dates):

Except for short-term projects, the building has essentially been abandoned, with little maintenance, since 1973 when the NRDS program ended.

g. **Condition:** Good

h. **Threats:** Demolition of building under the DOE/NV Environmental Management Deactivation and Decommissioning Program (Carlson 1999)

12. **SIGNIFICANCE** (use additional sheet if necessary):

a. **Architect/Builder/Engineer:**
Engineering: Air Products, Inc., Allentown, Pennsylvania
Construction:

b. **Style/Period:** N/A

c. **Date(s):** 1961

d. **Main themes of historic resource:** Nuclear Rocket Development - U.S. Space Program

e. **National Register eligible:** Yes, contributor to NRDS Historic District

f. **Justification** (include criteria):

Test Cell C was one of seven separate but interconnected complexes associated with the NRDS in Area 25 of the NTS. The mission of the NRDS was to develop and test nuclear reactors and engines for rockets in the space program of the United States from the late 1950s to the early 1970s. Tlachac (1991), in the *Nevada Comprehensive Preservation Plan*, indicated the NRDS would be potentially eligible to the NRHP under criterion a, and it is mentioned in the *Cultural Resources Management Plan for the Nevada Test Site* for consideration as an historic district by the Department of Energy /Nevada Operations Office (DOE/NV) (Drollinger et al. 1999:38, 55). Test Cell C, operating from 1961 to 1973, is recommended to be eligible to the National Register under criteria a and c, consideration g for its role in the space program of the United States and for its unique construction and technology associated with the testing of nuclear reactors at the NRDS for the development of nuclear-powered rockets. It was second in a series of test locales at the NRDS and reflects the upgrades in construction and technology when compared to the earlier Test Cell A. In addition, improvements were implemented as knowledge was gained over time and in correspondance with the ever-expanding testing requirements of the Rover program.

For consideration g, a property must be less than fifty years old, of exceptional importance, and unquestionably historic. The official United States space program is less than fifty years old and buildings associated with its early history have been recognized by the NRHP as meeting the requirements of exceptional importance (Sherfy and Luce 1998:11). Test Cell C is one of the significant buildings associated with the development of this program. The Rover program ended almost 30 years ago, establishing a definitive historic time period for the construction and use of the facility. Furthermore, other facilities and objects within the NRDS have been recommended or determined eligible to the NRHP through consultation between DOE/NV and the Nevada State Historic Preservation Office. These are the E-MAD, the R-MAD, Jr. Hot Cell, and the Railroad Transport System. Building 2201 associated with the development of the nuclear ramjet engine has also been determined eligible to the NRHP as a contributing element of a historic property.

The concept of nuclear-propelled rockets was initially discussed in 1944 by personnel at both LASL and the University of Chicago Metallurgical Laboratory (Bussard 1962:169; Bussard and DeLauer 1965:1). Following these discussions, the first serious study dealing with the concept of nuclear rockets, aircraft, and ramjets, according to Bussard (Bussard 1962:169; Bussard and DeLauer (1965:2), was produced in 1946 as a secret document by personnel at the Applied Physics Laboratory, John Hopkins University. This document summarized the contemporary information about nuclear propulsion and the principles and problems for developing such systems. What was made evident in the document was that little or nothing was known about specific properties of materials in order to build the systems. A second secret document was prepared in 1947 by the Aerophysics Laboratory, North American Aviation Corporation, focusing on nuclear ramjets and rockets of different sizes for military purposes (Bussard 1962:170; Bussard and DeLauer 1965:2).

In 1946, the U.S. Air Force established the Nuclear Energy for Propulsion of Aircraft (NEPA) project at the Oak Ridge National Laboratory, Tennessee for exploring the possibility of low-altitude nuclear aircraft (Bussard and DeLauer 1965:2; Larson 1950:2). Work on this project continued intermittently until 1949 (Bussard 1962:170). The Lexington Project, an ad hoc study group convening in 1948 at the Massachusetts Institute of Technology at the behest of the AEC, determined the least difficult system to develop was the low-altitude nuclear aircraft, followed by the nuclear ramjet for powering missiles, with the nuclear rocket being the most difficult. The NEPA project evolved into a new and expanded Aircraft Nuclear Propulsion (ANP) program in 1951 when the U.S. Air Force joined with the AEC to develop the systems, focusing primarily on manned military aircraft (AEC 1956). In 1955 the U.S. Navy also became interested and requested a feasibility study for a nuclear-powered seaplane (AEC 1956). The ANP program ended in 1961, however, with few results (Bussard and DeLauer 1965:4). In contrast to the earlier beliefs, it was found that a nuclear-propelled low-altitude aircraft was the most difficult of the three systems to develop, due mostly to size constraints and safety considerations. Furthermore, it was determined little advantage was to be gained in developing ballistic missiles powered by nuclear engines when compared to chemically-propelled missiles already developed, and therefore, effort and money could be spent elsewhere (Baker 1996:62; General Advisory Committee 1960:28).

In the 1950s, an article by Bussard (1953), who was working at the Oak Ridge National Laboratory at the time, on the potentialities of a wide range of missions for nuclear rockets, sufficiently influenced the U.S. Air Force to direct, through the AEC, the LASL and UCRL to study the feasibility of linking nuclear power with rockets (AEC 1962:71; Baker 1996:48-49; Bussard 1962:170; Bussard and DeLauer 1965:3; General Advisory Committee 1956:18-24; House 1963). The great appeal of nuclear propulsion, as opposed to chemical propulsion, was its smaller size and greater velocity to enable bigger payloads. Consequently, it was considered more efficient and preferable than chemical systems, particularly in the long and complex journeys for exploring the solar system (see Angelo and Buden 1985:ix; Schreiber 1961:25, 29). In 1955, the Condor committee of the U.S. Air Force Scientific Advisory Board recommended that work was to begin on a nuclear-propelled rocket (Baker 1996:55; House 1963). In 1957, a Rover reactor approach using uranium-loaded graphite fuel was selected as the method to be developed based on the studies by LASL and UCRL (AEC 1962:71). Construction and testing of reactors for rockets was assigned to LASL within the Rover program, while UCRL was given a similar task for ramjets, thereafter referred to as the Pluto program (AEC 1958a, 1958b; Schreiber 1958:70).

The NTS, with a record of nuclear weapons testing, including atmospheric or above ground tests, was chosen as the place to conduct the nuclear reactor tests because of the possibility of an excursion within the reactor, and also, the tests released a radioactive exhaust plume into the atmosphere that was acceptable for the NTS at the time (AEC 1958a; see Bernhardt et al. 1974; House 1963; see Friesen 1995). Initial development of the NRDS in 1956 was a joint AEC and U.S. Air Force effort that eventually evolved into an AEC and National Aeronautics and Space Administration (NASA) project (AEC 1957:10, 1958a, 1961:71, 1964:109; Baker 1996:57; Beck et al. 1996:26; House 1963; Miller 1984:1). In 1961, the NRDS area, about 318,000 acres, was officially withdrawn to the AEC from the Nellis Air Force Range under Public Land Order 2568 (Space Nuclear Propulsion Office 1969:75). The mission of the AEC was to develop nuclear reactors and reactor technology, while NASA, who had taken over the role from the U.S. Air Force, had the responsibility to develop nuclear engines and engine technology and for the integration of the reactors into engines (AEC 1963:168). Administration of the program was by a newly created Space Nuclear Propulsion Office located in Georgetown, Maryland, headquarters of the AEC, with operating extensions in Albuquerque, Cleveland, and Las Vegas.

The primary mission of the NRDS at the NTS was to support the Rover program in developing nuclear rocket reactors and engines for the space program (AEC 1961:69; House 1963; Miller 1984:1). Initially, three stages were outlined for the program. The first stage was to develop test reactors in order to investigate and solve various problems in achieving a high-power density, to develop reactor materials capable of withstanding high temperatures, and to generate new concepts for converting nuclear energy into useful propulsion forms (AEC 1960:77). The second stage was to develop and test a nuclear engine for actual flight and the third stage, performed by NASA, was to incorporate the engine into a Saturn V launch vehicle for flight testing (AEC 1964:109; Schreiber 1961:33).

The first nuclear rocket test reactor at the NRDS, designated Kiwi-A, was conducted in 1959 (AEC 1961:69; Bussard and DeLauer 1965:3; Schreiber 1961:29). More test series followed, including NRX, Phoebus, Pewee, XE, and Nuclear Furnace (Angelo and Buden 1985:179-183; DOE/NV 1985:2-2, Table 6.2.1; Friesen 1995). Following the initial outline of the Rover program, the objective of the Kiwi test series was to develop the reactor technology and design (Schreiber 1958:70). The ground-based Kiwi reactor, appropriately named after a flightless New Zealand bird, would become the basic design for the NERVA (Nuclear Engine for Rocket Vehicle Application) engine to be flight-tested in the RIFT (Reactor in Flight Test) vehicle (AEC 1963:168, 1965:111). The RIFT vehicle would then be developed for an upper stage on an advanced Saturn rocket, capable of putting large payloads on the moon for lunar-based missions. The module would also be used for manned missions to Mars or Venus (AEC 1967:181).

In late 1963, the Rover program was revised, emphasizing ground-based research and engineering. That is, the Kiwi project was unchanged, worked continued on the NERVA engine technology, but the planned RIFT stage was cancelled (AEC 1964:110). Early in 1972, the NERVA project was cancelled (AEC 1973:25). Eventually, further budget restrictions in 1973 led to a termination of all space-oriented nuclear propulsion development efforts and the entire NRDS program was phased out at the end of the fiscal year. Management and responsibility for the NRDS area was assumed by the Nevada Operations Office (AEC 1974:23; Miller 1984:5). Despite this somewhat abrupt ending, the significant technological advances made during the Rover program proved the feasibility of nuclear-propelled vehicles and constitute the primary building blocks for future space explorations in the twenty-first century (Angelo and Buden 1985:194; e.g., Porta 1995; Watson 1994). Overall, the program can be considered a successful pioneering achievement in the space program of the United States.

The primary purpose of Test Cell C was to test the nuclear reactors being developed for the propulsion of rockets for the United States space program. The facility, an upgrade of the earlier Test Cell A and capable of larger and more powerful tests, was constructed in 1961, with camera bunkers added in 1964, and the maintenance and supply building (Building 3228) and the operations building (Building 3229) added in 1966 (Space Nuclear Propulsion Office 1969:66-67). In 1961, President John F. Kennedy toured the AEC facilities in New Mexico and Nevada for the purpose of receiving briefings on the Rover program, and at the NRDS he inspected the R-MAD, Test Cell C, and ETS-1 (AEC 1963:172). At the R-MAD he witnessed a portion of the disassembly of the Kiwi B-4A reactor. This event marks the only time a President of the United States has visited the NTS.

All operations at Test Cell C were designed to be operated remotely from the Reactor Control Point located about 2 miles (3 km) to the south, and during tests the facility was vacated, being remotely controlled from this other location (Space Nuclear Propulsion Office 1969:101). During such tests the reactors, staged on a railroad car for ease of transportation between facilities, exhausted skyward. In contrast, the later and more advanced XE, designated for Experimental Engine, exhausted downward and was tested at ETS-1, constructed in 1966 specifically for this purpose (AEC 1969:161; Space Nuclear Propulsion Office 1969:68). In the latter the engine was placed in the stand and not attached to a railroad car. Effluent exhausted from these reactor tests contained radioactive materials in various quantities determined by the amount of power generated and rose thousands of feet above the ground (Bernhardt et al. 1974; Friesen 1995:7). Most of the heavy particles, including solid pieces of nuclear fuel from the reactor core, tended to drop out within a few thousand feet of the test, but the smaller radioactive particles could drift with the plume and range tens of miles, or even a couple hundred miles, before decaying and dissipating. LASL developed the Kiwi, Phoebus, and Pewee reactors and the Westinghouse Astronuclear Laboratory at Large, Pennsylvania developed the NRX and XE reactors (AEC 1961:69, 1968:164; Friesen 1995:6).

The first reactors tested, initially at Test Cell A and later at Test Cell C, were the Kiwi series (Table 1). The Kiwi A was the first full power reactor and provided the fundamental information on fuel element design and reactor control (Friesen 1995:5). Objectives of later ones in this series were "to explore a somewhat different problem and incorporated advances made from the preceding ones" (AEC 1964:110). For example, Kiwi B 1B and B 4A reactors demonstrated the use of liquid hydrogen as a coolant at power levels and temperatures for space missions (AEC 1963:169; Friesen 1995:5); Kiwi B 4A, B 4A CF, B 2A, and B 4B reactors tested design changes to eliminate core damage from flow vibrations of liquid hydrogen (AEC 1964:110; Friesen 1995:5); and the Kiwi B 4E was the first reactor fueled by uranium carbide beads (Friesen 1995:5). In 1965, a safety test known as the Kiwi Transient Nuclear Test was conducted on a railroad trestle just west of Test Cell C and a Kiwi reactor was deliberately destroyed by subjecting it to a very fast power increase (AEC 1966:146; Friesen 1995:5; Miller 1984:5). The aim of the experiment was to determine the effects of a nuclear reactor explosion under launch conditions.

Phase two of the Rover program was NERVA, an Aerojet General/Westinghouse effort to provide the technology for a complete nuclear rocket engine capable of flight based on the Kiwi reactor design and technology (AEC 1966:142, 1968:169). Test Cell C was used for testing NERVA reactors, while testing of the engine systems was conducted at ETS-1. At Test Cell C these included the NERVA Reactor Experimental (NRX) reactors (AEC 1964:113). In 1966, the NRX A4 EST was the first test that consisted of all the engine components, although arranged in a breadboard design for test convenience. It was also the first to bootstrap or self-start, demonstrating that a nuclear-powered rocket could start and operate on its own power (Friesen 1995:6). The XE Prime was the first engine to be tested, at the ETS-1, in the correct flight configuration, that is, all the parts were put together in the proper sequence. In 1967, the NRX A6 operated at full power for one hour.

Continuing with the post-Kiwi research aspect of the Rover reactor program, in contrast to the NERVA engine program, were the Phoebus reactors, named after the Greek sun god, and Pewee reactors, designed as a small test-bed reactor using fewer fuel elements and operating at full power and temperature (AEC 1970:166; Friesen 1995:6). The Phoebus reactor was designed to be more powerful (Watson 1994:20). In 1965 at Test Cell C the first Phoebus test was conducted at full power, but during shutdown the liquid hydrogen coolant to cool the reactor was exhausted because of a gate malfunction in the fuel storage tank and the reactor core was damaged from overheating (AEC 1966:146). In 1966, modifications to the test cell were completed for further testing of the Phoebus reactor series (AEC 1967:193). Major improvements were the addition of two 500,000 gallon liquid hydrogen storage dewars, an emergency pressurized liquid hydrogen storage dewar for supplying hydrogen coolant to a reactor in the event of a feed system failure, and the NFS 3B, a high capacity liquid hydrogen feed system. The Phoebus 2A was the most powerful reactor ever developed and capable of reaching 5,000 megawatts. In 1968 it successfully operated at full power for twelve minutes with over 4,000 megawatts generated and intermediate power for twenty minutes (AEC 1969:159; Friesen 1995:6).

In 1968, the test cell was again modified to handle the testing of the Pewee reactor. These changes consisted of adding a new liquid-hydrogen feed-system turbopump and minor alterations to various lines and valves to accommodate reduced flow requirements (AEC 1969:160). The Pewee reactor program was implemented to check corrosion of the fuel element for the NERVA engine (AEC 1970:166). This small reactor uses only a few fuel elements in contrast to the larger reactors, and therefore, was largely an economical decision to use. The greatest effect on a fuel element during reactor operation is corrosion of the graphite by hot hydrogen. The higher the temperature, the greater the corrosion. The program essentially consisted of improving fuel element coatings to resist the corrosion. The last of the nuclear reactors tested at Test Cell C was Nuclear Furnace in 1972. Nuclear Furnace, also used to evaluate fuel elements, was designed and built at LASL (AEC 1971:176). The turnaround time was quicker than the Pewee reactors so more experiments could be conducted. It also holds the record for total time at full power for 109 minutes (Watson 1994:24).

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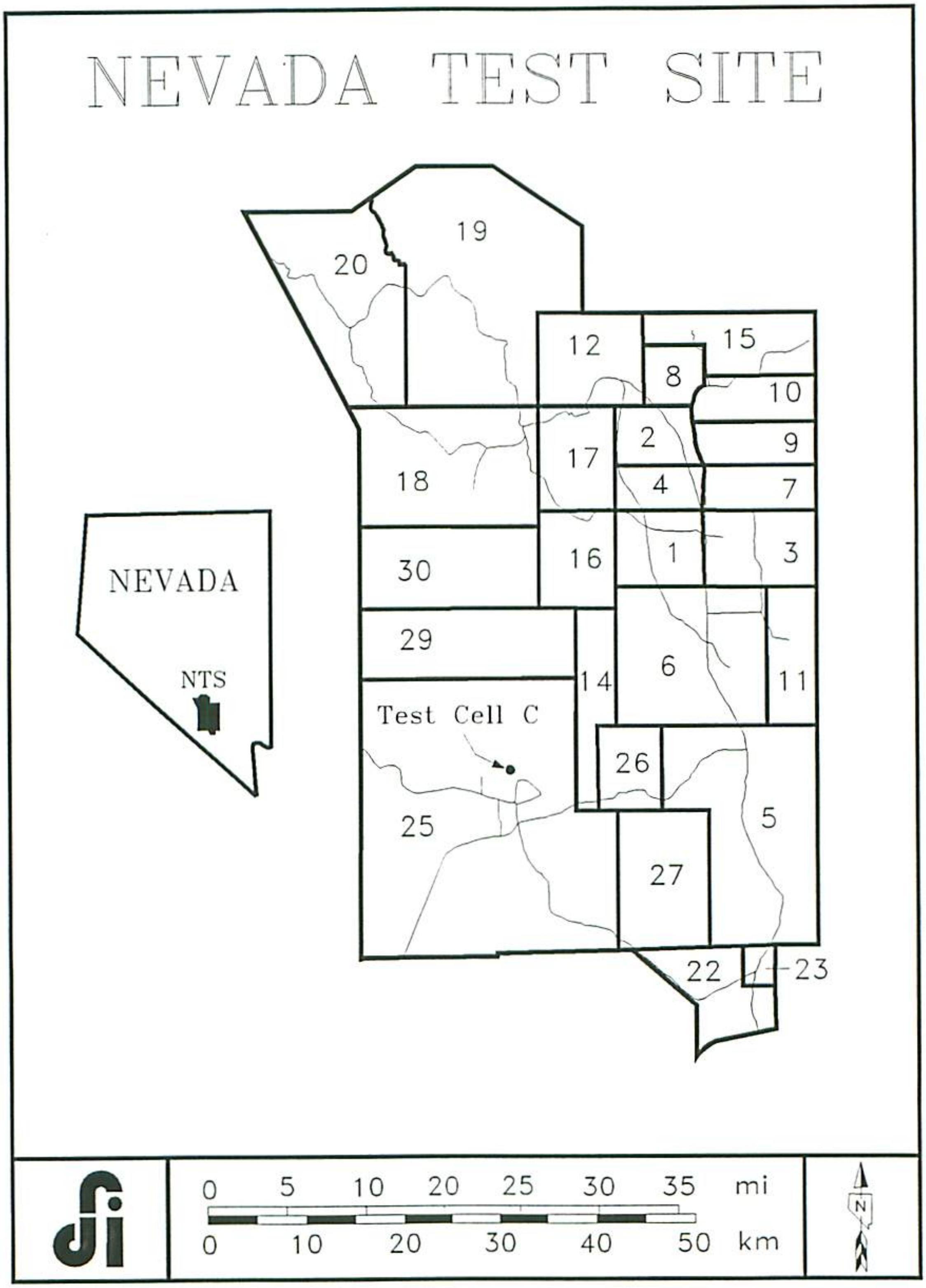
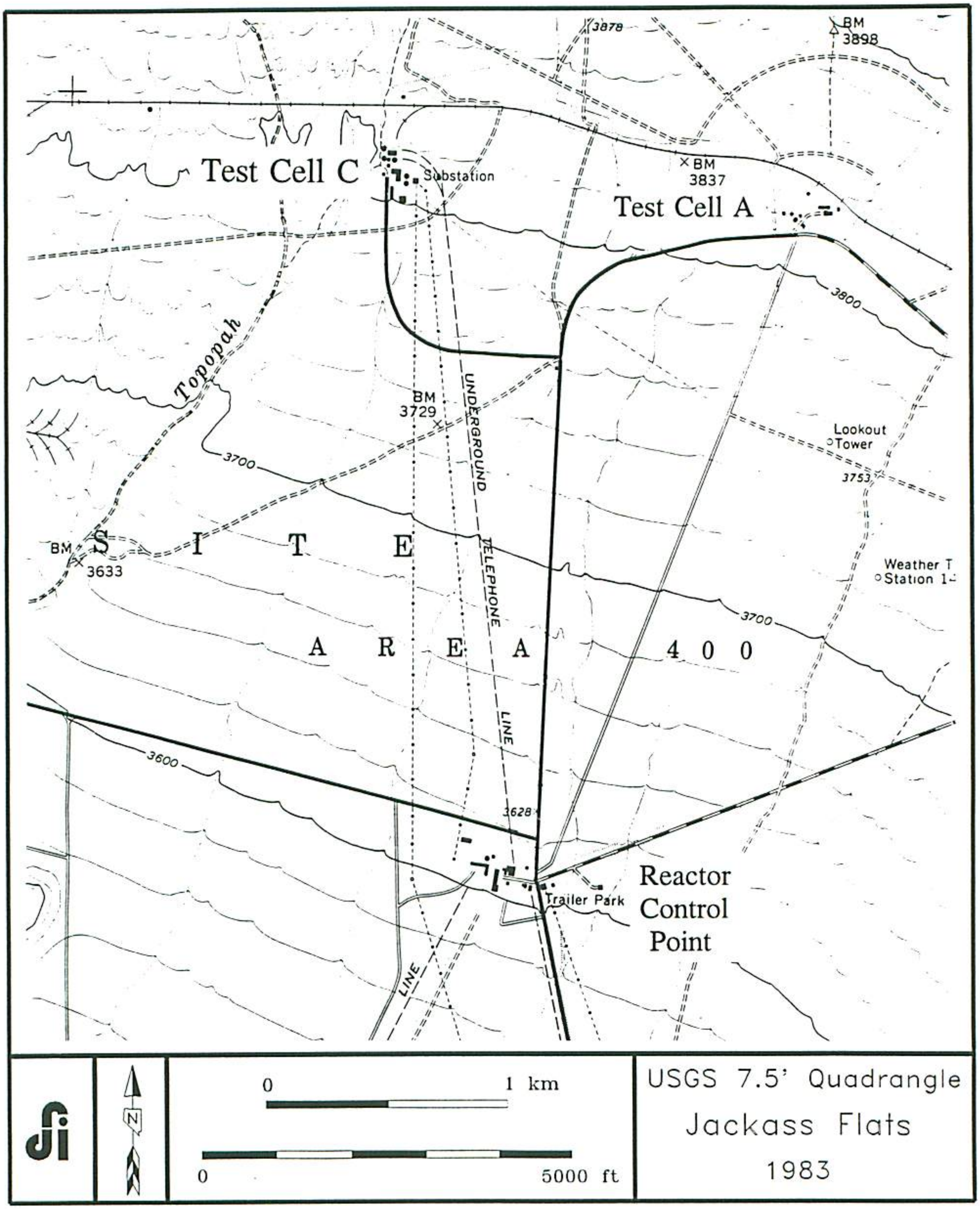
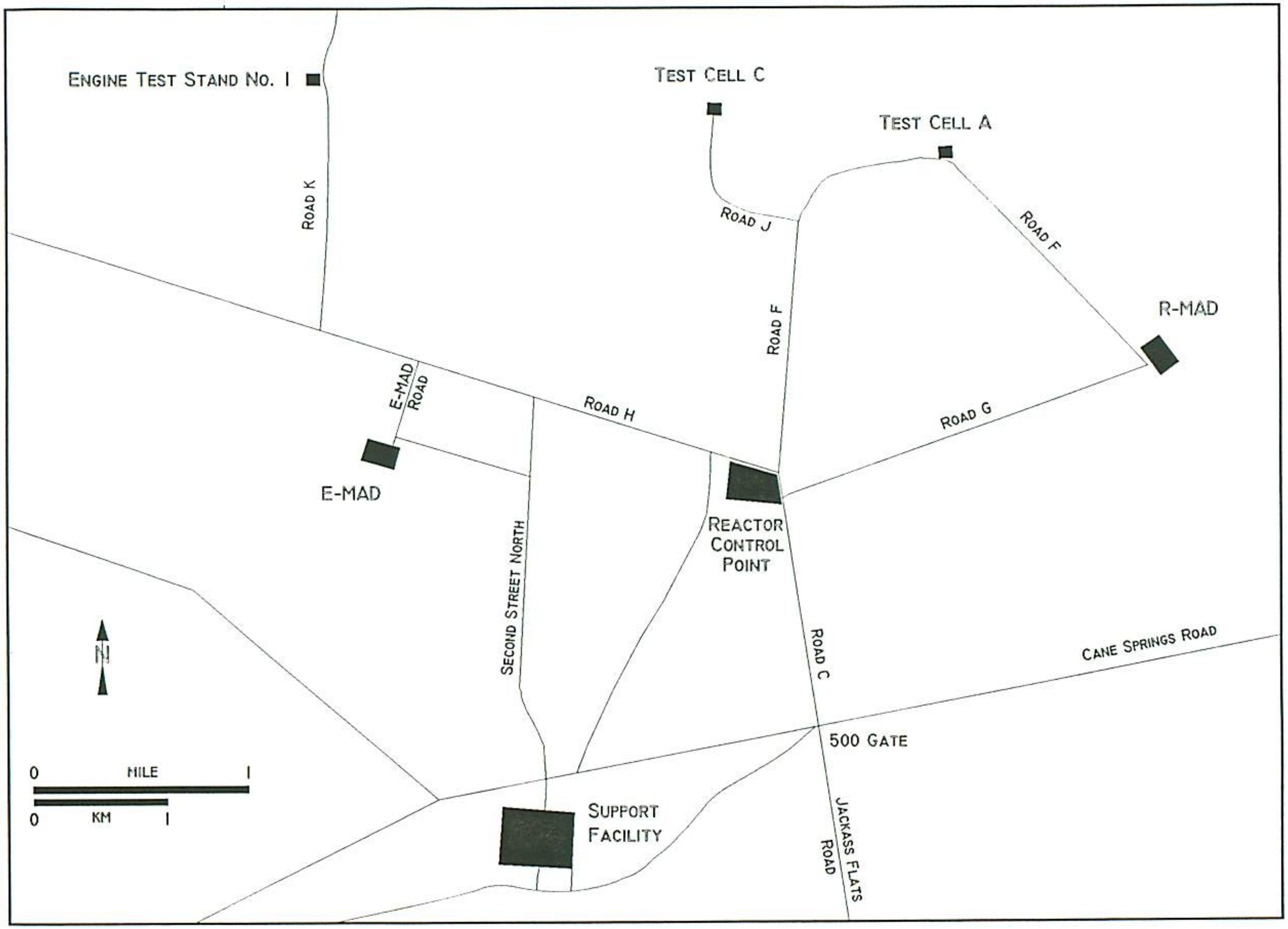
DATE: May 25, 2000



Location of the Test Cell C Facility on the Nevada Test Site.



Test Cell C Facility and surrounding topographic features.



Major facilities of the Nuclear Rocket Development Station.

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
General View of Facility

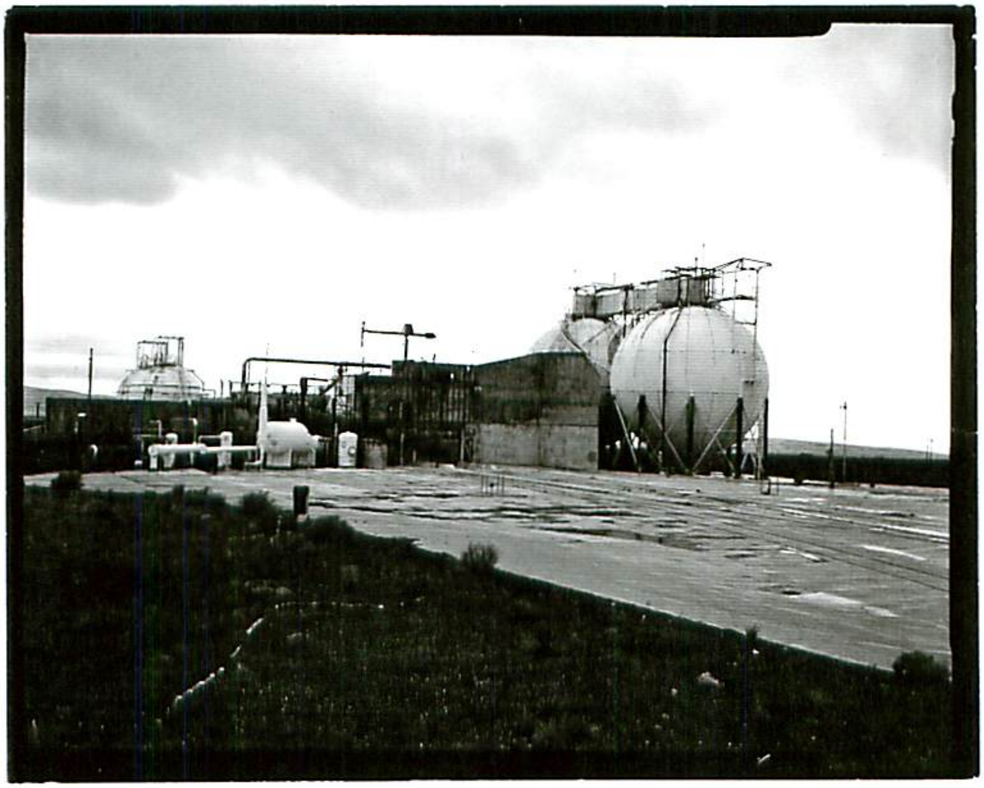
View Northwest
February 2000

Photograph 1

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Camera Bunker

View Southeast
February 2000

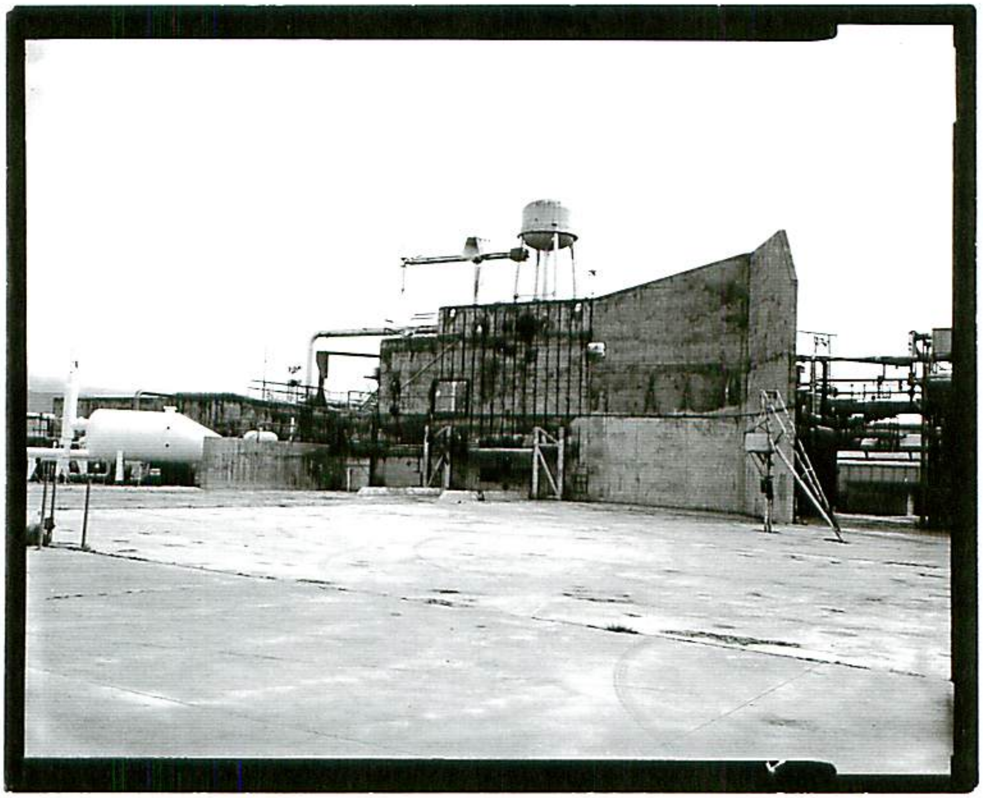
Photograph 2



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, North Elevation

View Southwest
February 2000

Photograph 3



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, North Elevation

View Southeast
February 2000

Photograph 4

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, North and West Elevations

View Southeast
February 2000

Photograph 5

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, South Elevation

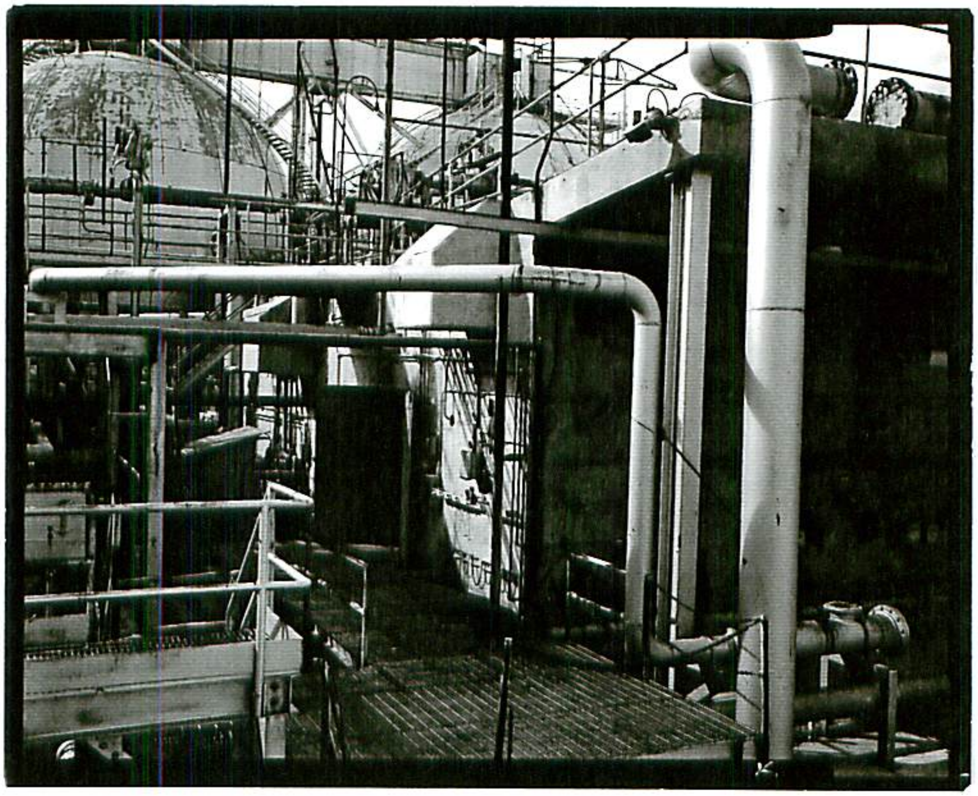
View North
February 2000

Photograph 6

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, East Elevation

View West
February 2000

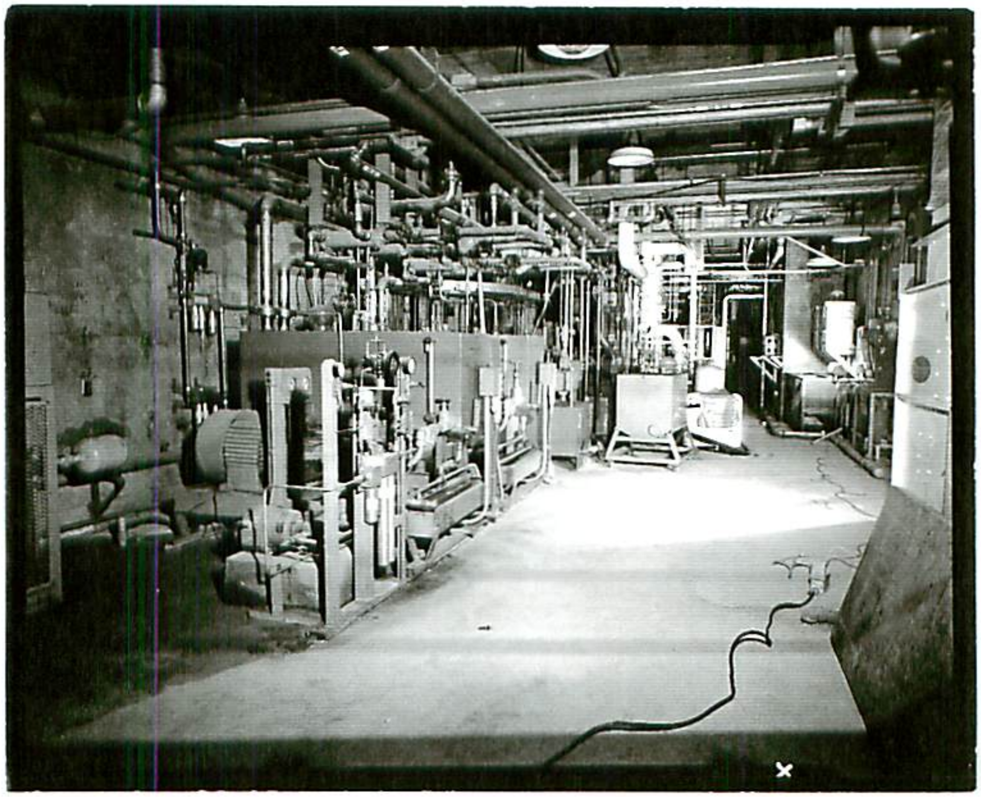
Photograph 7



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Southeast Corner

View Northwest
February 2000

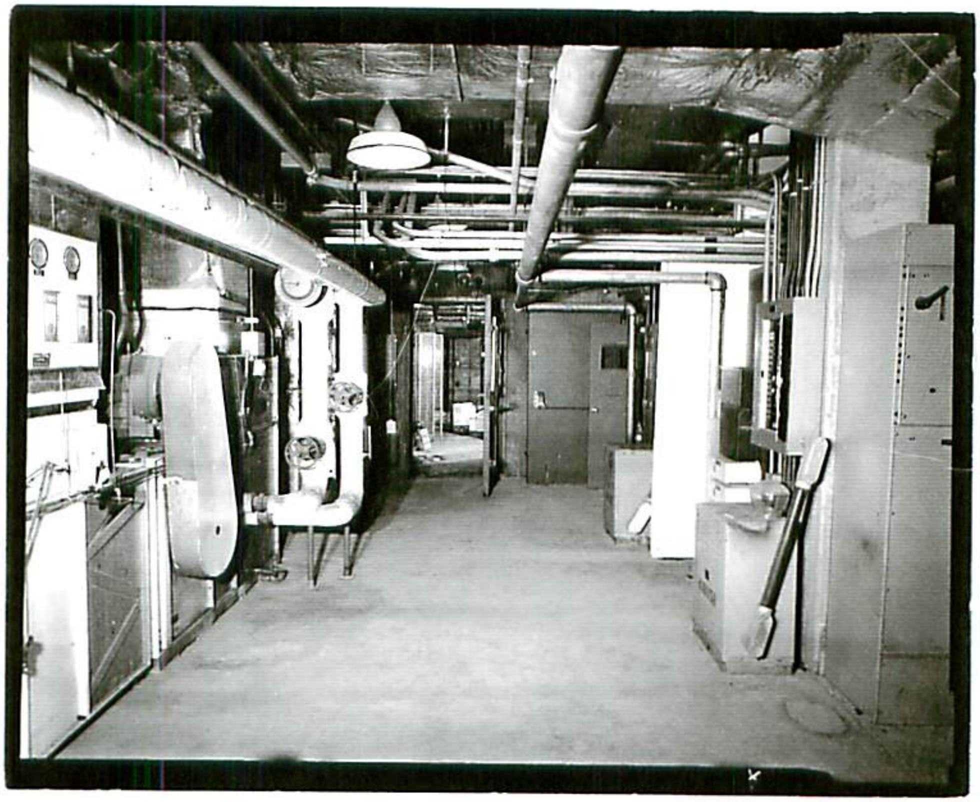
Photograph 8



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Mechanical Equipment Room, West Side

View North
February 2000

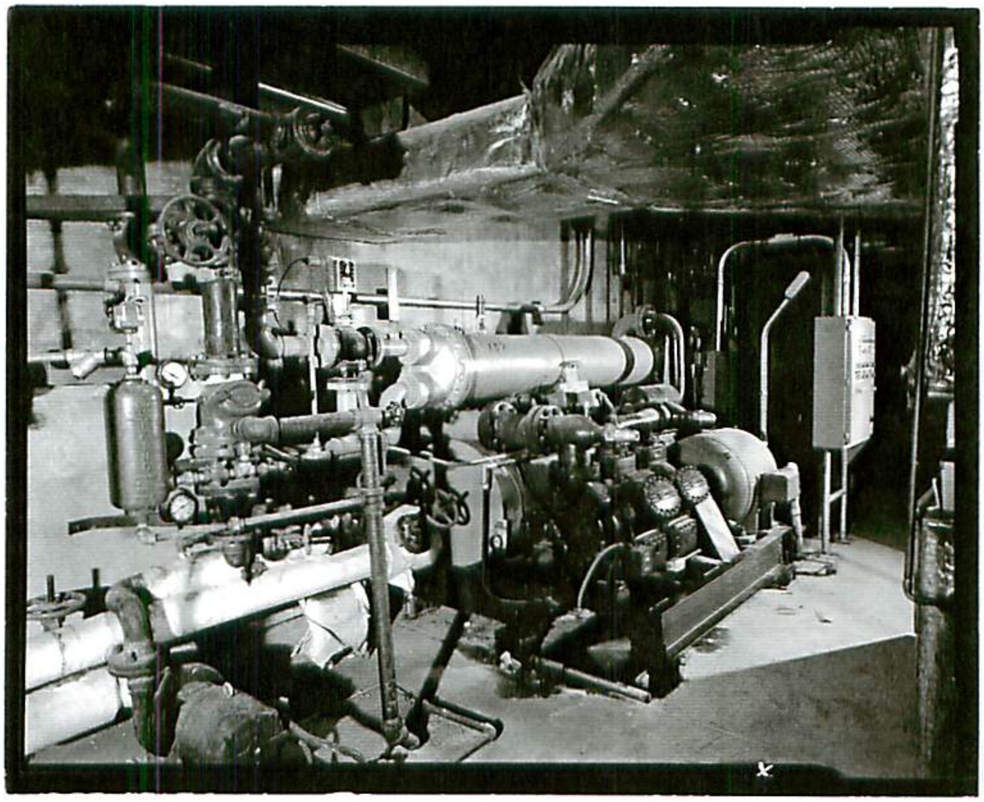
Photograph 9



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Mechanical Equipment Room, East Side

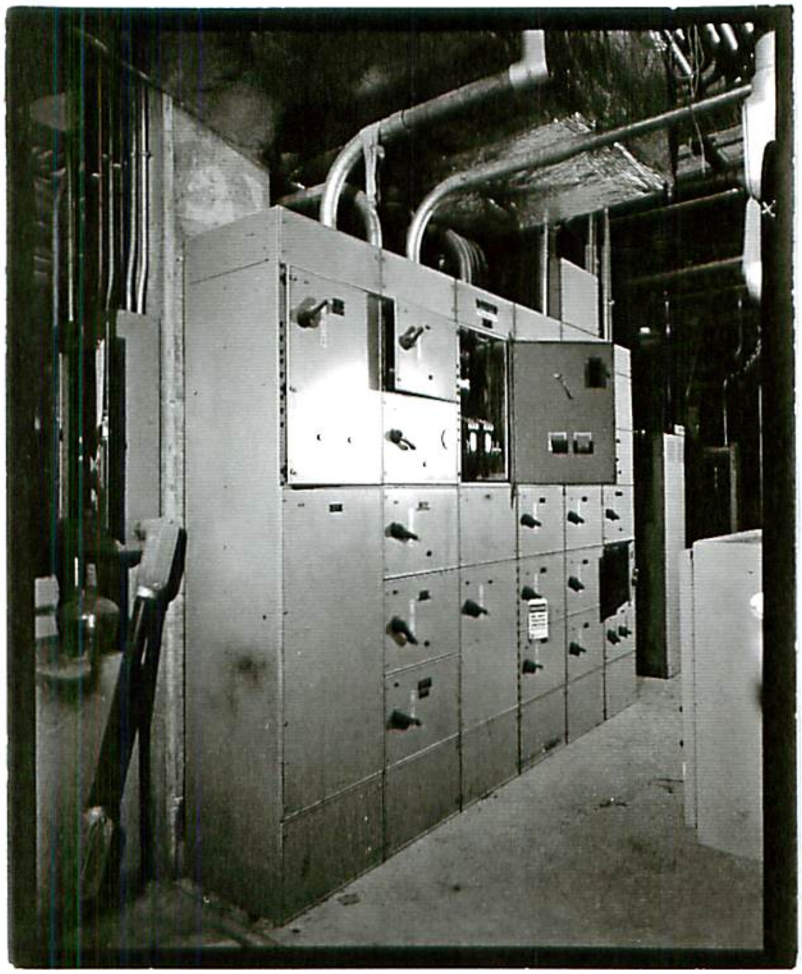
View North
February 2000

Photograph 10



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Mechanical Equipment Room, South Side
Air Compressor
View North
February 2000

Photograph 11



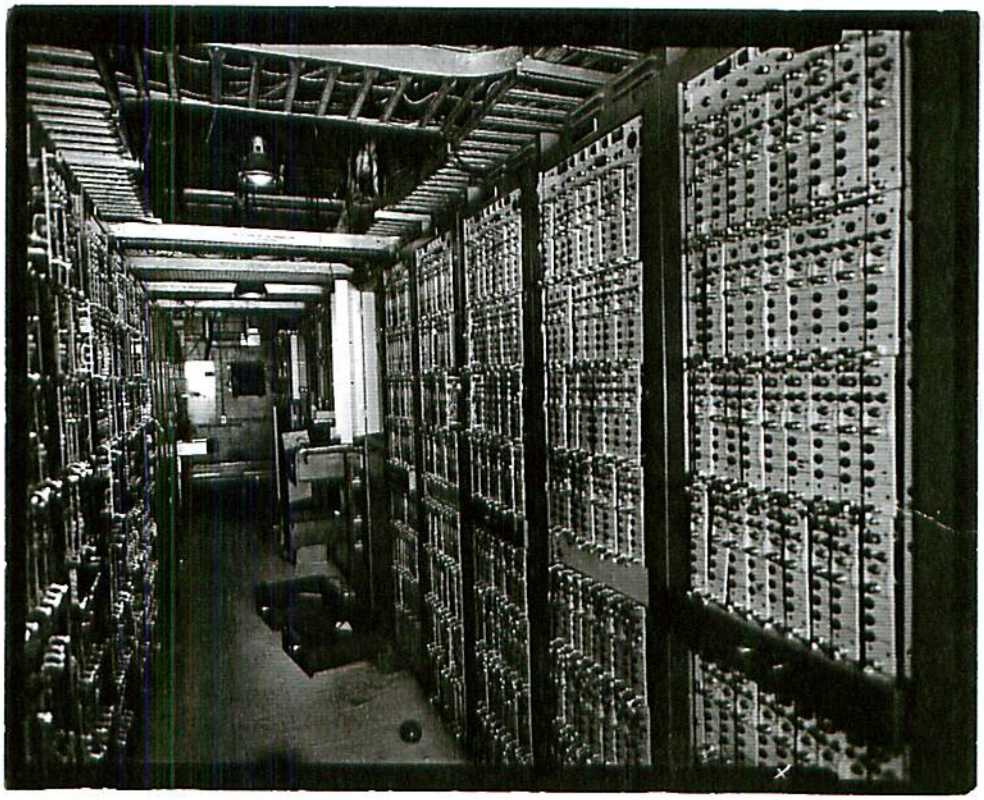
Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Mechanical Equipment Room, East Side
Electric Panels
View Northeast
February 2000

Photograph 12

Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Electronics Room

View North
February 2000

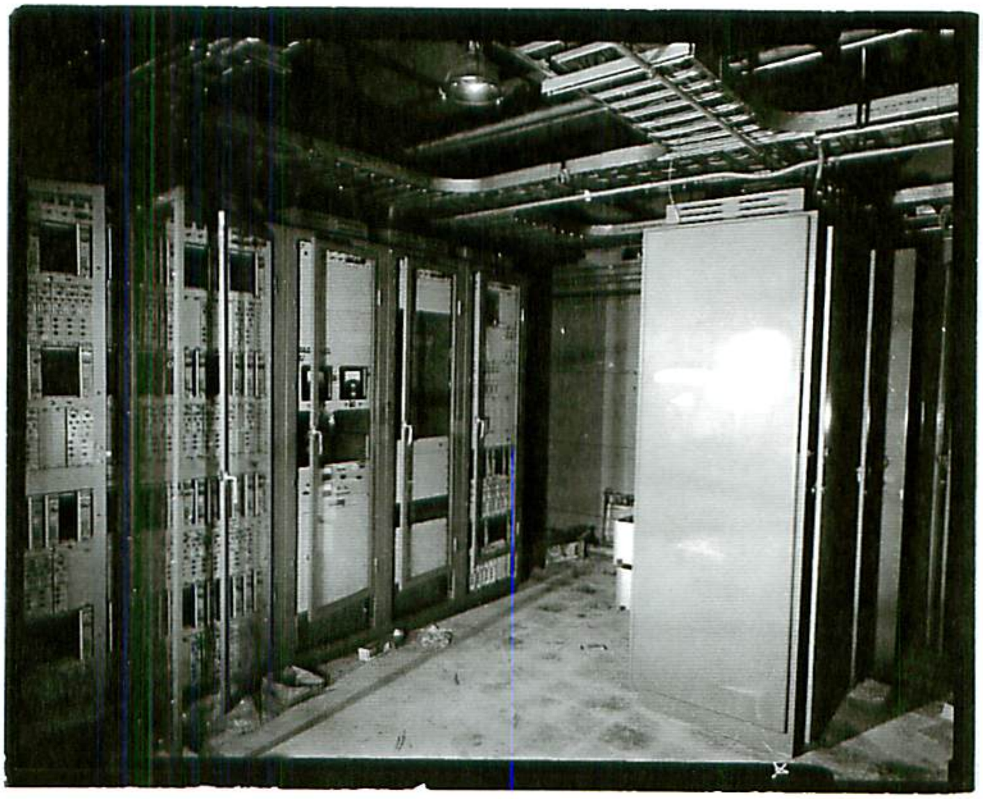
Photograph 13



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Electronics Room

View East
February 2000

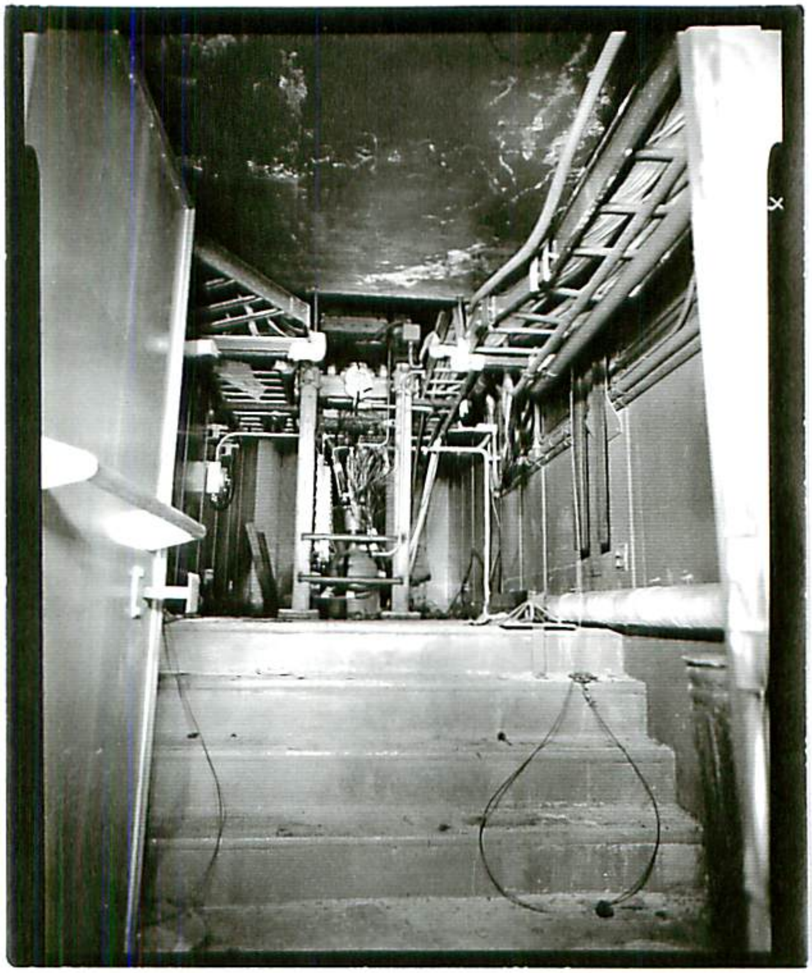
Photograph 14



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Forward Control Room

View Northwest
February 2000

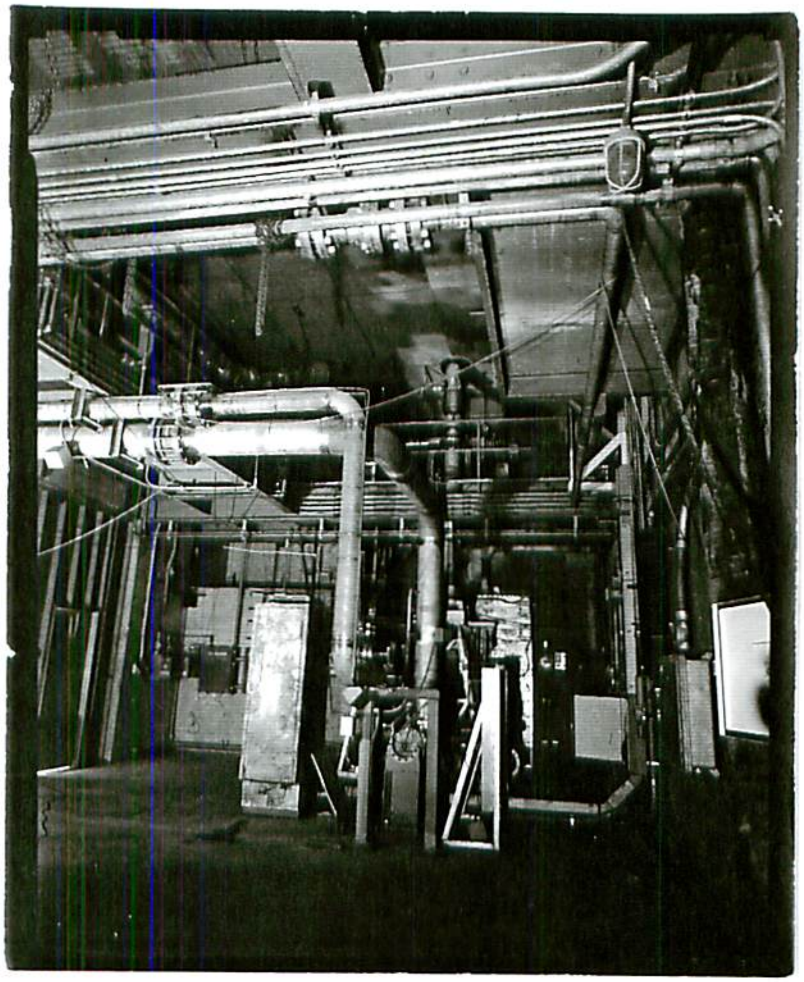
Photograph 15



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Basement
Small Room in Northeast Corner

View North
February 2000

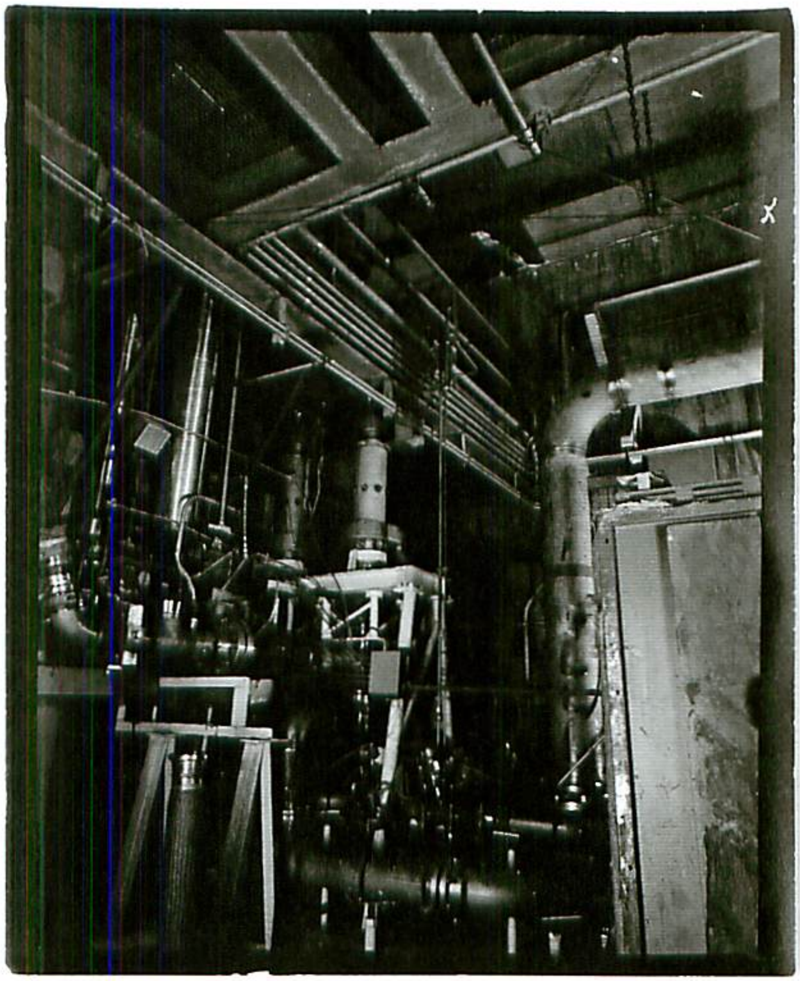
Photograph 16



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Addition

View North
February 2000

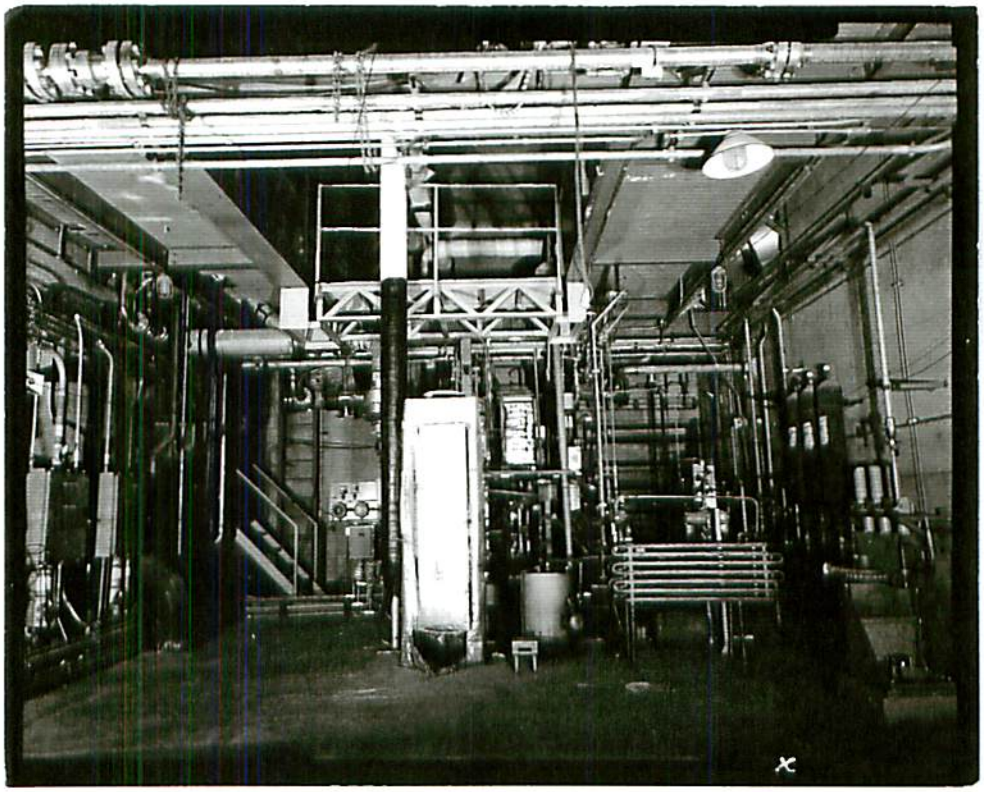
Photograph 17



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1, Addition
Closeup of Equipment

View Northeast
February 2000

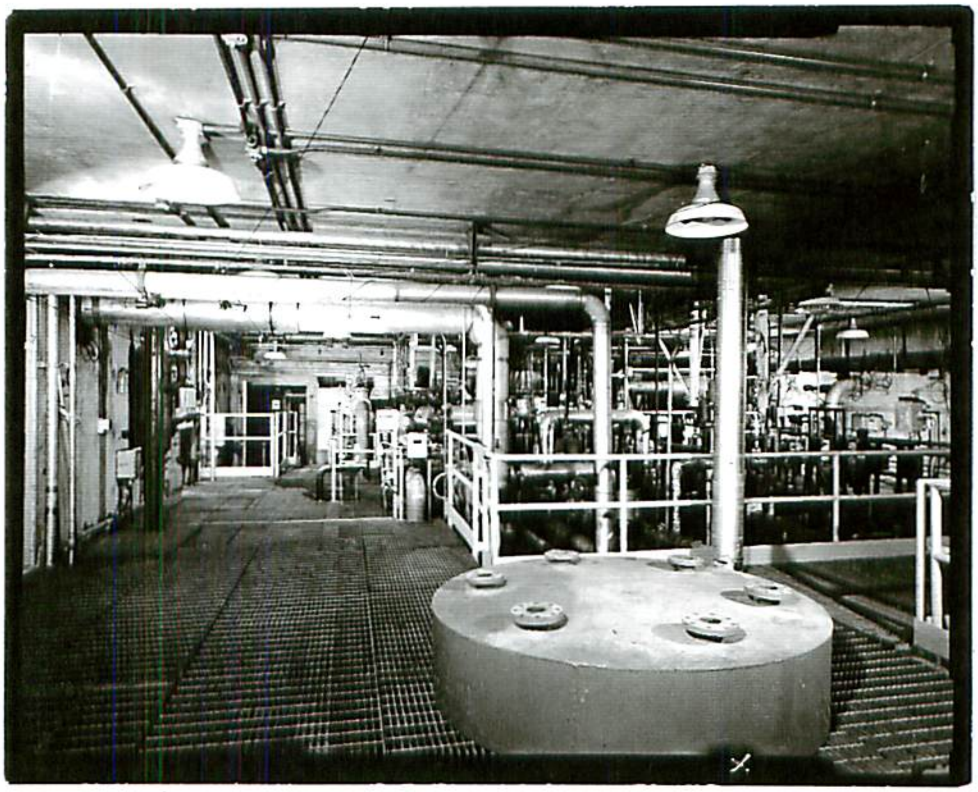
Photograph 18



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Addition

View South
February 2000

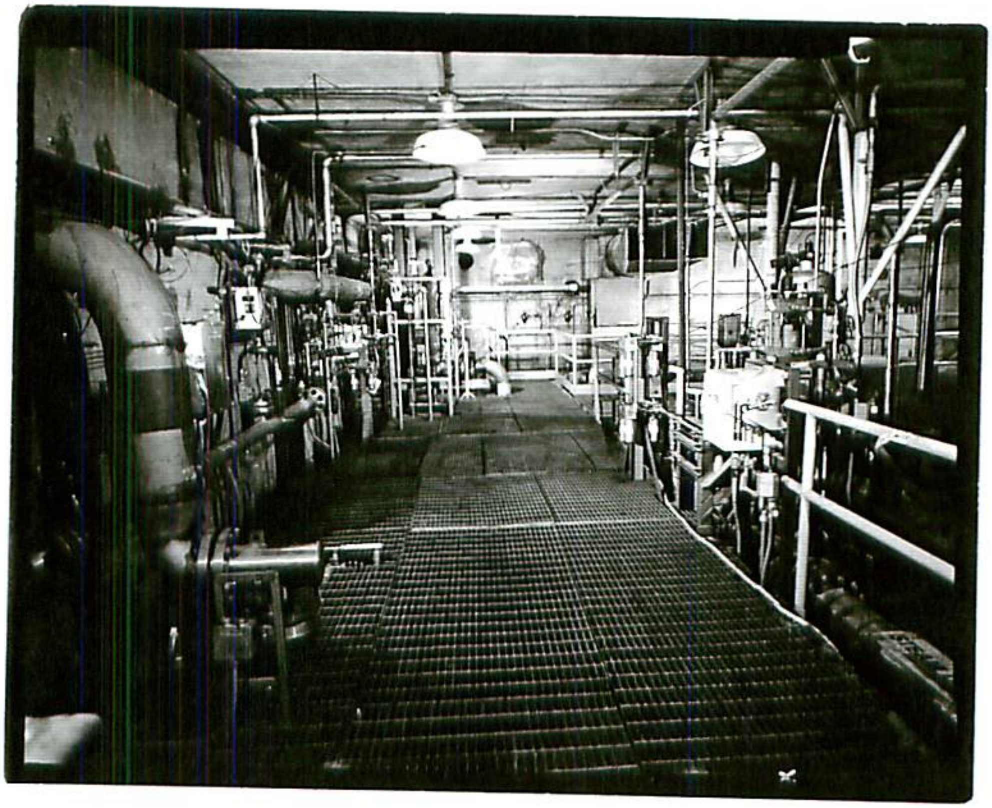
Photograph 19



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Flow Control Room, Southwest Corner

View North
February 2000

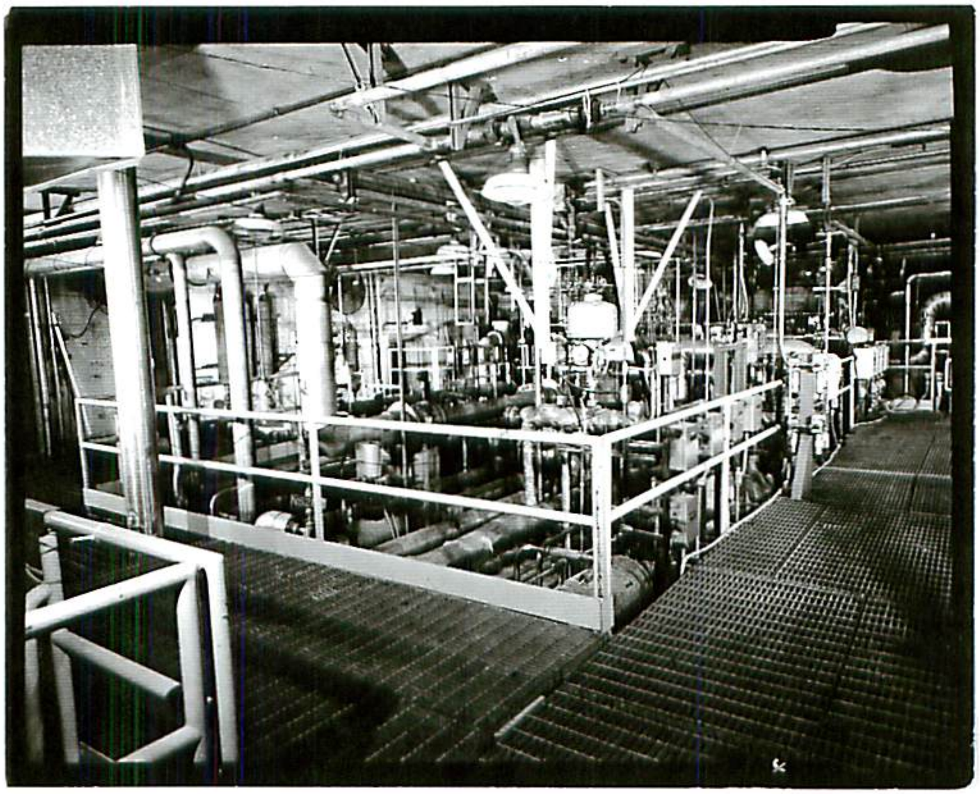
Photograph 20



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Flow Control Room, Northeast Corner

View South
February 2000

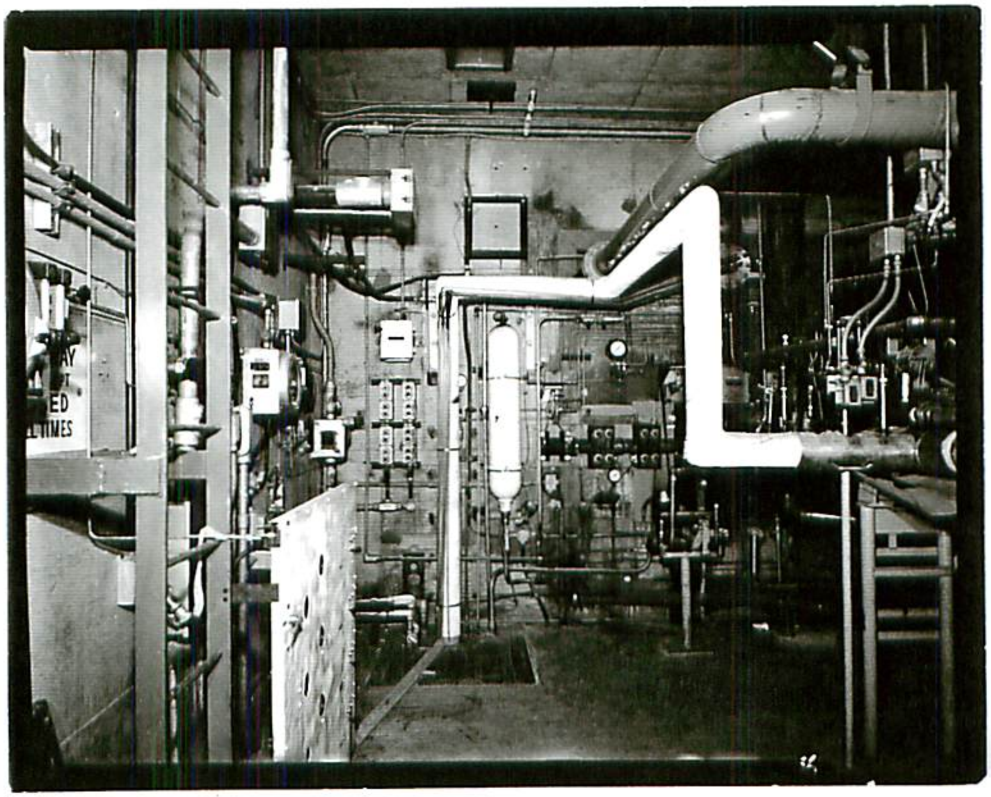
Photograph 21



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Flow Control Room, Southeast Corner

View Northwest
February 2000

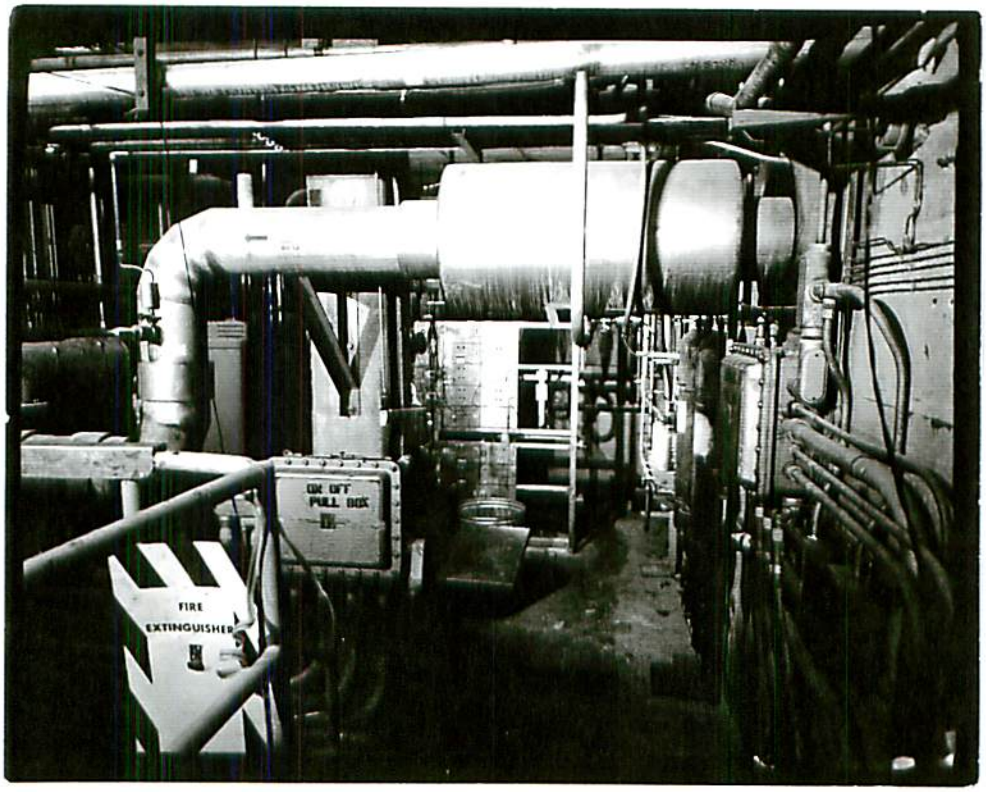
Photograph 22



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Hookup Room

View North
February 2000

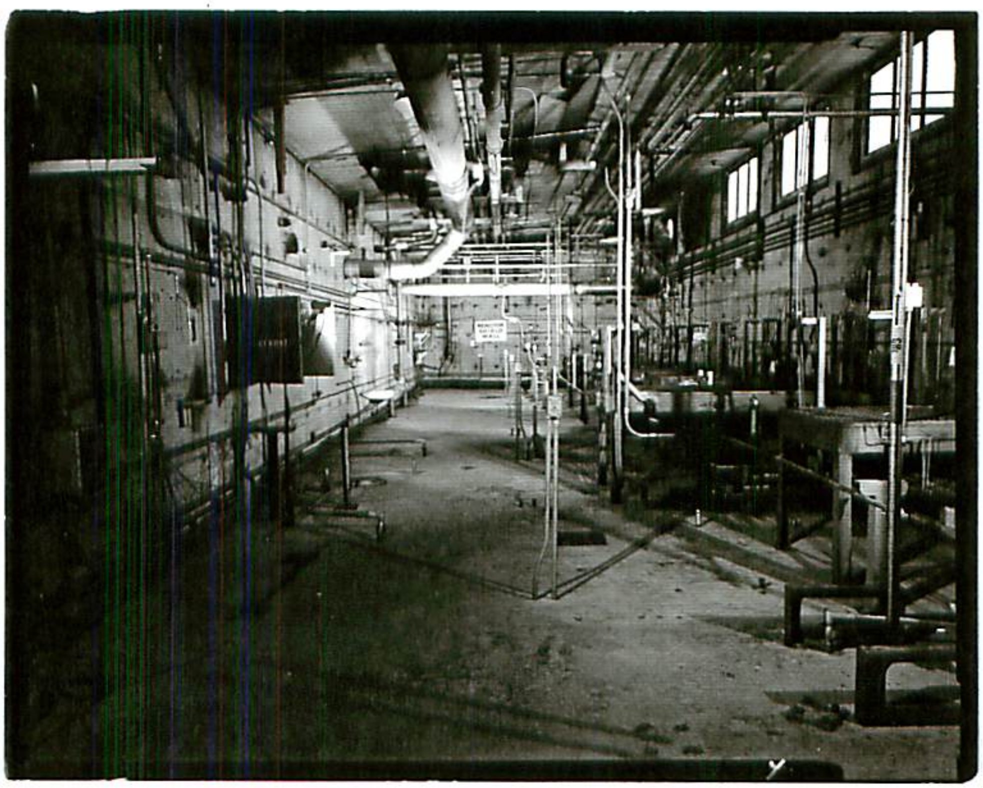
Photograph 23



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
Experimental Room

View North
February 2000

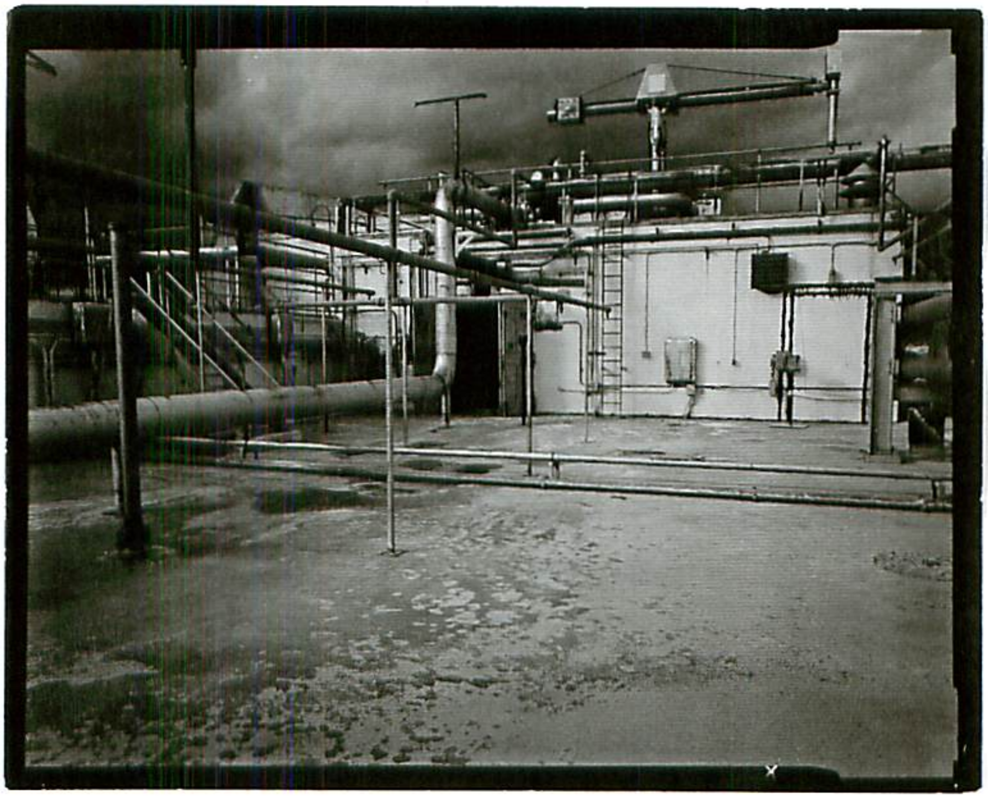
Photograph 24



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Floor 1
High Pressure Room

View North
February 2000

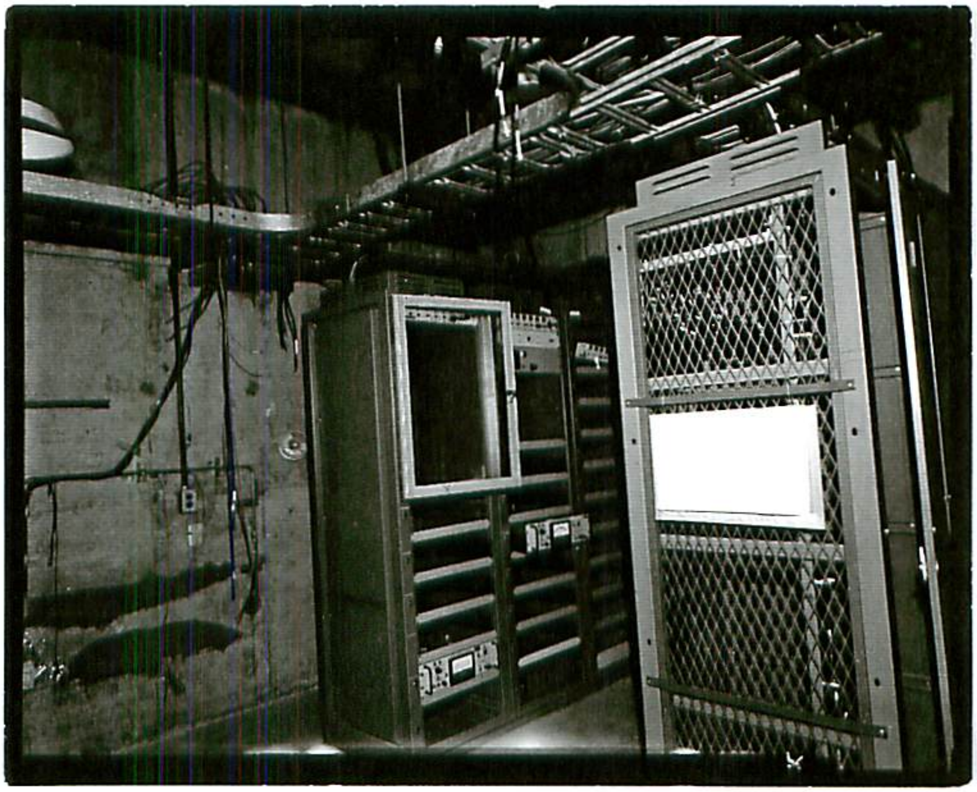
Photograph 25



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Penthouse
South Elevation

View North
February 2000

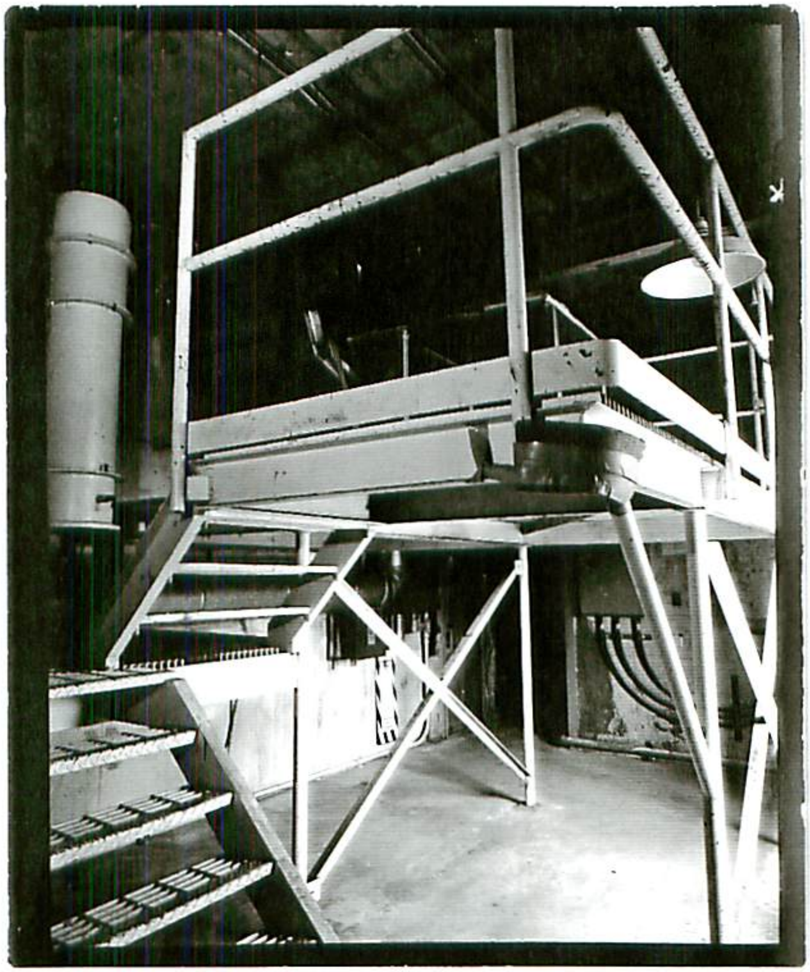
Photograph 26



Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Penthouse
Interior

View Southeast
February 2000

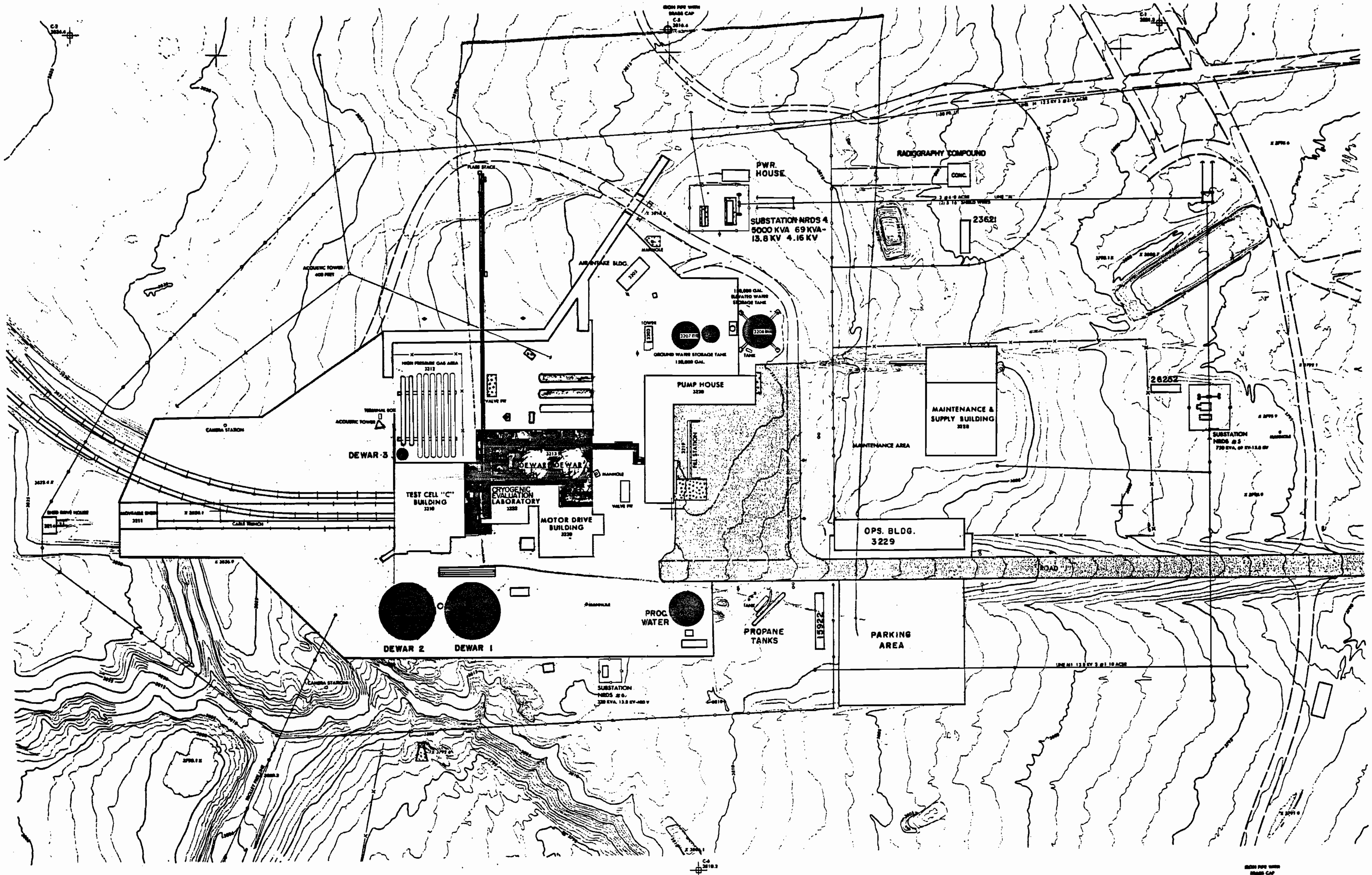
Photograph 27



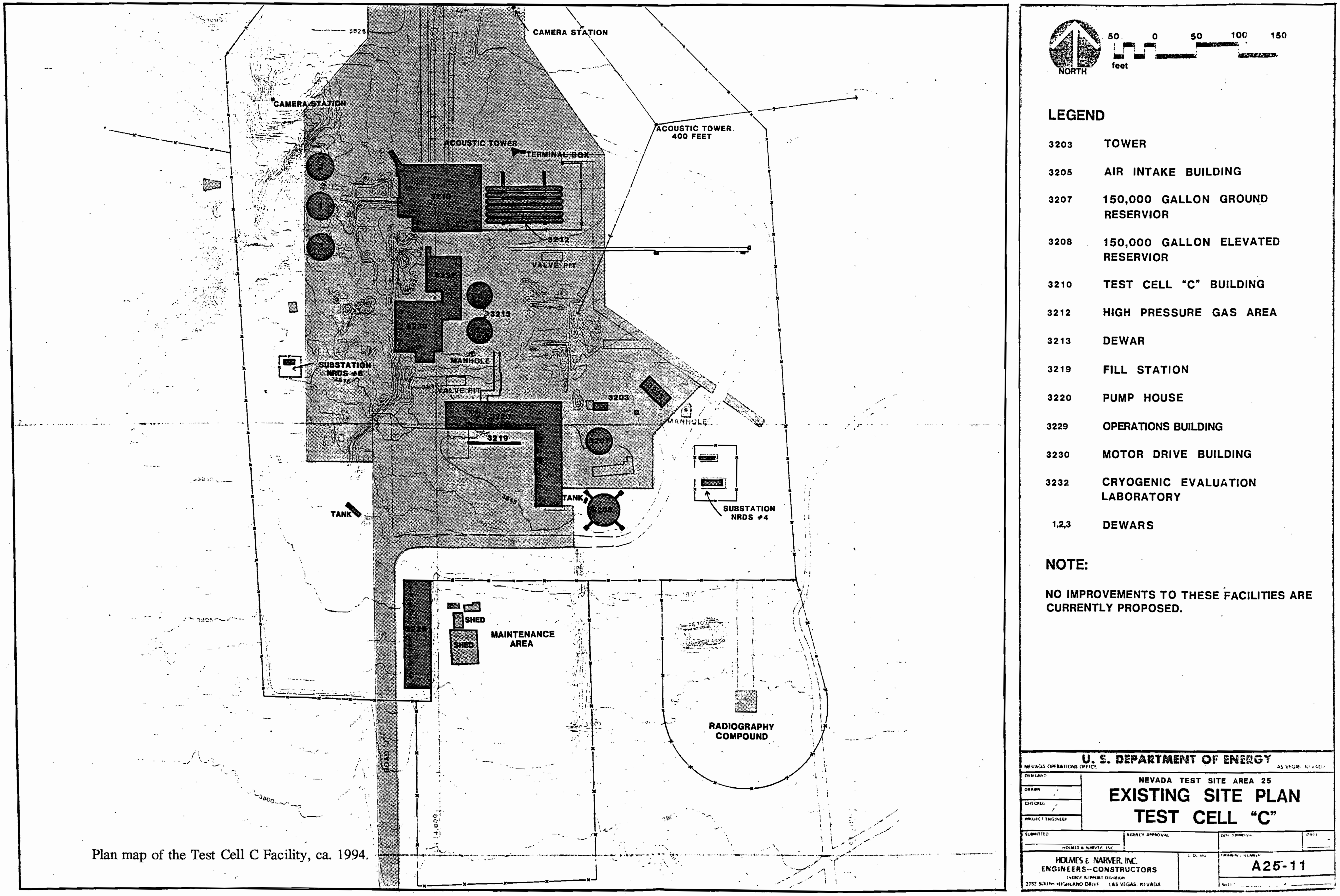
Site 26NY11258, Test Cell C Facility
Area 25, Nevada Test Site, Nye County
Building 3210, Penthouse
Interior

View Northeast
February 2000

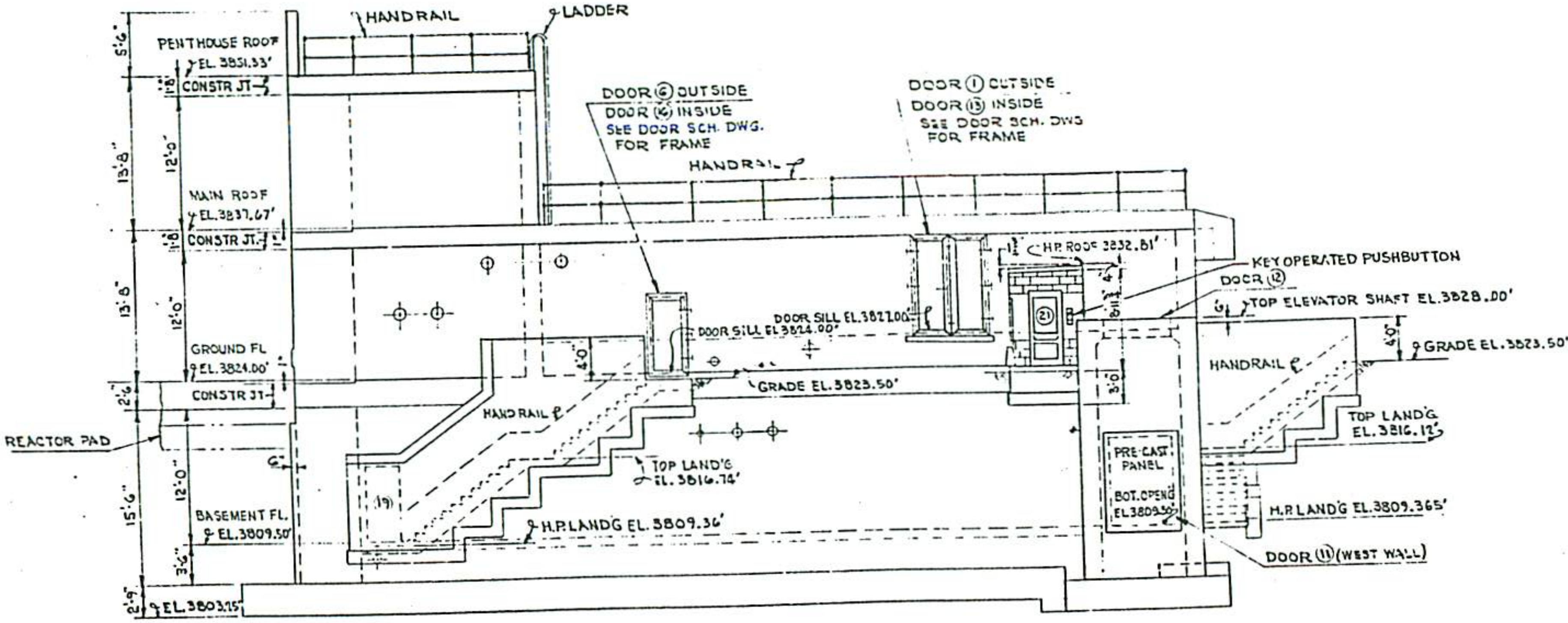
Photograph 28



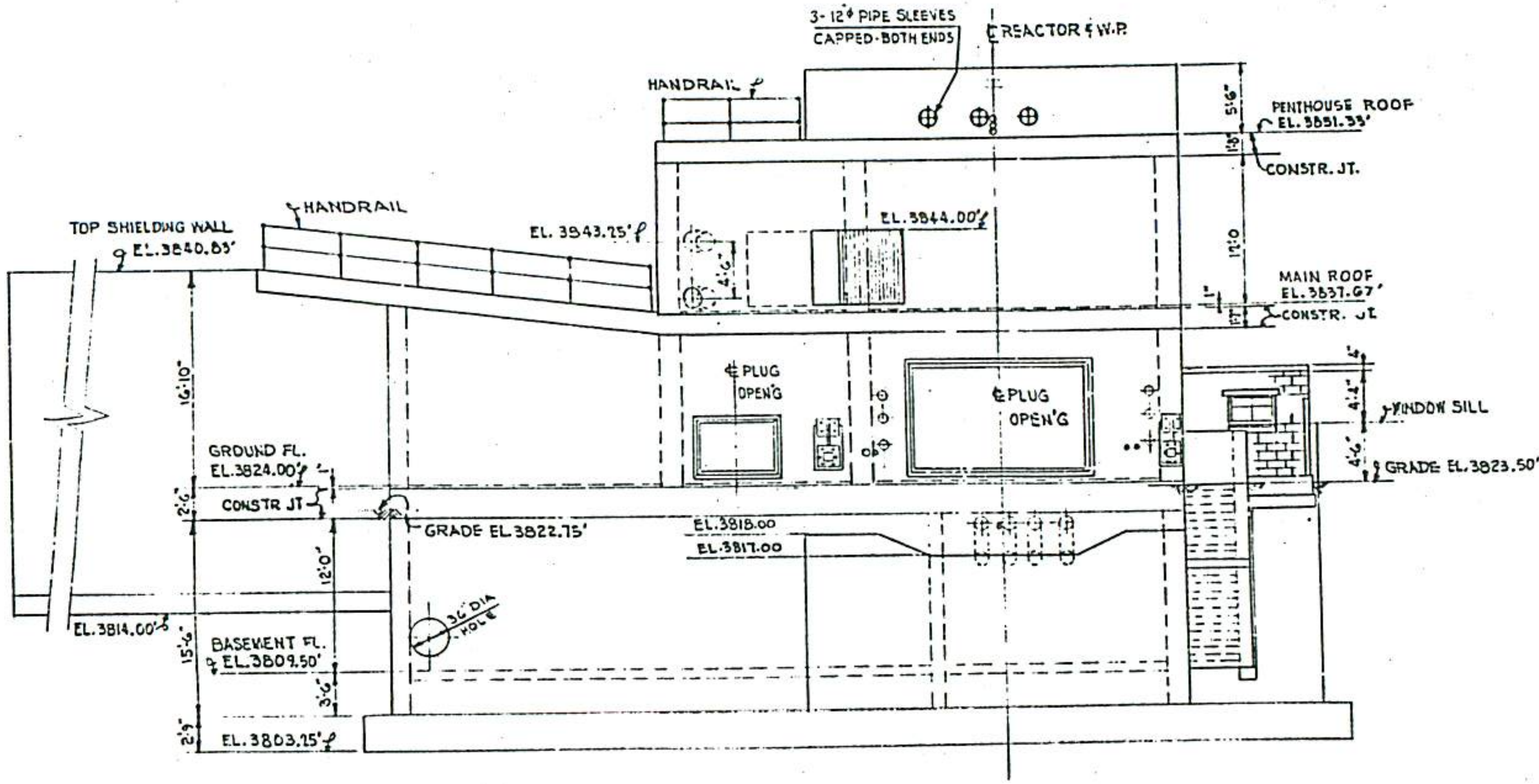
Plan map of the Test Cell C Facility, ca. 1965.



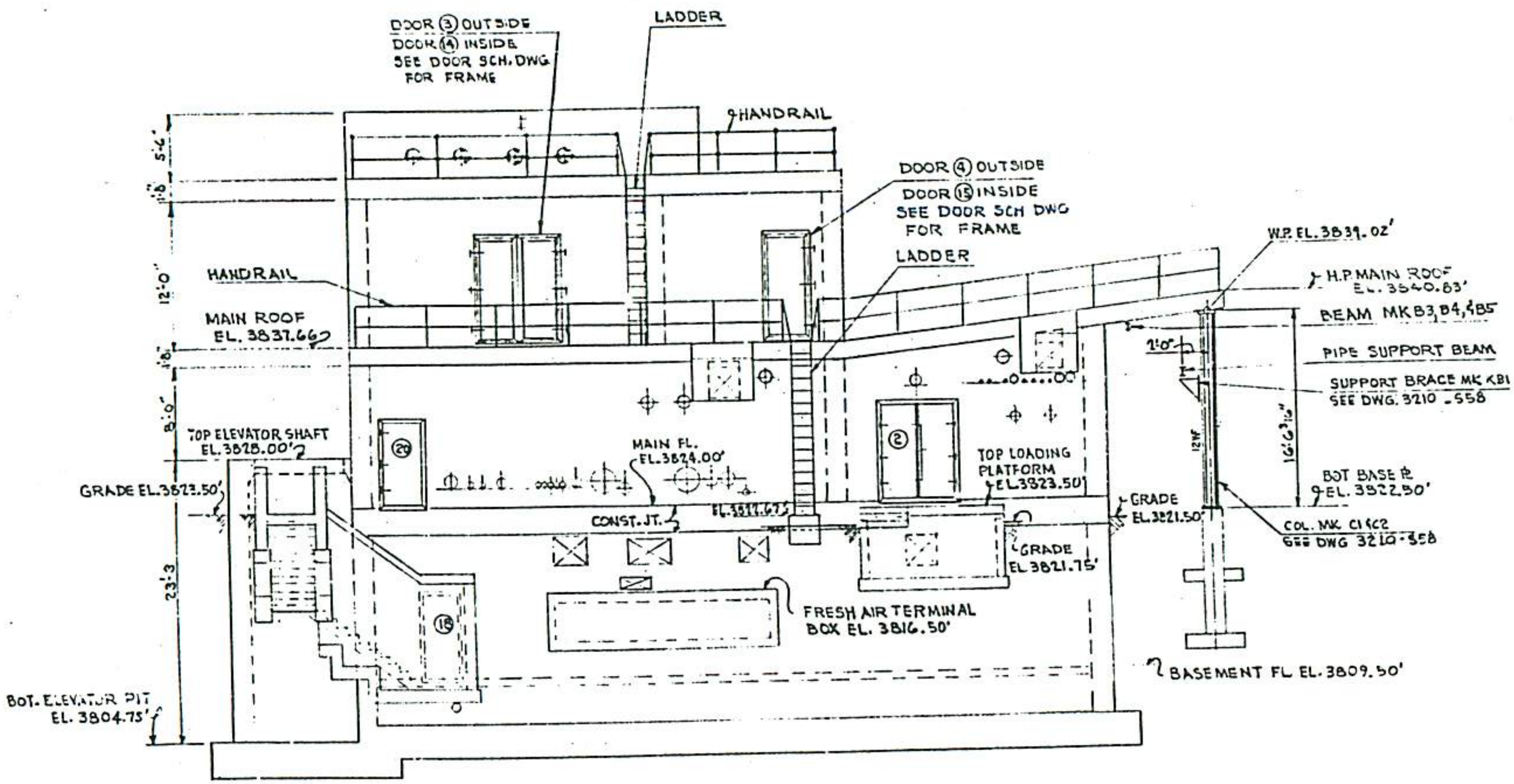
Plan map of the Test Cell C Facility, ca. 1994.



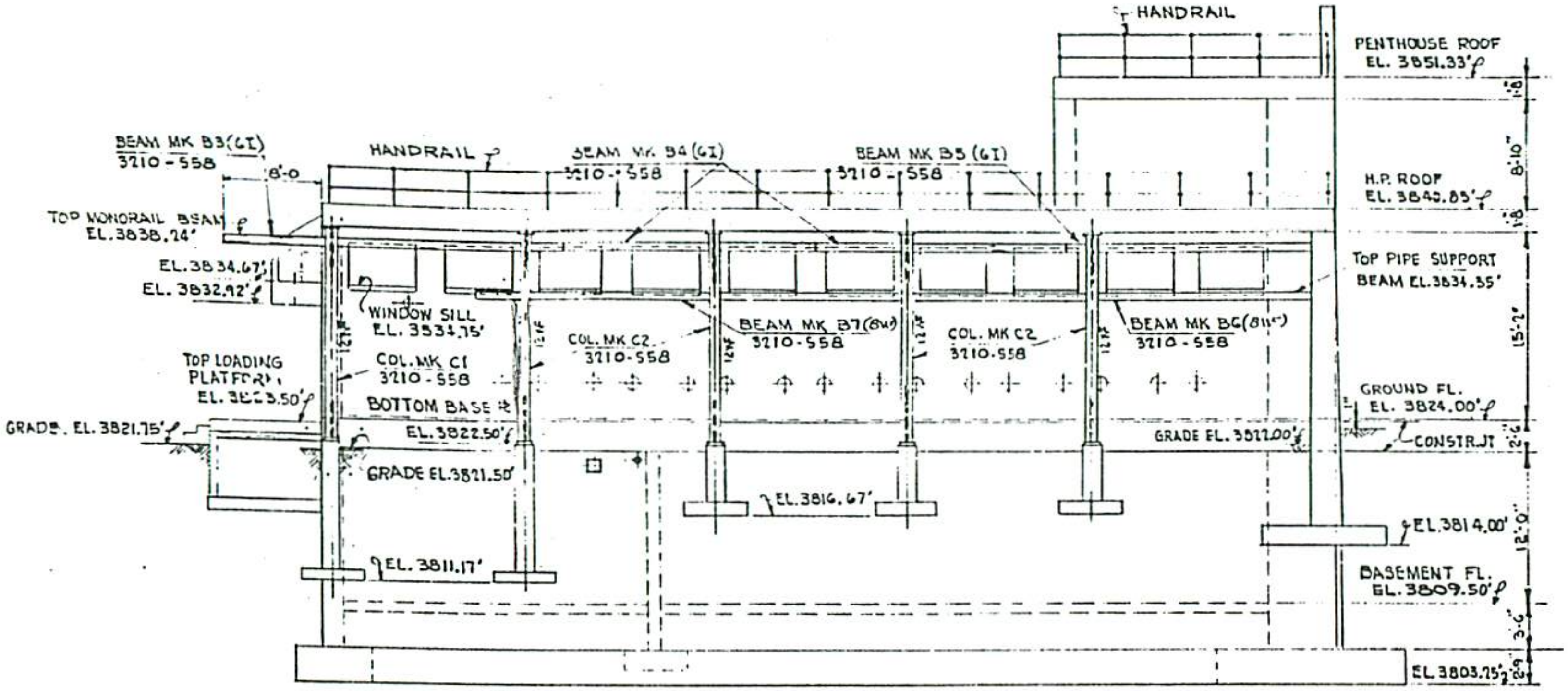
Test Cell C, Building 3210, west elevation, ca. 1960.



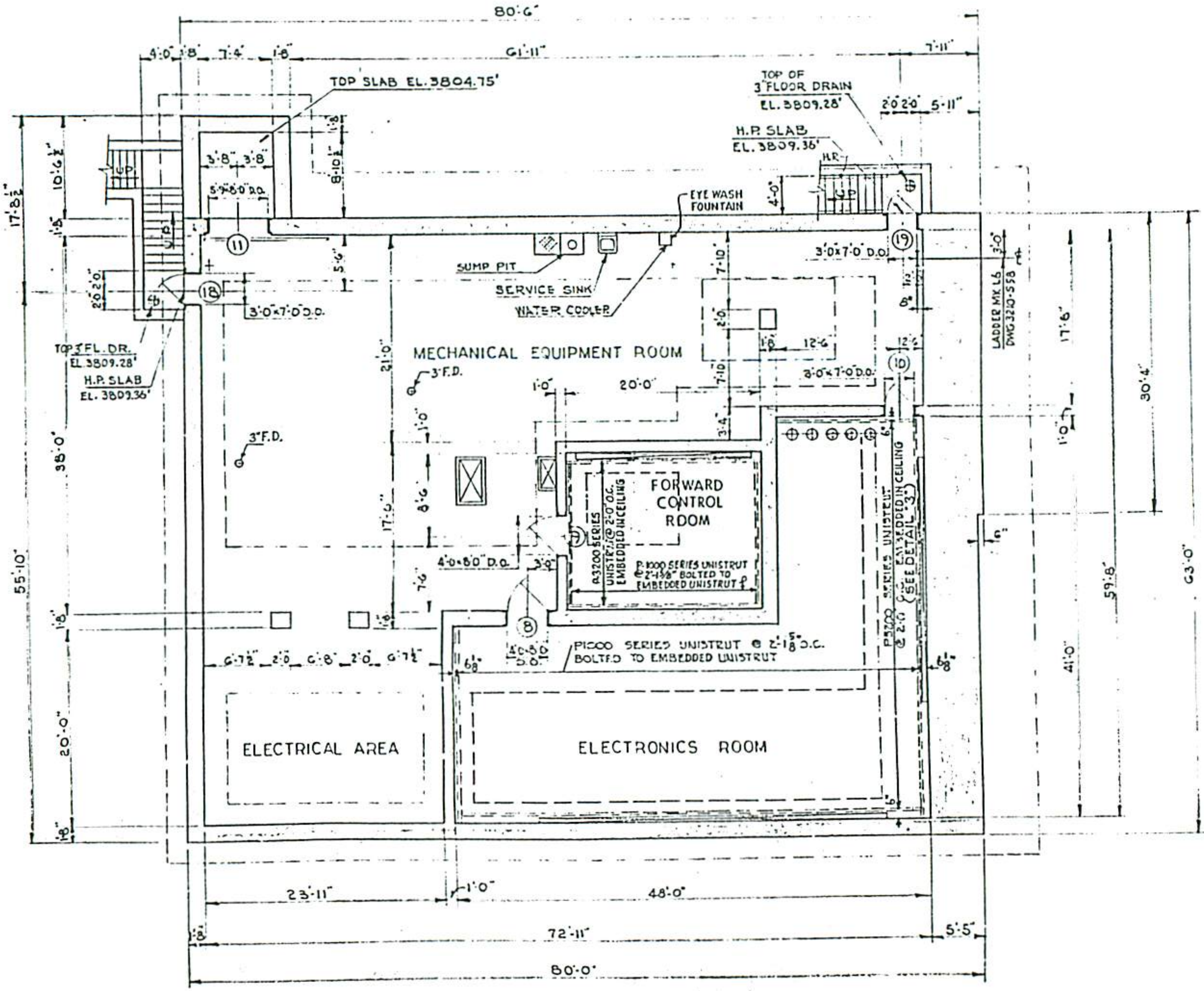
Test Cell C, Building 3210, north elevation, ca. 1960.



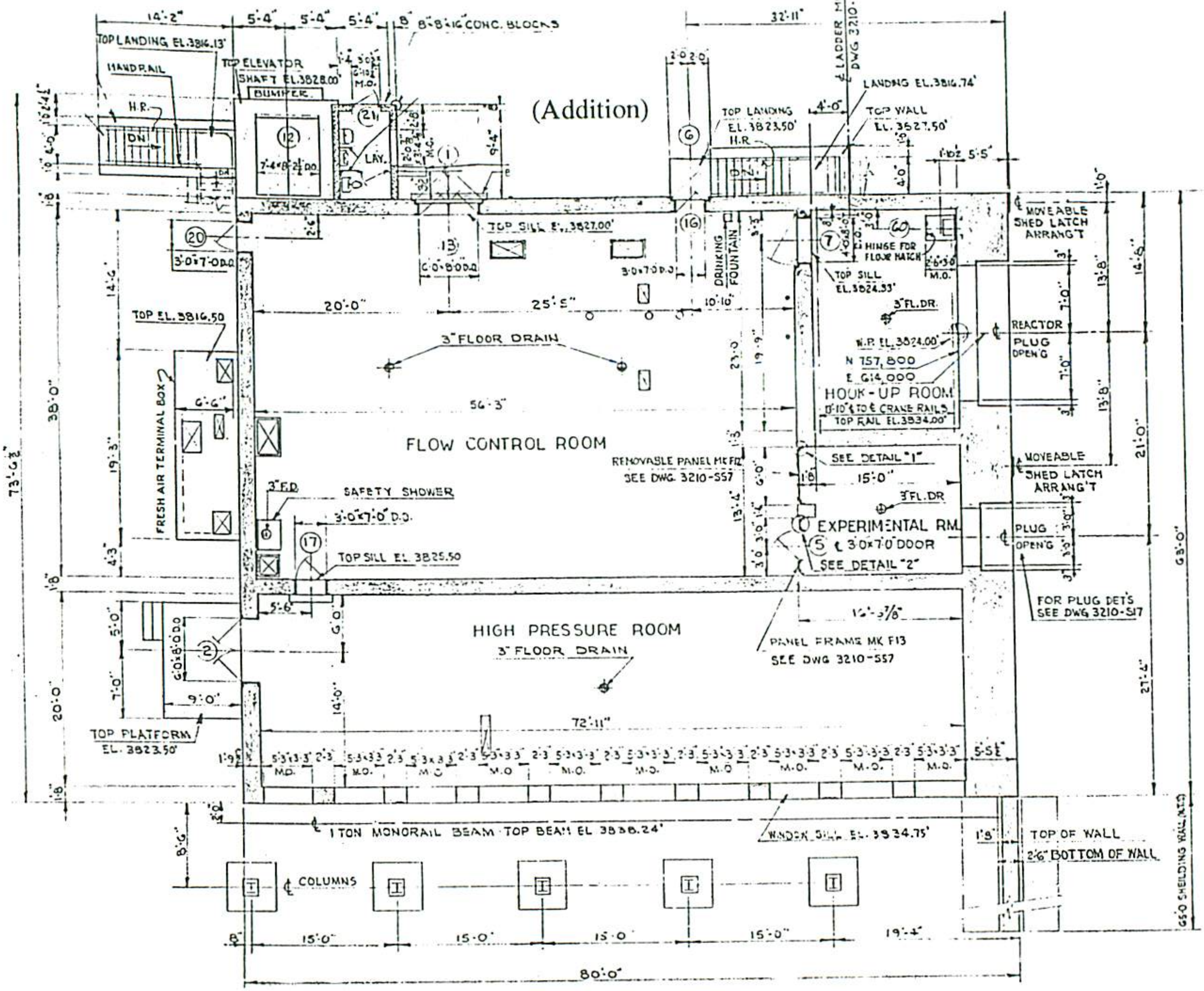
Test Cell C, Building 3210, south elevation, ca. 1960.



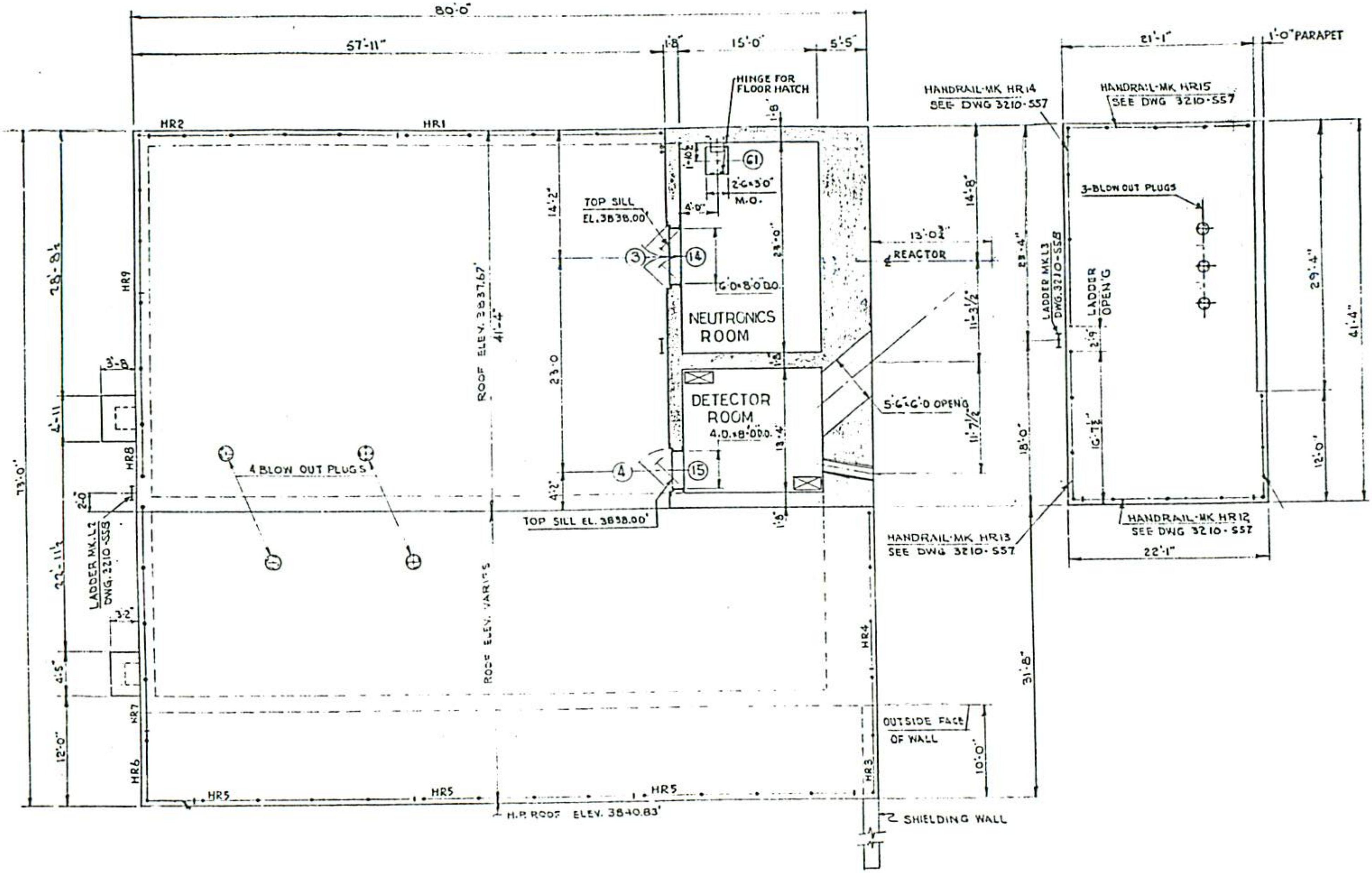
Test Cell C, Building 3210, east elevation, ca. 1960.



Test Cell C, Building 3210, Basement plan, ca. 1960.



Test Cell C, Building 3210, Floor 1 plan, ca. 1960.



Test Cell C, Building 3210, Penthouse and roof plan, ca. 1960.

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APPENDIX C

ARCHITECTURAL RESOURCE ASSESSMENT FORMS

SHPO RESOURCE #	NNSS BUILDING #	NAME
D346		Test Cell C Historic District
B2444	25-3210	Test Cell C Primary Building
B18109	25-3214	Shed Drive Funicular Railroad
B18110	25-3220	Support Building
B18111	25-3226	North Camera Bunker
B18112	25-3228	Warehouse
B18113	25-3229	Operations Building
B18114	25-3230 through 3232	Cryogenic Building
B18115	25-3233	Powerhouse
S2287	Kiwi-TNT	Reactor Test Stand

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NEVADA
STATE HISTORIC
PRESERVATION OFFICE

Historic District Resource Assessment (RA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N	Date:			
Survey Date	Jan 2019	Recorded By	Desert Research Inst.	Agency Report #	TR 117

1. District Overview & Information

District Historic Name	Test Cell C Historic District				
Current/Common Name	Test Cell C Historic District				
City, Zip Code(s)	Area 25, Nevada National Security Site (NNSS)				
County	Nye				
Subdivision(s)	Part of the Nuclear Rocket Development Station (NRDS)				
UTMs (NAD 83, UTM Zone 11 North)					
Coordinate #	Easting		Northing		
Northern Extent	564400		4076660		
Western Extent	564100		4076430		
Southern Extent	564420		4076110		
Eastern Extent	564595		4076465		
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Total Acres in the District	35.7				
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the district's location be kept confidential?				Yes ☐	No ☒

2. National Register Eligibility

Is the district listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed:	NRIS #:
If not already listed, complete the information below:					
Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☒	
	Not Eligible ☐	Unevaluated ☐			
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine				
Period(s) of Significance	1960-1972				
Total **Resources**: 9	**Contributing**: 9	**Non-contributing**: 0			
Integrity – Does the resource possess integrity in all or some of the 7 aspects?					
General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s): c.1990-present	
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒ Association ☒
Condition of District?	Good ☐	Fair ☒	Poor ☐		
Explanation	Several buildings and many structures have been demolished or removed. The facility is not maintained, resulting in severe decay of some buildings and structures. Despite this, overall integrity is still sufficiently high in all 7 aspects. It still easily conveys its significance to the visitor.				
Threats to Resource?	Demolition, Equipment Removal, Structural Decay				

3. District Inventory

SHPO RESOURCE #	***NAME***	***ADDRESS***	***YEAR BUILT***	***CONTRIBUTING? (YES OR NO)***
B2444	25-3210 Test Cell C Primary Building	Area 25, NNSS, Nye County	1961	Yes
B18109	25-3214 Shed Drive Funicular Railroad	Area 25, NNSS, Nye County	1961	Yes
B18110	25-3220 Support Building	Area 25, NNSS, Nye County	1961	Yes
B18111	25-3226 North Camera Bunker	Area 25, NNSS, Nye County	1962	Yes
B18112	25-3228 Warehouse	Area 25, NNSS, Nye County	1966	Yes
B18113	25-3229 Operations Building	Area 25, NNSS, Nye County	1966	Yes
B18114	25-3230-3232 Cryogenic Building	Area 25, NNSS, Nye County	1961	Yes
B18115	25-3233 Powerhouse	Area 25, NNSS, Nye County	c.1970	Yes
S2287	Kiwi-TNT Reactor Test Stand	Area 25, NNSS, Nye County	1964	Yes

4. Narrative Eligibility Justification

Provide a detailed explanation of the district's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, a discussion of the seven aspects of integrity, and conclusions about eligibility.

Because of the intricate interconnectedness of the resources, the most appropriate level of National Register evaluation is the Test Cell C Historic District. All of the recorded resources, with the exception of one Accessory Resource (25-3230-32 AR-6), contribute to this district. In addition, five of the nine Principal Resources within the district are individually eligible to the National Register. Eligibility is summarized in the following table and further discussed in the Architectural Resource Assessment form for each individual resource.

The Test Cell C Historic District is a contributing element to the significance of the larger potential Nuclear Rocket Development Station (NRDS) Historic District (see map on page 11).

Summary of eligibility recommendations for resources in the Test Cell C Historic District.

RESOURCE			Individually Eligible: CRITERION				Contributes to Test Cell C Historic District **
SHPO #	NNSS #	NAME	A	B	C	D	
D346	25-3210	Test Cell C Historic District	X	?	X	X	
B2444	25-3210	Test Cell C Primary Building*	X		X		X
B18109	25-3214	Shed Drive Funicular Railroad					X
B18110	25-3220	Support Building	X		X		X
B18111	25-3226	North Camera Bunker	X		X		X
B18112	25-3228	Maintenance/Warehouse Foundation					X
B18113	25-3229	Operations Building Foundation					X
B18114	25-3230-32	Cryogenics Building	X		X		X
B18115	25-3233	Powerhouse					X
S2287	Kiwi-TNT	Reactor Accident Test Stand	X		X	X	X

?-Unevaluated at this time but eligibility under Criterion B is considered likely with further research.
*****-Building 25-3210 has previously been evaluated as individually eligible under Criteria A and C (Drollinger, Goldenberg, and Beck. 2000). It has been demolished, so individual eligibility of this resource now is based on Accessory Resource AR-3218.
******-All Principal and Accessory Resources are evaluated as contributing to the Historic District with the sole exception of 25-3230-32 AR-6. In addition, the Test Cell C Historic District is a contributing element of the proposed Nuclear Rocket Development Station Historic District.

Areas of Significance

Test Cell C closely relates to four Areas of Significance as defined by the National Park Service.

Engineering: Test Cell C was integral to the successful development of one of the marvels of modern engineering, a nuclear rocket engine capable of reaching the outer planets at much greater speed and ultimately less cost than conventional rockets. In addition to the rocket components themselves, a large number of specialized handling and analysis devices had to be developed as part of the program. Outstanding examples of this are the two half-million-pound capacity liquid hydrogen dewars, which were the largest in the world at the time and involved many advances in welding technology, metallurgy, and design. Many of the engineering developments explored at Test Cell C have been adapted to subsequent space exploration programs. The program was cancelled for political and fiscal reasons, not because of technical problems. The nuclear rocket engine was ready for flight test when the program was suddenly cancelled.

Transportation: Of all the many modes of transportation that are reflected in the architectural record, none are more exotic than the nuclear rocket. Architectural resources related to the development of this mode of transportation are extremely rare and Test Cell C is one of the premier buildings related to its development.

Architecture: Test Cell C is highly significant under this theme because it involved the creation of building types, the most important of which was 23-3210, which was specifically designed based on the requirements of testing nuclear rocket engines.

Health/Medicine: Like several other major facilities at NRDS, Test Cell C is an outstanding laboratory for the long-term study of the interface between architecture and radiological hazards. This area of inquiry will be discussed further below under Criterion D.

Themes

The NRDS, including Test Cell C, is specifically discussed in Tlachac's (1991:25-6) contribution to the *Nevada Comprehensive Preservation Plan* under the Nuclear Testing Theme. In addition, Test Cell C relates closely to the Federal Government and Transportation Sub-Themes as defined in the plan. It also relates to the Military Sub-Theme because the program would not have come into being at all if it was not for the Cold War arms race between the United States and the Soviet Union regarding the design and testing of rapidly changing new generations of ballistic missiles and potential space-based weapons systems. Initially, the U.S. Air Force was one of the partners in nuclear rocket development, though it soon abdicated this role, preferring to concentrate on conventional missiles.

There is one additional historical theme that is directly applicable to Test Cell C and the other NRDS structures. In recognition of the historical significance of human space exploration, Congress passed Public Law (P.L.) 96-344 in 1980. The legislation directed the Secretary of the Interior to embark on a study of the events and locations associated with America's space efforts. Under the "Man in Space" Theme, the NPS was charged with identifying places, components and features representing this historic endeavor. Rocket engine and development test facilities were specifically noted as important to capturing the diverse technological and engineering innovations of the twentieth century to illustrate the story of the early U.S. space program (Butowsky 1987).

Period of Significance

The Period of Significance for Test Cell C extends from initial construction in 1960 through its last test of the Nuclear Furnace in 1972.

Criterion A

The Test Cell C Historic District is recommended eligible to the National Register under Criterion A. The principal building at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under this criterion through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg and Beck 2000). Test Cell C was determined significant for its role in the Space Program in forwarding the concept of nuclear rocket propulsion. As the core building of this highly integrated district, these comments and evaluations apply equally well to the district as a whole.

The massive, iconic structure of Test Cell C captures the technology of the beginnings of space travel in the last half of the twentieth century and its companions in conventional space travel, such as the launching gantries at Cape Canaveral or the Vehicle Assembly Building in Houston, which owes its great height to being designed to accommodate a nuclear-powered upper stage (Benjamin McGee *Personal Communication* 2019).

The Test Cell C complex remains a touchstone for the American space program because it marks the beginning of U.S. efforts to harness the power of the atom for interplanetary travel. To walk the Test Cell C Historic District is to journey back in time—to stare in awe at the towering steel and concrete creations unique to the country's only field-testing area for nuclear propulsion technology. It was a bold concept, confidently pursued by hundreds of scientists, engineers, and technicians cognizant of the obstacles and challenges that lay ahead, but driven by the age-old human desire to explore and excel.

The structures of Test Cell C continue to embody the hopes and aspirations of the first nuclear rocketeers and provide inspiration for their twenty-first-century counterparts with a dream of climbing aboard nuclear-propelled launch vehicles to orbit Mars, fly past Mercury and Jupiter, and travel on to the outer reaches of the solar system.

Criterion B

The Test Cell C Historic District is not recommended eligible to the National Register under Criterion B at this time. The critical aspect of National Register eligibility under Criterion B is that the resource be directly associated with an important aspect of the career that makes that person's achievements worthy of note.

Most of the individuals important at the national level to the nation's nuclear programs or other programs that were tested or developed at what is now the NNSS had far more important ties elsewhere, such as at the Los Alamos or Lawrence Livermore National Laboratories. Although many of these individuals spent time at the test site, it was often for short visits to monitor test results. The contributions and careers of some of these individuals, such as Senator Clinton Anderson and Los Alamos physicist George Grover, the Rover program inventor of the "heat pipe," are closely tied to the NRDS as a whole so that significance is best considered in relation to the proposed NRDS Historic District rather than in relation to the various elements of that district, such as Test Cell C.

It is likely that individuals of importance to specific operations at Test Cell C, particularly at the more local level, could be identified with further research. If so, they are most likely to be associated at the level of the Test Cell C Historic District rather than with one of its components.

Criterion C

The Test Cell C Historic District is recommended eligible to the National Register under Criterion C. The principal building at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under this criterion through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg, and Beck 2000). Test Cell C was determined significant under this criterion as a representative example of the type of structure used for conducting research with nuclear reactors. As the core building of this highly integrated district, these comments and evaluations apply equally well to the district as a whole.

Test Cell C's architecture is characterized throughout by strict functionalism. As McGee (n.d.) has noted, Test Cell C functioned "…much like an unpacked rocket system laterally unfurled into a series of buildings and external tanks." This is seen in its extremely rational layout and even more obviously by its striking exterior design and materials of Building 25-3210 which exhibit the Brutalist Style of architecture in its purest form. Selection of Brutalism in this case, as is the case with many industrial or military buildings, was largely mandated by lack of funds to attempt anything beyond pure function. It happens that the materials and requirements of interior room distribution and shapes essentially self-organized into a Brutalist creation with none of the inappropriate excesses in this direction for the sake of appearances that sometimes mar architect-designed buildings. Regarding the stark massing of industrial elements that comprises the entire complex, Constructivism is starkly recalled. In many ways the complex is also a Futurist fantasy brought to life in the desert. The various parts of the complex are tied together by bewildering amounts of pipes, all of which had to be subjected to extreme quality control measures, particularly the vacuum-jacketed cryogenic pipes.

Its functional character is largely influenced by the fact that it was almost entirely designed by engineering firms or laboratories. The original complex design was by Air Products, Incorporated. The firm of C.F. Braun of Alhambra, California, provided architectural and engineering services for some of the 1965 to 1966 modifications focused on increasing propellant storage capacity and cryogenic capabilities. Many of the subsequent upgrades and modifications were made by Los Alamos Scientific Laboratory. Other elements were designed by firms such as the Cosmodyne Corporation and EG&G. Chicago Bridge and Iron was responsible for the design and installation of most of the spherical dewars positioned throughout the test cell, and ACF designed and built the turbine energy source and much of the distribution piping associated with the later reactor tests. The only building designed by an architectural firm was the Operations Building (25-3229) by Bryant, Jehle & Associates, Architects & Engineers, of which only the foundations now exist.

Criterion D

It is rare for an architectural resource to warrant eligibility for its research potential, but a strong case can be made for Test Cell C. This facility was initially designed with the intention of containing high levels of radiation while still allowing personnel to safely work in close proximity. The success of this design has been exhaustively documented because of the intensive radiological monitoring conducted during its periods of active use. Monitoring, including personal dosimetry of all workers potentially exposed to radiation, has continued to present and also includes radiological surveys of the surround areas.

Test Cell C also presents many decades of research findings and ongoing investigation of methods and the efficacy of such methods for decontamination. The advantage of such an extended duration study is that decontamination efforts that appear to be effective in the short term can be far from successful in the long term because deeply penetrated radiation sometimes re-contaminates surfaces that were thought to be fully decontaminated. A recent study by McGee (n.d.) exploits this research potential by using Test Cell C as a test case for using gamma-ray spectrometry to assess radioactive contamination at abandoned nuclear testing facilities.

Questions regarding radioactive containment are important in relation to the various medical and industrial uses of atomic energy. Decontamination issues could become critical in the case of nuclear engineering accidents, or in this age of nuclear weapon proliferation, the intentional detonation of a nuclear device or intentional contamination with nuclear materials.

With the exception of Kiwi-TNT, this research potential is best considered at the level of the Test Cell C Historic District because all portions of the facility are involved to some extent, although the radioactive contamination is most highly concentrated at the Reactor Pad and surrounding concrete apron.

Integrity

In the earlier discussion of the condition of the various components of the Test Cell C Historic District, it is clear that it has severe problems of many kinds. Several of the most important components have been removed, including the Principal Test Cell C Building, Operations Building, Warehouse, Reactor Shed, and many tanks and other small elements.

Despite these integrity issues, the complex overall retains all seven aspects of integrity sufficiently to convey its significance to the observer. It is in its original location. No major design changes have taken place since the period of significance. The setting of the entire NRDS area of Jackass Flats is practically the same as it was during the period of significance. Additional construction of support facilities for the Yucca Mountain waste management project are some distance away and are of a designs similar to those constructed to support the NERVA program. The sense of feeling remains, but the stripped interiors of several key rooms has somewhat reduced this aspect of the complex's integrity. However, the importance of the various integrity issues at Test Cell C is reduced because it is a unique facility at the only testing ground for a unique program, and therefore it is the best surviving example of its type. This is even more the case since its prototype, Test Cell A, has largely been demolished.

5. Written Description

Provide a written description of the district, including all character-defining features or elements. Be sure to describe accessory resources as well.

The primary purpose of Test Cell C was to test the nuclear reactors being developed for the propulsion of rockets for the United States space program. The original configuration of Test Cell C was built between 1960 and 1961. The facility was an advanced version of the Test Cell A facility and was capable of larger and more powerful tests. Unlike its earlier counterpart, which was limited to gas propellants, Test Cell C was designed to use both gaseous and liquid hydrogen (Space Nuclear Propulsion Office 1969:66-67).

The major events in the construction and use history of Test Cell C can be summarized as follows. The facility was designed by Air Products, Inc., of Allentown, Pennsylvania (*Albuquerque Journal* February 21, 1960:8; *Aviation Week* 1960:37). Construction began in 1960. Okland Construction Company of Salt Lake City, Utah, won a $1.1 million contract for the first phase of the test cell proper. Okland Construction was responsible for building the heavily reinforced concrete test cell (Building 25-3210) and a propellant fill station building (25-3220 AR-3219), furnishing and erecting two prefabricated metal buildings (Buildings 25-3230 and 25-3232), constructing a cooling tower (Bldg. 25-3220 AR-3203) and outdoor power substation (25-3233 AR-3215), and installing the utility systems within the test cell complex (M&R 1960a:77; 1960b:52-53). The initial contracted work was completed by 1961, but small additions and modifications continued. Although it was fully operational in 1963, technical changes delayed the first test until 1964. Even before the initial test, a contract had been issued for architectural and engineering services to C.F. Braun of Alhambra, California, for additional modifications to Test Cell C, which focused on increasing liquid hydrogen storage capacity and cryogenic capabilities (M&R 1963a:48).

On June 24, 1965, a Phoebus 1A reactor expelled large amounts of reactor component when one of the existing liquid hydrogen storage tanks accidently ran dry during the experiment, causing the reactor core to overheat (Dewar 2004:164-165). The debris took months to clean up (Sanders 1967). This event occurred while an extensive expansion project was underway. Much of the concrete foundation work had been completed for the new structures, but fortunately the structural components of the dewars were undergoing partial assembly outside the test cell complex and were not damaged. Construction of the new facilities was not significantly affected by the incident and subsequent decontamination activities, but the testing schedule slipped by nearly a year.

Following the cleanup in 1965, the planned expansion work continued. Although the core 1960 to 1961 components remained, the additions were extensive and they significantly altered the complex's visual appearance by increasing the horizontal extent and density of the footprint within the fenced area. Alteration of the facility's vertical profile was achieved principally by the installation of a pair of massive 500,000-gallon steel dewars and a labyrinth of piping to the west of the main test cell building. With a combined capacity of a million gallons, the gigantic liquid hydrogen storage tanks were the work of CB&I. The company developed a new field-welding technique specifically for the Test Cell C Hortonsphere tanks (M&R 1963b:37). This method, with its superior strength characteristics, allowed the rapid on-site assembly of the double-walled aluminum and carbon steel vessels, which ensured that they could withstand the exacting high-pressure and cryogenic requirements. Other enhancements at that time included the Operations Building and Warehouse. The last test at the facility was of the Nuclear Furnace in 1972. Demolitions and equipment removals occurred after testing ceased, often without documentation. The greatest amount of demolition work occurred between 2005 and 2011.

A more detailed historic context for the district is available and the associated report (Reno et al. 2019).

Because this area is not divided into lots, such as found in urban surveys, the assignment of Principal Resources and the boundaries of their resources is, of necessity, somewhat arbitrary. It was decided to make every standing building and every resource physically separated from the main compound a Principal Resource. In addition, foundations of major buildings were also designated Principal Resources. The entire compound was then divided into contiguous lots around all of these Principal Resources. In many cases, these lots encompass Accessory Resources with an obvious functional link to the Principal Resource. However, bearing in mind the interconnectedness of the various elements throughout Test Cell C, quite a few are related to the Principal Resource only by relative proximity. In this regard, the initial approach would have had merit. For any cases in which functional association to a building was unusually strong, the lot was extended to encompass it even though another Principal Resource happened to be closer. A good example of this is the Air Intake Building Foundation. Although the foundation is physically closer to building 25-3220, it was recorded as an accessory to 25-3210 because the two are connected by a large underground air duct. In summary, it is best to regard the assignment of Principal and Accessory Resources and lot boundaries as recording conveniences. These resources, many of which are individually significant, have more meaning when considered as part of the Test Cell C Historic District as a whole.

The Principal Resources are listed on page 2. See the individual Architectural Resource Assessment forms for detailed descriptions and photographs of each property.

6. References

List references used to research and evaluate the individual property.

Albuquerque Journal
1960 "Test Work Begun on Kiwi A-Prime Nuclear Device." 21 Feb., 1960, p. A-8, Albuquerque.

Aviation Week
1960 "Kiwi Reactor Facility Construction Starts." May 23, 1960. McGraw-Hill Publishing Co., New York.

Butowsky, Harry A.
1987 *Man in Space: Study of Alternatives*. National Park Service Theme Study, United States Department of Interior, National Park Service, Washington DC.

Dewar, James A.
2004 *To the End of the Solar System: The Story of the Nuclear Rocket*. University Press of Kentucky, Lexington.

Drollinger, Harold, Nancy Goldenberg, and Colleen M. Beck
2000 *An Historical Evaluation of the Test Cell C Facility for Characterization Activities Associated with Decontamination and Decommissioning, Area 25, Nevada Test Site, Nye County, Nevada*. DRI Report No. SR021500-1, Desert Research Institute, Las Vegas.

Missiles and Rockets (M&R)
1960a "Work Begun on Liquid H2 Complex at Nevada Test Site." *Missiles and Rockets* Volume 6:22, May 30 issue

1960b "Theories Proven…Kiwi A-Prime Run Brings Flight Closer." *Missiles and Rockets* Volume 7:3, July 18 issue.

1963a "Contracts and Procurement: Awards: Industry." *Missiles and Rockets*. Volume 13:9, August 26 issue

1963b "Liquid Hydrogen on Scorching Jackass Flats…CB&I Built It." *Missiles and Rockets*. Volume 13:9, August 26 issue.

Sanders, Fred
1967 *Decontamination of Test Cell "C" at the Nuclear Reactor Development Station after a Reactor Accident*. LASL Report No. LA-3633-MS. Los Alamos Scientific Laboratory of the University of California, Los Alamos.

Reno, Ron, Susan Edwards, Jeffrey Wedding, Harold Drollinger, and Cheryl Collins
An Architectural Survey of Test Cell C, Area 25, Nevada National Security Site, Nye County, Nevada. DRI Report No. TR-117. Desert Research Institute, Las Vegas.

Space Nuclear Propulsion Office (SNPO)
1969 *NRDS Master Plan, 1969-1970*. Manuscript on file, Department of Energy, Nevada Operations Office, Las Vegas.

Tlachac, Eve M.
1991 Nuclear Testing. In *Nevada Comprehensive Preservation Plan*, edited by White, W.G., R.M. James, and R. Bernstein, pp. 25/1-25/12. Division of Historic Preservation and Archaeology, Department of Conservation and Natural Resources, Nevada Historical Society, Department of Museums and History, Carson City.

Historic photographs and drawings at end of form:

Dewar, James A.
2004 *To the End of the Solar System: The Story of the Nuclear Rocket*. University Press of Kentucky, Lexington.

Los Alamos Scientific Laboratory (LASL)
1963 Test Cell "C" Layout. Drawing No. Figure-4, Sheet No. 4 of 8. University of California, Los Alamos.

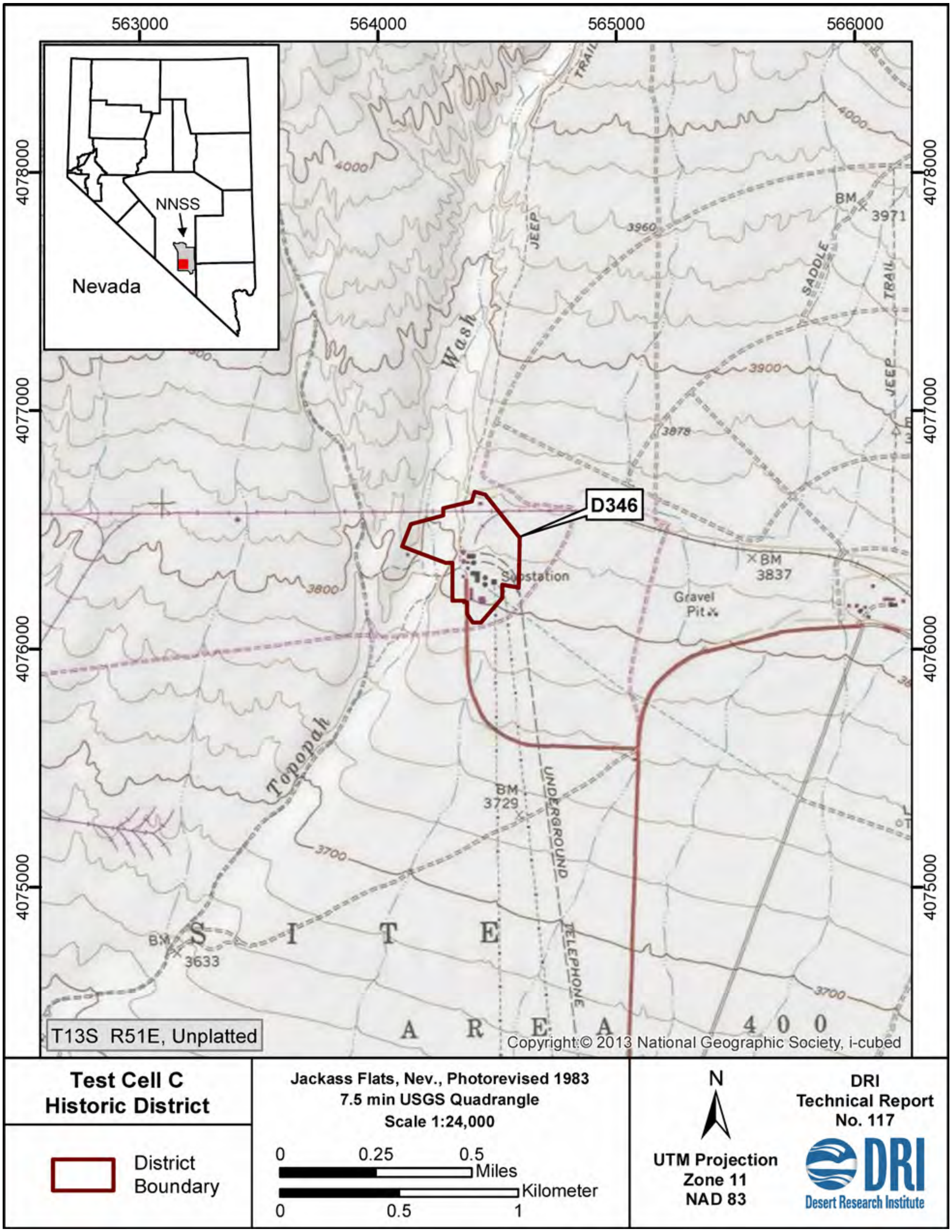
1967 Test Cell "C" Layout. Drawing No. SK-125, Revised 1972 (Rev. H). University of California, Los Alamos.

Reynolds Electrical & Engineering Co. (REECo)
1982 *Photograph Album Index (1958 – 1976)*. Photos and index on file at the Desert Research Institute, Las Vegas.

Drawings and archival maps are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

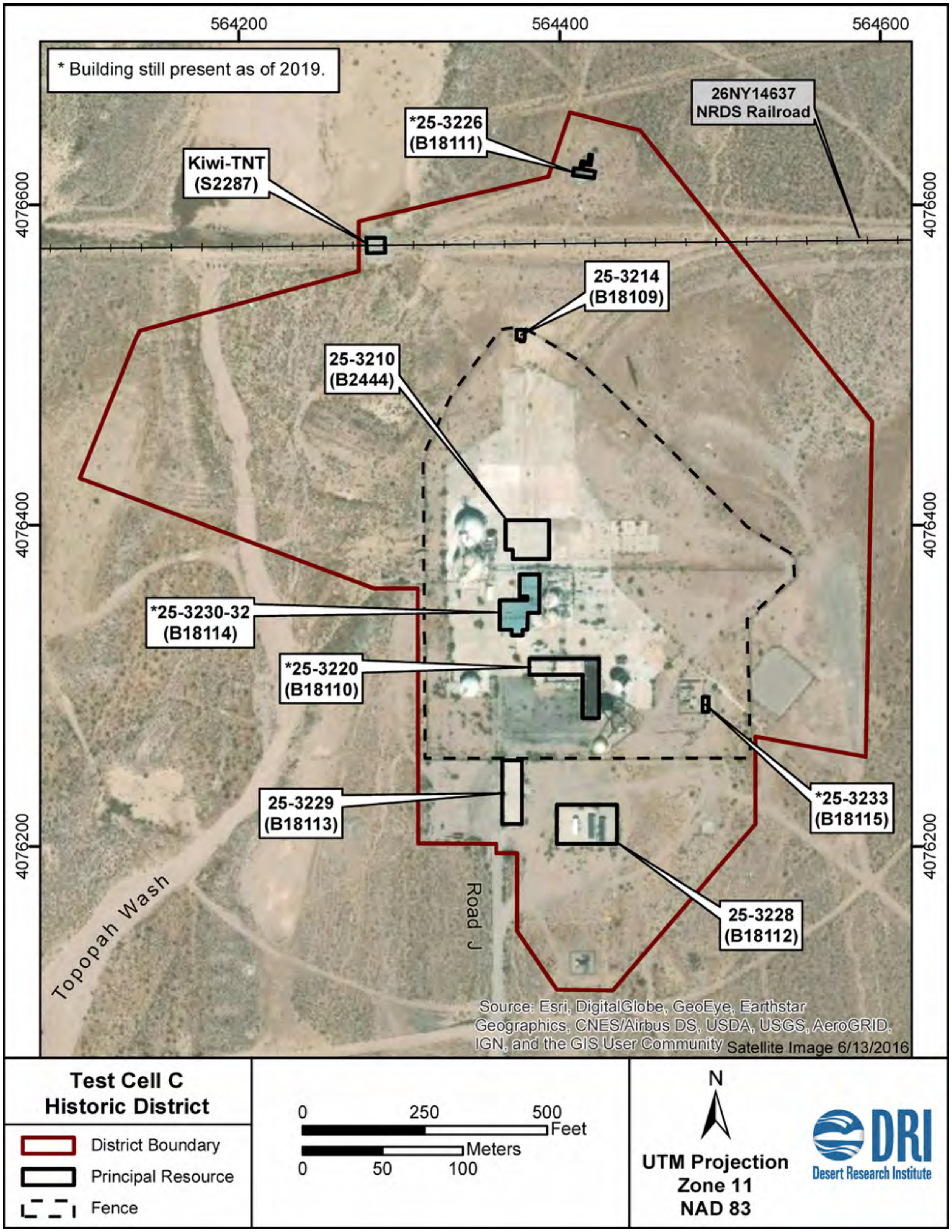
Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

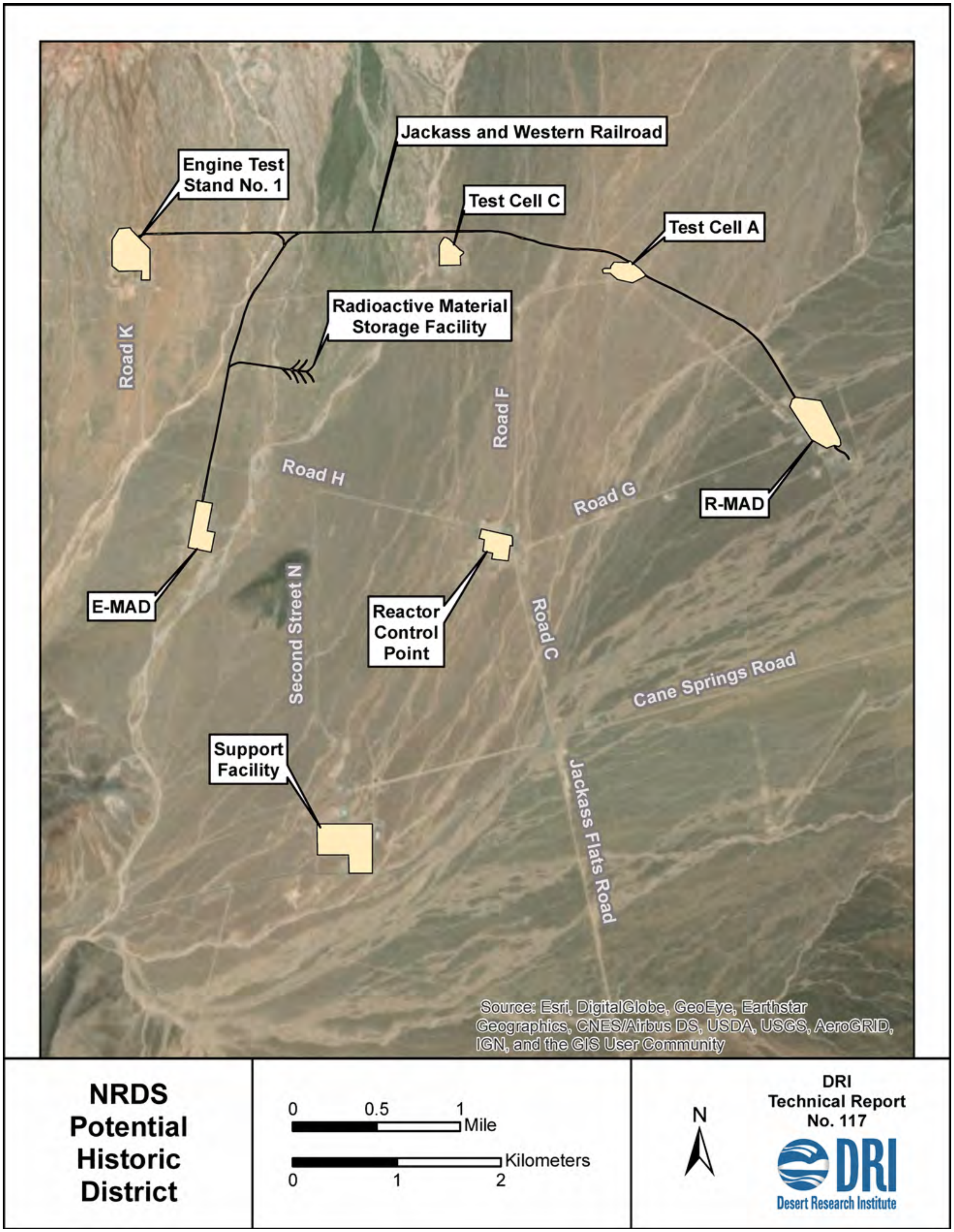
7. District Location Map



8. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, all contributing and non-contributing resources and their spatial relationship to one another.



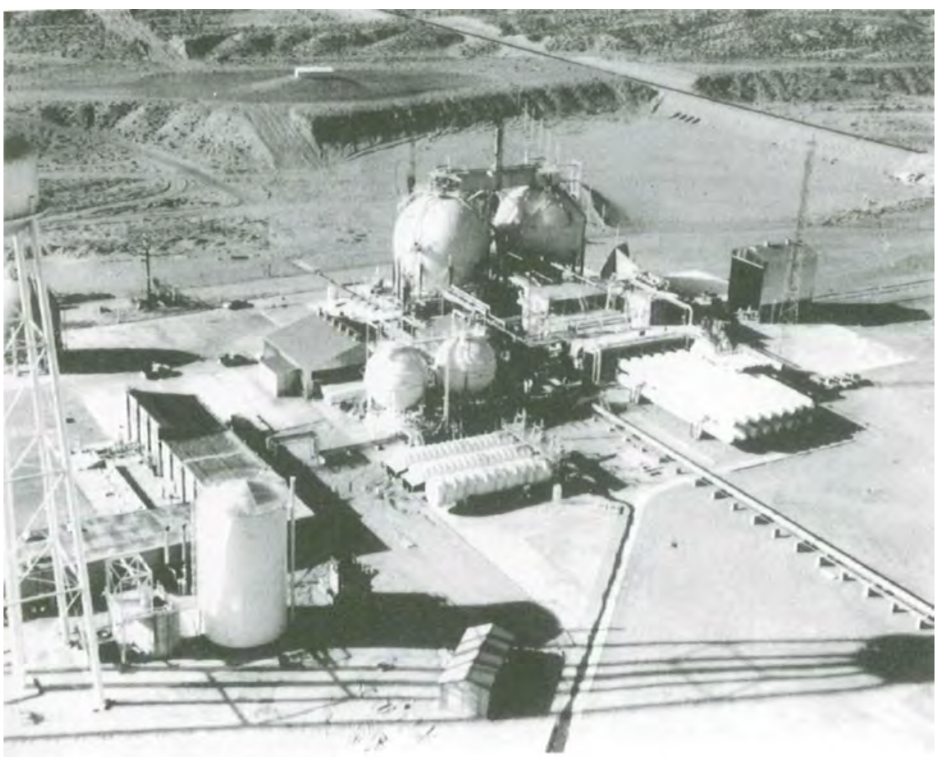

Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
Kilometers 0 1 2
N
DRI Technical Report No. 117
DRI
Desert Research Institute

9. Photographs

Elevation: North/West Direction facing: Southeast Photographer: Remote Sensing Laboratory (RSL) Date: 2000

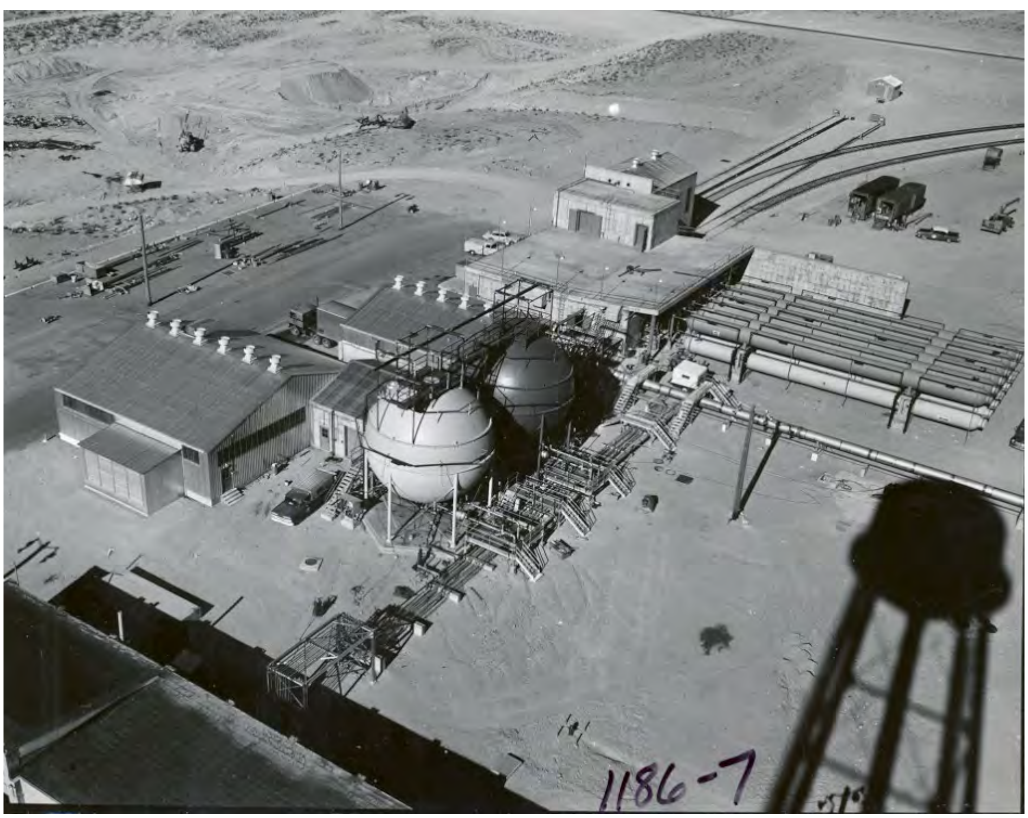
Elevation: North Direction facing: South Photo source: RSL Date: c. 1967

Elevation: North/West Direction facing: Southeast Photo source: RSL Date: c. 1967



Overview facing northwest. In the distance from left to right are the West Camera Bunker which no longer exists, the poles of the Dosage Measurement Aerial Tramway crossing Topopah Wash, and the dike where the Jackass & Western Railroad crosses the wash with the KIWI-TNT Reactor Test Stand on the railroad grade at the right edge of the image (Los Alamos, reproduced from Dewar 2004:87, c. 1966).

Test Cell C overview facing east-southeast. This image shows radiation levels following the June 25, 1965 Phoebus 1A reactor core ejection incident. It was taken immediately before the major 1965-1966 upgrade and includes full images of both towers (Los Alamos, reproduced from Dewar 2004:129, 1965).



Overview from top of Water Tower facing northwest (REECo, Photo 1186-7, 1961).

Overview facing northeast (REECo, Photo 1158-1, 1960).

Overview, facing southwest, with bladed site of former Waste Water Treatment Facility in foreground (DRI, Photo 78, 2019.

Overview, facing south, with sunken Jackass & Western Railroad grade in foreground (DRI, Photo 160, 2019).

Overview, facing northeast (RSL, Photo 2009-39, 2009). Other than removal of Building 25-3210 between the two clusters of dewars, Test Cell C looks the same today from this vantage.

View toward the north of the western half of the compound at the Main Gate (DRI, Photo 44, 2019).

The eastern half of the compound from Road J in front of the Main Gate, facing northeast. The Operations Building 25-3229 foundation is in the foreground (DRI, Photo 30, 2019).

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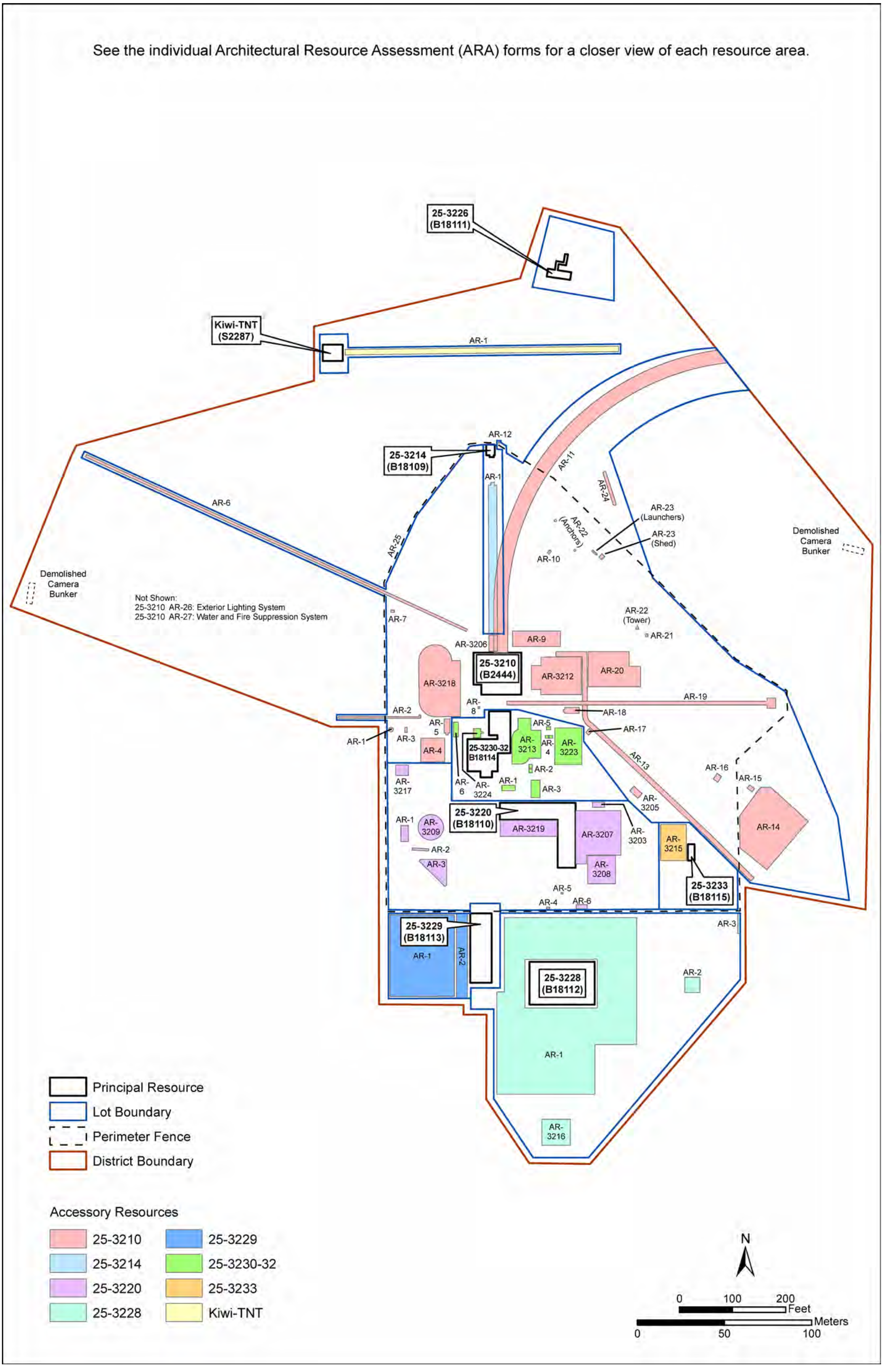

Map showing Principal and Accessory Resources within the Test Cell C Historic District. All resources contribute to the significance of the district.

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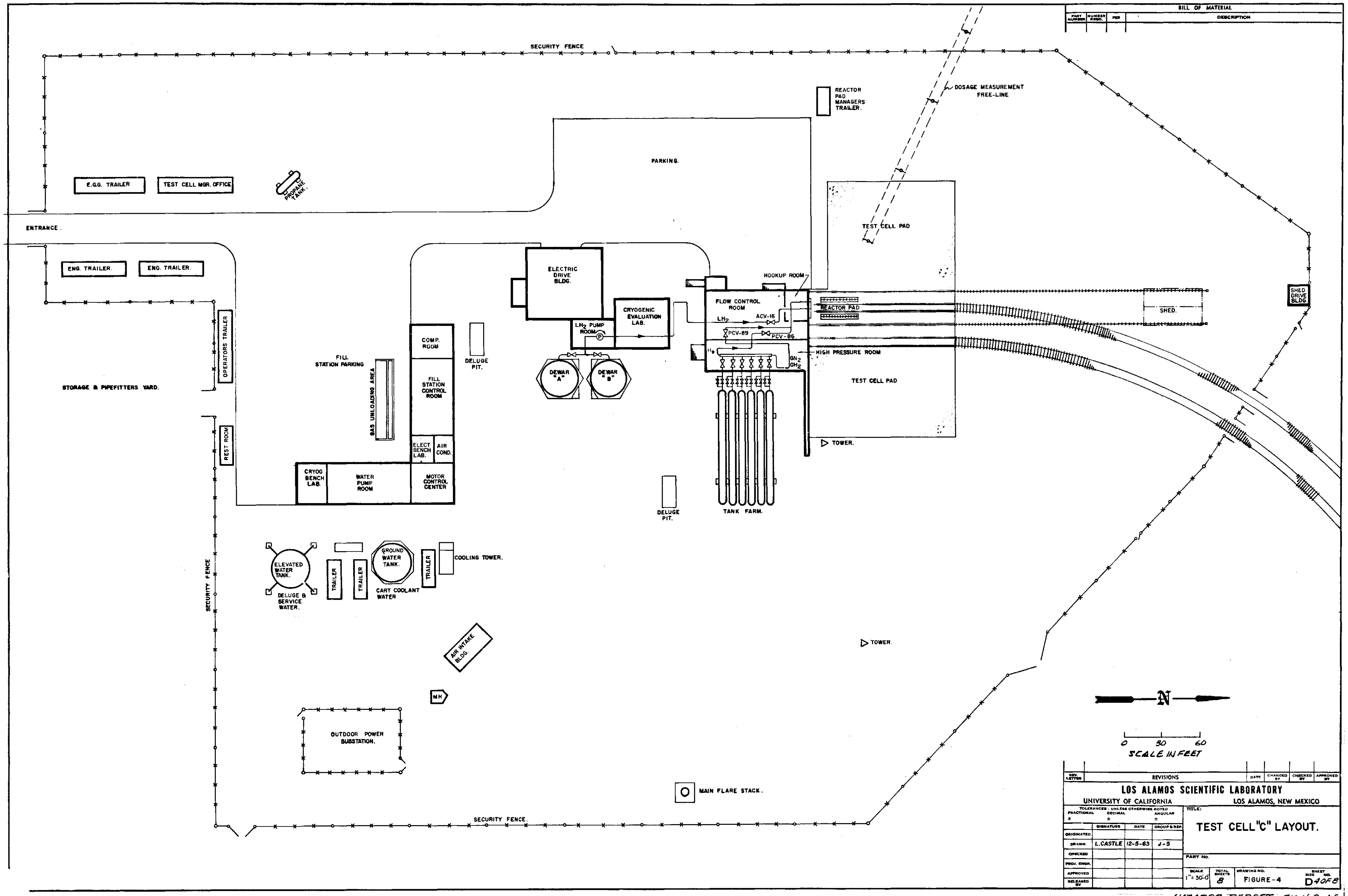
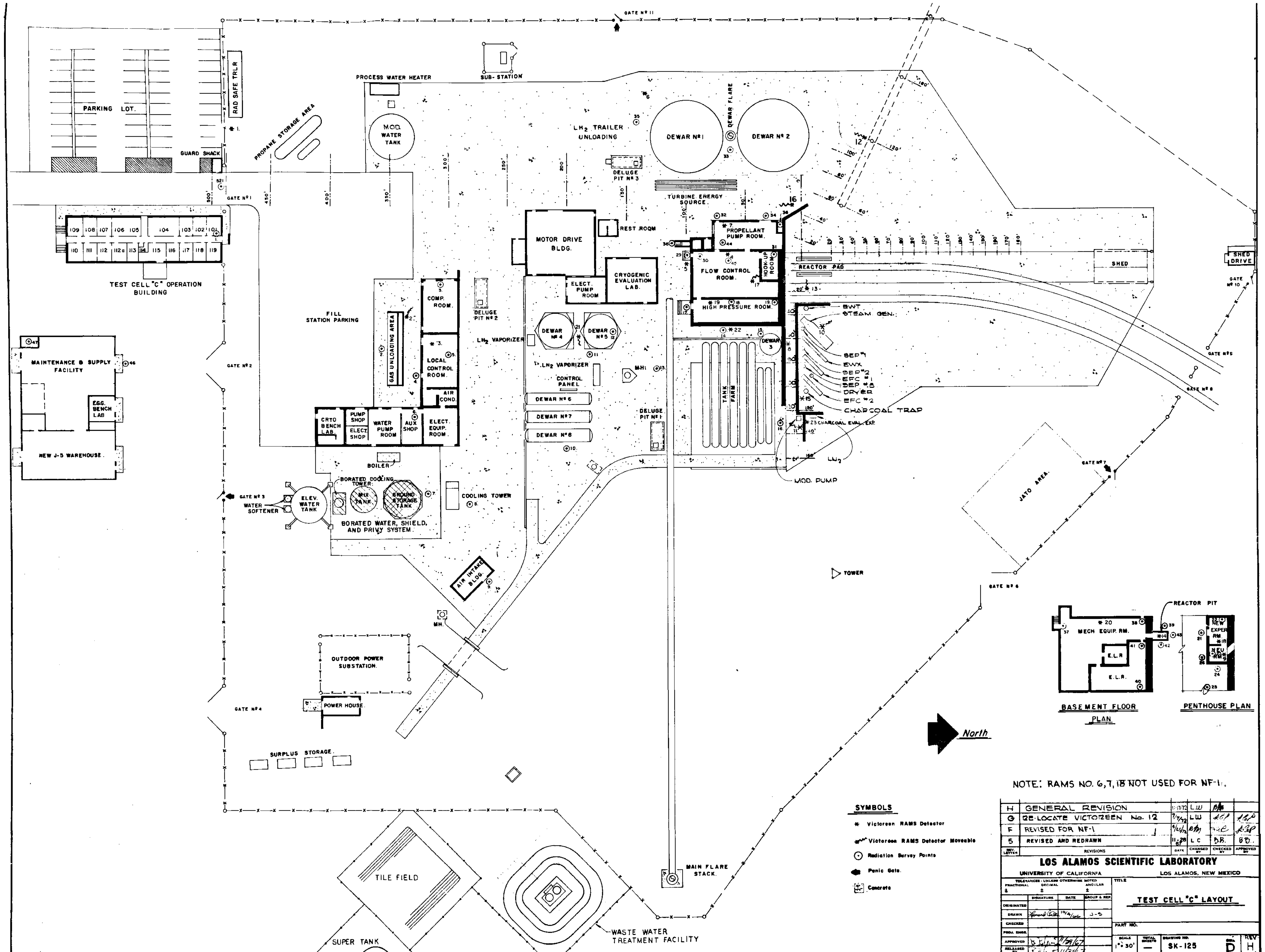

SECURITY FENCE
ENTRANCE
E.G.G. TRAILER
TEST CELL MGR. OFFICE
PROPANE TANK
PARKING
REACTOR PAD MANAGERS TRAILER
DOSAGE MEASUREMENT FREE-LINE
TEST CELL PAD
ENG. TRAILER
ENG. TRAILER
OPERATORS TRAILER
STORAGE & PIPEFITTERS YARD
REST ROOM
FILL STATION PARKING
GAS UNLOADING AREA
COMP. ROOM
FILL STATION CONTROL ROOM
ELECT BENCH LAB.
AIR COND.
CRYOG BENCH LAB.
WATER PUMP ROOM
MOTOR CONTROL CENTER
DELUGE PIT.
ELECTRIC DRIVE BLDG.
LH2 PUMP ROOM
CRYOGENIC EVALUATION LAB.
DEWAR "A"
DEWAR "B"
HOOKUP ROOM
FLOW CONTROL ROOM
ACV-16
PCV-89
PCV-86
REACTOR PAD
HIGH PRESSURE ROOM
GN2
GH2
TEST CELL PAD
TOWER.
TANK FARM.
DELUGE PIT.
SHED.
SHED DRIVE BLDG.
ELEVATED WATER TANK.
DELUGE & SERVICE WATER.
TRAILER
TRAILER
GROUND WATER TANK.
CART COOLANT WATER
TRAILER
COOLING TOWER.
SECURITY FENCE
AIR INTAKE BLDG.
MH
TOWER.
OUTDOOR POWER SUBSTATION.
MAIN FLARE STACK.
SECURITY FENCE.
N
0 30 60
SCALE IN FEET
BILL OF MATERIAL
DESCRIPTION
REVISIONS
LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO
TITLE:
TEST CELL "C" LAYOUT.
DRAWN L. CASTLE 12-5-63 J-5
SCALE 1" = 30-0
TOTAL SHEETS 8
FIGURE-4
D4OF8
HAZARDS REPORT SK-169 J-5

LASL 1963


PARKING LOT
RAD SAFE TRLR
GUARD SHACK
PROPANE STORAGE AREA
PROCESS WATER HEATER
SUB- STATION
MOD. WATER TANK
LH2 TRAILER UNLOADING
DEWAR FLARE
DEWAR Nº1
DEWAR Nº 2
DELUGE PIT Nº 3
TURBINE ENERGY SOURCE
MOTOR DRIVE BLDG.
REST ROOM
PROPELLANT PUMP ROOM
FLOW CONTROL ROOM
REACTOR PAD
SHED
SHED DRIVE
CRYOGENIC EVALUATION LAB.
ELECT. PUMP ROOM
HIGH PRESSURE ROOM
TEST CELL "C" OPERATION BUILDING
FILL STATION PARKING
GAS UNLOADING AREA
COMP. ROOM
DELUGE PIT Nº 2
LH2 VAPORIZER
DEWAR Nº 4
DEWAR Nº 5
LOCAL CONTROL ROOM
AIR COND.
CONTROL PANEL
DEWAR Nº 6
DEWAR Nº 7
DEWAR Nº 8
DELUGE PIT Nº 1
TANK FARM
STEAM GEN.
CHARCOAL TRAP
MOD. PUMP
MAINTENANCE & SUPPLY FACILITY
EGG. BENCH LAB
NEW J-5 WAREHOUSE
CRYO BENCH LAB
PUMP SHOP
ELECT SHOP
WATER PUMP ROOM
AUX SHOP
ELECT. EQUIP. ROOM
BOILER
BORATED COOLING TOWER
MIX TANK
GROUND STORAGE TANK
COOLING TOWER
ELEV. WATER TANK
WATER SOFTENER
BORATED WATER, SHIELD, AND PRIVY SYSTEM
JATO AREA
TOWER
AIR INTAKE BLDG.
OUTDOOR POWER SUBSTATION
POWER HOUSE
SURPLUS STORAGE
TILE FIELD
SUPER TANK
WASTE WATER TREATMENT FACILITY
MAIN FLARE STACK
REACTOR PIT
MECH EQUIP. RM.
BASEMENT FLOOR PLAN
PENTHOUSE PLAN
North
NOTE: RAMS NO. 6,7,18 NOT USED FOR NF-1.
SYMBOLS
Victoreen RAMS Detector
Victoreen RAMS Detector Moveable
Radiation Survey Points
Panic Gate
Concrete
H GENERAL REVISION
G RE-LOCATE VICTOREEN No. 12
F REVISED FOR NF-1
5 REVISED AND REDRAWN
LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO
TEST CELL "C" LAYOUT
SK-125
D
H

LASL 1967

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A	Subdivision Name	Nuclear Rocket Development Station (NRDS)		
UTM Location (NAD 83, UTM Zone 11 North)		Easting: 564380	Northing: 4076390		
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?		Yes ☐	No ☒		

3. Architectural Information

Construction Date	1960-1961
Architectural Style	Brutalist
Architectural Type	Factory
Roof Form	Flat
Roof Materials	Concrete
Exterior Wall Materials	Concrete
Foundation Materials	Concrete
Window Materials	None
Window Type	None
Accessory Resources?	Yes ☒ No ☐
	Number?: 32

Condition of Resource(s)?		
Good ☐	Fair ☐	Poor ☒
Explanation: Principal Resource and many Accessories have been removed. Main dewars survive in excellent condition along with some other Accessories and extensive foundations.		

(Insert primary photograph below.)

Oblique view of 25-3210, north and west elevations, facing southeast (Photo source: Remote Sensing Laboratory [RSL], c. 1967).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: / NRIS #:
Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: / Date listed: / NRIS #:
If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒ No ☐
		If so, is this resource contributing?		Yes ☒ No ☐
District Name: Test Cell C Historic District			SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☐
	Not Eligible ☐	Unevaluated ☐		

Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine
Period(s) of Significance	1960-1972

Integrity – Does the resource possess integrity in all or some of the 7 aspects?						
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒

General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s):2005-2011

Threats to Resource:	Demolition, Structural Decay, Equipment Removal
Historic Name	25-3210 Test Cell C Building
Current/Common Name	Same
Historic/Original Owner	U.S. Atomic Energy Commission
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030
Historic Building Use	Nuclear rocket reactor testing.
Current Building Use	None.
Architect/Engineer/Designer	Air Systems, Inc., Allentown, Penn.
Builder/Contractor	Unknown.

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6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

The Principal Resource at Test Cell C (25-3210) has previously been determined eligible to the NRHP at the national level of significance under Criteria A and C through consultation between the Nevada SHPO and the Department of Energy, Nevada Field Office (Drollinger, Goldenberg, and Beck 2000). Test Cell C was determined significant for its role in the U.S. Space Program and as a representative example of the type of structure used to conduct research with nuclear reactors. With demolition of this building, only enough remains to consider it a contributing element to the district rather than individually eligible.

However, Accessory Resource AR-3218, the gigantic pair of liquid hydrogen dewars added to the facility in 1966, fully takes the place of the Principal Resource as warranting individual significance under these two criteria. The tanks, which are in excellent condition, tower over the surrounding landscape and are visible from many miles away and epitomize the scale and ambition of the space program under Criterion A.

Under Criterion C their construction presented unprecedented problems in engineering and metallurgy. A new metallurgical process (the Horton Pickling Process) and a field-welding technique were patented for making steel that would withstand the incredible pressures of half million gallons of liquid hydrogen in a single tank in addition to the strains involved in storing such large amounts of cryogenic liquid. In terms of representing a structure on a scale never seen before, these dewars were among the largest in the world at the time.

This resource is not eligible under Criterion B, nor does it appear to have special research potential that would make it eligible under Criterion D.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

This resource encompasses the remains of the principal test building at Test Cell C (25-3210) and most of the other resources within the northern half of the Test Cell C complex. Building 25-3210 was located adjacent to the functional center of the complex, which was the Reactor Pad (AR-3206). Much of the area north and northeast of the Reactor Pad was open space that was either paved with concrete or left as bare earth because it was downwind of the test under normal conditions, and, therefore, there was a high risk of radioactive contamination of the area.

Test Cell Building Foundation and Basement: Although the building was torn down in 2010 or 2011, there are some remnants that can be used to establish its exact location in relation to surrounding elements. The main part of the building is marked by a recent concrete slab. This slab caps the basement, which was backfilled with radioactive debris from the building rather than disposed of off-site. The foundation and concrete floor slab of the Propellant Pump Room addition at the west end of the building survived because it was not highly contaminated, nor was it over the basement. The base of the thick northern shield wall adjacent to the Reactor Pad is also visible on the surface.

Building 25-3210 is the only building described in any detail by the trio of 2000 survey, evaluation, and mitigation documents. Construction details can be found in the state site form for 26NY11258 and the Historic Properties Inventory Form and the Historic American Engineering Record (Drollinger, Beck, and Goldenberg 2000). Briefly, it was the largest and by far the most complex building at Test Cell C at 63 by 80 feet with a height of 36 feet and two additions comprising a total of 12,180 square feet. It was constructed of reinforced concrete. Most of the building was a tall single story with a complex plan and a flat roof. It had a basement and small penthouse. The tall concrete shield wall between it and the Reactor Pad dominated the north façade. Much of the rest of the exterior was dominated by a maze of piping. The building served as the interface between the reactor and engine on the Reactor Pad and the rest of the NRDS. Materials needed for the test, particularly liquid hydrogen and other gasses, were regulated and passed through this building. Diagnostics were passed in the opposite direction. All controls of the test either originated in or passed through the building. Some were done within the building itself, but it was also connected to the Local Control Room in Building 25-3220, the Operations Building 25-3229, and the NRDS Control Point.

Accessory Resources

The entire TCC facility is an extremely integrated network of diverse construction all centered on the Reactor Pad and Test Cell Building. Although recorded as a number of Principal Resources, this division, including the placement of resource boundaries encompassing Accessory Resources is largely arbitrary for convenience in recording given the extensive interrelationships among the various components of the facility. Except for support facilities such as parking lots and outlying buildings, nearly all are connected via a dense network of piping, communications lines, power lines, and so on. Facility numbers are used for these resources when known with an AR- prefix. Arbitrary sequential numbers were assigned to the remaining Accessory Resources. Although some Accessory Resources were mentioned or photographed in the previous documents noted above, none have previously been described. Construction and demolition dates are based on a multitude of engineering drawings and photographs, only a small sample of which are included with this form.

AR-3205, Air Intake Building Foundation: Presently, this area is a concrete slab with two large raised-concrete mounts that supported the blower. Kingbolts are present for wall attachment. The building was a 16 by 36 foot rectangular-plan, one-story metal building with a low-pitch gable roof. It is oriented northwest to southeast in line with the underground air duct running from this building to Building 25-3210. Nearly the entire southeast elevation was filled with louvers for air intake. A steel-panel double door was in the northeast elevation. Small louvered vents were in the gable ends. The building was erected in 1960 and removed prior to 2005.

Drawings made in 1967 exist for modification of the air intake tunnel for improving its utility as an emergency exit tunnel by increasing its height and adding an exit staircase. It appears that this modification was never executed. Presumably, the intake was still regarded as emergency egress, but travel through it would have been slower and hampered by having to exit a manhole near the Air Intake Building.

AR-3206, Reactor Pad: The concrete Reactor Pad, built in 1960, has grooves backfilled with gravel for the removed railroad spur along its center from north to south and parallel rails for the Moveable Shed along the east and west edges. A lead manhole cover is near the center of the pad, and some piping emerges from the concrete. The cellar for the Moveable Shed drive cable sheave is near the north end of the pad. When in use, there were two raised curbs with steel rails on the top surfaces that were used to actually support the test devices. These curbs have been removed. Numerous openings were in the north shield wall of Building 25-3210 adjacent to the Reactor Pad for necessary connections with the test device.

AR-3212, High Pressure Gas Tank Farm Foundations: Presently, this area is a concrete slab with abundant stubs of piping, rebar, and tank foundations all sheared off at slab level. A two-foot-tall concrete wall at the eastern end has many copper grounding pads on its upper surface.

This Tank Farm contained 12 horizontal gas tanks arranged as an array of six mounted over six, four smaller helium tanks arranged two-high in a similar manner, and a small spherical dewar crowned by an equipment shelter (Dewar 3). The large tanks were installed in 1961 and removed prior to 1998.

AR-3218, LH2 Dewars 1 and 2: Each of these dewars has a capacity of 500,000 gallons of liquid hydrogen (LH2), making them the largest in the world at the time they were built in 1965. The south dewar is Dewar 1, also known as 3218A, and the north dewar is Dewar 2, or 3218B. Their construction required renumbering the existing smaller dewars. The two dewars are white-painted steel on concrete-clad steel pipe supports. Each has a curved steel stairway to a top mechanical platform that spans the gap between the two dewars. Both are on concrete foundations with the entire area beneath and surrounding them paved with concrete as well.

Plates on the leg of Dewar 1 are marked “HORTON CRYOGENIC VESSEL, 1965” built by CB&I. Steel was treated by the “HORTON PICKLING PROCESS.”

AR-3218C, Turbine Energy Source/Exchanger: Built in 1965 along with the two adjacent dewars, this structure exhibits an incredible array of piping on a skeletal steel framework. At the south end, it has the best collection of accordion expansion joints remaining at the facility.

AR-1, Concrete Standpipe: Only the top edge is aboveground in the form of an approximately six-foot-diameter circular curb with a narrow cutout in its north edge for plumbing and a valve. The interior is backfilled with sorted gravel. It was likely constructed around 1965.

AR-2, Drain: Although this drain served to remove surface water, it also served to facilitate the movement of spilled liquid hydrogen into Topopah Wash before it had a chance to vaporize and create an explosive hazard. Pipes within this drain also lead to AR-18, one of the deluge pits. The drain is U-shaped and inset in the concrete slab that covers this portion of the facility. Steel grates were placed over traffic areas. Upon leaving the fenced perimeter, it transitions to an open, concrete-lined channel that drops into Topopah Wash. It was built in 1966.

AR-3, Concrete Pad: This rectangular pad is approximately 6 by 10 feet. Its edges are reinforced with small, galvanized, L-section steel. The construction date is unknown.

AR-4, LH2 Unloading Ramp: This trailer-unloading ramp served to accurately position the trailer for unloading liquid hydrogen. It is simply a wide, raised-concrete platform with a gently convex top surface. At its highest point, it rises less than two feet off the surrounding pavement. It was built as part of the 1966 LH2 upgrade. The ramp is part of the system of curbs designed to direct any spilled LH2 into Topopah Wash.

AR-5, Deluge Pit #3: In the event of fire or spillage of hazardous materials, the entire complex could be subjected to a major flow of water by the Deluge System, which was controlled from the Local Control Room in Building 25-3220. Principal areas with deluge protection were the liquid hydrogen unloading areas, hydrogen compressor room in Building 3220, liquid hydrogen dewars, high-pressure hydrogen bottles, propane storage area, and Cryogenic (Cryo) Pump and Test Buildings. Water pipes originate at the bottom of the elevated water tank and continue underground throughout the facility.

The complex of valves for the system was distributed in three similar 11-by-25-foot rectangular concrete underground vaults called Deluge Pits that projected to varying heights aboveground. The 7.5-foot interiors hold pipes, many valves, and gauges. Each has an interior ladder formed of individual steel rungs embedded in concrete. All have a rectangular access port near one end and a ventilator and pipe projecting from the top of the opposite end. Adjacent to one end is a smaller rectangular concrete valve box with a metal lid. Deluge Pit #3 rises approximately 2.5 feet above grade. The valve box rises all the way to the top of the main pit.

AR-6, Dosage Measurement Aerial Trolley: A 790-foot-long series of cylindrical steel posts cross Topopah Wash from near the Reactor Pad to the west bank of the wash. These are the most prominent components of the miniature aerial tramway that held a series of radiation monitoring devices at regular intervals. The poles are all different heights, but all terminate at the same level. Frames at the tops of the poles supported the travelling line (now missing), which enabled collection of the devices. Communications lines and powerlines also ran along the bases of the posts. The electric drive motor is located in a small corrugated steel structure at the west end of the tramway. This trolley is closely based on an earlier model installed at Test Cell A. It was designed by Los Alamos in late 1962, indicating construction then or perhaps in 1963.

AR-7, Camera Station Pedestal: Two pedestals (this one and AR-10) providing permanent mounting locations for cameras were installed facing the Reactor Pad and both still exist. Each is a one-foot, five-inch square concrete pedestal standing four feet, eight inches tall. AR-7 faces the Reactor Pad to the southeast. Electrical equipment has been cut off. Electrical sweeps are on the rear of the pedestals. The stations were designed by Los Alamos for use by EG&G and installed in 1962.

AR-8, Vault: This vault is inset into the surrounding concrete slab. It has an open-grid steel cover that is barely visible since it has been backfilled with concrete. The vault was constructed in 1965.

AR-9, Nuclear Furnace Cleanup System: This area did not have a specific function until 1972 when it was used for construction of the complex of machinery used to filter exhaust from the Nuclear Furnace. This was the first attempt to capture and filter out radioactive effluent from a test at Test Cell C. All machinery has been removed, but many fasteners are visible in the concrete along with several machinery outlines where the existing surface of the concrete was chipped away to make solid bedding surfaces. It featured a cascading series of scrubber traps that used water, ice, and a dryer prior to passing the exhaust through charcoal. This system was removed in 2009.

The original triangular structural steel 120-foot tower and an adjacent small building were at the east end of this area and appear to have been removed when the filtering devices were installed. No traces were found of the tower foundation.

AR-10, Camera Station Pedestal: See AR-7 for a description. This pedestal is located immediately south of the extended concrete apron and faces northwest toward the Reactor Pad.

AR-11, Railroad Spurs: The main line of the Jackass and Western Railroad (site 26NY14637) runs east-west through the northern portion of the testing area centered on Test Cell C. From the west, the railroad enters the Test Cell C Historic District via a cut before crossing Topopah Wash on a large dike. Near the east end of the dike is the concrete pad and other track modifications for the KIWI-TNT test described below (SHPO Resource No. S2287). The railroad grade is deeply incised for the rest of its passage north of Test Cell C. The Jackass and Western Railroad main line is described by Drollinger (2012).

From 1962 through 1967, the Reactor Maintenance and Disassembly (R-MAD) facility to the east provided reactors and engines for testing at Test Cell C. The rail line connecting these two facilities was extended westward from Test Cell A in 1960.

Despite this early association with the R-MAD facility, the main source of reactors and engines for testing came from the E-MAD facility to the west. Construction of the connecting rail line began in 1960, but because of delays, the E-MAD facility did not begin its testing partnership with Test Cell C until 1967. The Railroad Transport System from the E-MAD facility actually passed beyond Text Cell C and continued farther beyond the switch for the spur leading to the Reactor Pad (AR-3206). This was necessary so that the engine could push the reactor car directly to the pad. On the way there, the train passed through Gate 9. Once the tracks reached the concrete apron of Test Cell C, they were inset so the tops of the rails were at the same level as the surrounding slab surface.

A second service spur runs parallel to and immediately east of the spur to the Reactor Pad. This spur entered the compound through its own gate (Gate 8) and ended just east of the Reactor Pad.

Both of these spurs were built in 1960 and are still intact, except that rails within the slab were removed between 2009 and 2011.

AR-12, Metal Ground Panels: This is one of several identical panels found throughout the facility. It is simply a two-foot square of galvanized sheet metal nailed to the ground. The purpose of these panels could not be determined. They are too small to be aerial photo markers. They lack the robust, permanent stake that is expected if they are survey markers. Current RAD SAFE personnel indicated that they have no function in present radiological monitoring of the facility. It appears that these panels, with their uniform size and smooth surface, would have been ideal for collecting radioactive dust or tiny reactor pieces scattered during active testing at the facility, but without documentation, this notion must remain conjectural. It is not known when the panels were installed.

AR-13, Runoff Channel: This shallow, open concrete channel borders the north and east edges of the original Tank Farm (AR-3212) and continues southeast along the northeast edge of the concrete-paved portion of the compound. It was designed to move water and other potential fluids off the concrete area and outside of the fence to the southeast. Between the Air Intake Building (AR-3205) and Substation 4, it passes under a one-lane bridge with concrete curbs via twin culverts. Beyond this point, it continues to pass under the eastern Perimeter Fence, where it ceases to be concrete lined. It is generally 10 feet wide. The channel was built in 1966 and the extension through the Perimeter Fence was added in 1967.

AR-14, Tile Field: Wastewater, some of which was radioactive, was disposed of in three adjacent facilities just outside the East Perimeter Fence. Unlike the main facility, these were oriented northwest-southeast. From north to south, they were the Waste Water Treatment Facility, Tile Field, and Super Tank. Each was surrounded by its own perimeter fence. Only the Tile Field remains. The other two were demolished between 2006 and 2011 as part of the remediation project, and all that remains are cleared gravel areas surrounded by radiation hazard signs. The Tile Field is surrounded by a raised rectangular gravel berm inside a raised barbed wire and chain-link fence with round posts bearing radiation hazard signs. It was built around 1962.

AR-15, Radioactive Wastewater Vault: The vault is a concrete cellar with an aluminum lid. Sweeps are in an adjacent concrete pad. Its position suggests it is associated with the underground radioactive waste waterline. It is in a fenced contaminated area, so it was not closely inspected, but it closely resembles AR-16. The construction date is unknown.

AR-16, Radioactive Wastewater Vault: A concrete cellar with an aluminum lid. A radioactive warning sign is attached to the lid. The construction date is unknown.

AR-17, Electrical Vault: A large concrete cellar with a stepped top and two manhole covers stamped “E.” It is located on a large electrical conduit running parallel to the underground air intake duct to Building 25-3210 from the Air Intake Building. The vault was probably built in 1961.

AR-18, Deluge Pit #1: See AR-5 above for a description of the Deluge System. Pit 1 rises a mere four to six inches above the surrounding pavement and the top of the valve box is at the same height as the top of the pit. This system was part of the original design and was likely completed by 1961.

AR-19, Flare Stack and Flume: After a test, all gaseous hydrogen left in the system had to be purged and safely disposed of. This was done by forcing the hydrogen to the eastern edge of the complex, which was normally the downwind side, and igniting it with a propane torch, similar to those found in oil refineries to dispose of natural gas. The gas flume is readily identified by its extremely large diameter compared with all other piping at the facility. The portion of it between the main Test Cell C building and the Cryogenic Evaluation Lab (25-3232) is still intact. From that point, it leaves its skeletal steel supports and is carried on a succession of concrete piers to its terminus at the stack. These piers also carry piping and conduit for a variety of purposes, including electrical and propane functions.

The east end of the Flume entered the vertical Flare Stack, of which only the octagonal concrete footing remains. The system was built in 1960 or 1961.

AR-20, Tank Farm Extension Foundations: Sometime after 1966, an additional area of horizontal high-pressure tanks was installed immediately east of the original tank farm. The remaining components include a concrete slab with a curb along its upslope (north) edge. Raised, chamfered, concrete tank foundations are arrayed on the slab. Steel fasteners have been cut off by torch. There are numerous access pipes cast into the slab. No plans or images of this area were reviewed during the present phase of research.

AR-21, Meteorological Station: A collapsed Meteorological Station is near the Tower (AR-22). It is of typical design, a louvered wood box on a galvanized steel frame, which is still partly attached to a foundation slab. The box was painted white. Its construction date is unknown.

AR-22, Tower: The 420-foot, triangular-plan, skeletal steel acoustic and meteorological tower was located near the center of the open compound northeast of the main complex. The triangular concrete foundation has indentations and installation hardware indicating that the tower was three feet wide on all sides. It had three sets of guy wires. One set extended to just east of the Air Intake Building (AR-3205), another to well outside the northeast perimeter fence, and the final one extended northwest to the Jet-assisted Takeoff (JATO) compound, which was built after the Tower. Anchors survive only for this last series of wires. The standard galvanized-steel anchor fitting can accommodate up to four guy wires, but all of the attachment holes may not have been used. A mid-height anchor with three shackles and cable ends is adjacent to the JATO berm. Another anchor is next to it that has been removed from another location and placed here. The anchor for the topmost series of cables is beyond the JATO compound, nearly to the concrete slab by the railroad entry to the compound. This anchor has been reinforced with concrete. A powerline runs along the ground next to this anchor. The anchor has a fine supplemental ground wire and a three-quarter-inch-diameter braided copper ground cable that leads back to the intermediate anchor. Presumably, such a cable linked the Tower with all of the anchors. This Tower was in place by 1963. It was removed sometime between 1998 and 2005.

AR-23, Jet-assisted Takeoff (JATO) Area: This area was the source of a smoke plume used to help track the probable movement of the effluent plume from the reactor. It is just inside the perimeter fence northeast of the Reactor Pad, which was normally downwind of the test device.

Two bundles of 10 standard steel JATO rocket canisters are entrenched in the ground facing downward and at a slight angle away from Test Cell C. When fired, the individual rocket did not move, but its exhaust plume was aimed into the sky and slightly away from the test area.

An earth berm, which is approximately five feet tall, protects the test area from the rocket canisters in case of mishap. An electrical box for rocket firing controls is adjacent to the rocket bundles and protected by a flat-roofed corrugated aluminum shelter with two walls on a steel frame. The entire berm area is surrounded by a T-post and plain wire fence that joins with the perimeter fence. This facility was designed by Los Alamos and probably built in 1966.

AR-24, Relocated Tank: The tank farms (AR-3212 and AR-25) immediately east of the main Test Cell C building were made up of many horizontal high-pressure steel tanks that contained the inert gases (liquid nitrogen and helium) needed for cryogenics and for flushing hydrogen out of the systems. None of these tanks remain in place, but one is stored outside the northern Perimeter Fence. This tank has a 5-foot diameter and a length of over 65 feet. The ends are convex to handle high pressure and have heavy central fittings. It was moved to this location prior to 1998.

AR-25, Perimeter Fence and Gates: The Test Cell C Perimeter Fence is an eight-foot chain-link fence on galvanized steel I-posts topped by three strands of barbed wire on angled spreaders. Steel signs indicate that the fence was installed by Tholl Fence of Sparks, Nevada. Most of the fence was built by 1961. Later additions and modifications to the fence, particularly along the east and northeast sides of the compound, used round posts. Electrical conduit runs along the base of the fence.

The Main Gate (Gate 1) is in the south fence next to the Operations Building (AR-3229). It, like all other gates, is made of chain link with galvanized steel pipe framing. It ran on rollers next to the Guard Shack, of which no trace remains. By the former Guard Shack location are an electrical panel and status lights. Spaced around the entire irregular perimeter are three double swing vehicle gates, two single swing gates on the two Railroad Spurs that enter from the north, and four personnel Panic Gates. The Panic Gates are equipped with push bars for opening from inside the compound. The opening devices are protected from outside tampering by galvanized steel panels. Panic Gates distant from the main compound lighting system had their own lights.

AR-26, Exterior Lighting System: The principal elements of the exterior lighting system are galvanized steel poles of the kind normally found with cobra fixtures. In this case, they are equipped with multiple floodlights attached to short arms, which were fabricated on-site. These lights are supplemented by floodlights and other incandescent fixtures attached to buildings and other structures. Construction of this system began in 1960, and it was greatly modified during the facility upgrade and expansion in 1965 and 1966.

AR-27, Water and Fire Suppression System: Water mains and turnoff standpipes occur throughout the facility. Fire suppression equipment includes outside hydrants, hoses and hydrants in and adjacent to buildings, portable fire extinguishers, and fire blankets in steel canisters. In addition, the extensive centrally controlled Deluge System could be activated for fire suppression.

8. References

List references used to research and evaluate the individual property.

Drollinger, Harold
2012 *Historical Evaluation of the Railroad Lines in Areas 25 and 26, Nevada National Security Site, Nye County, Nevada*. DRI Report No. HE072610-1. Las Vegas, NV.

Drollinger, Harold, Colleen M. Beck, and Nancy Goldenberg
2000a *Nevada Test Site, Test Cell C Facility, Building 3210*. Historic American Engineering Record No. NV-30-A, U.S. National Park Service, Washington, D.C.

Historic photographs and engineering drawings at end of form:

Air Products Incorporated
1960 Air Intake Building Plan and Details. Drawing No. 3205-S50.1 (As-Built revision date unreadable), File 107196. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

Los Alamos Scientific Laboratory (LASL)
1966 JATO Bottle Installation Test Cell C. Drawing No. J6-SK; JA 556, Revised 1967, File 108757. University of California, Los Alamos.

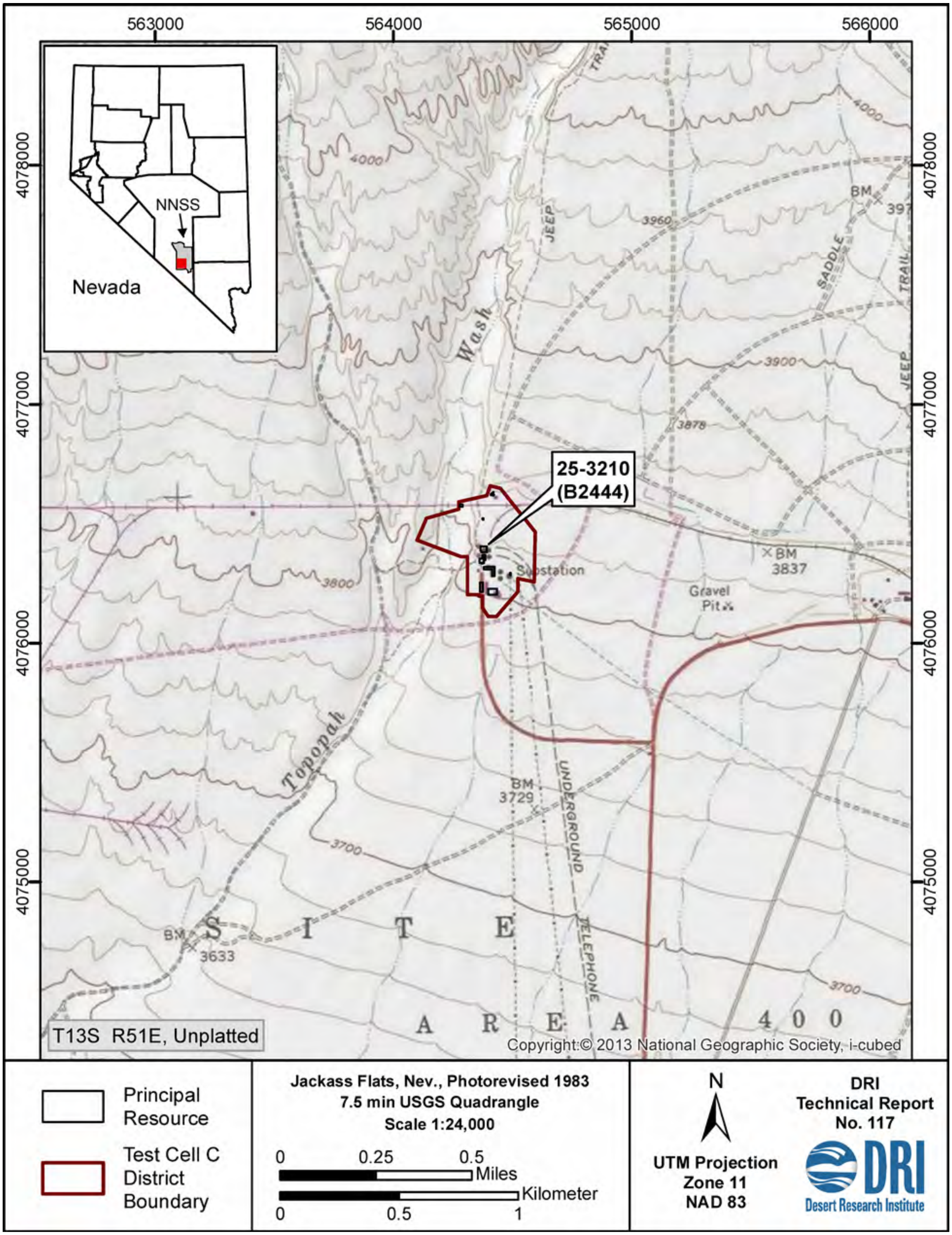
Reynolds Electrical & Engineering Co. (REECo)
1982 *Photograph Album Index (1958 – 1976)*. Photos and index on file at the Desert Research Institute, Las Vegas.

Engineering drawings and archival maps are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

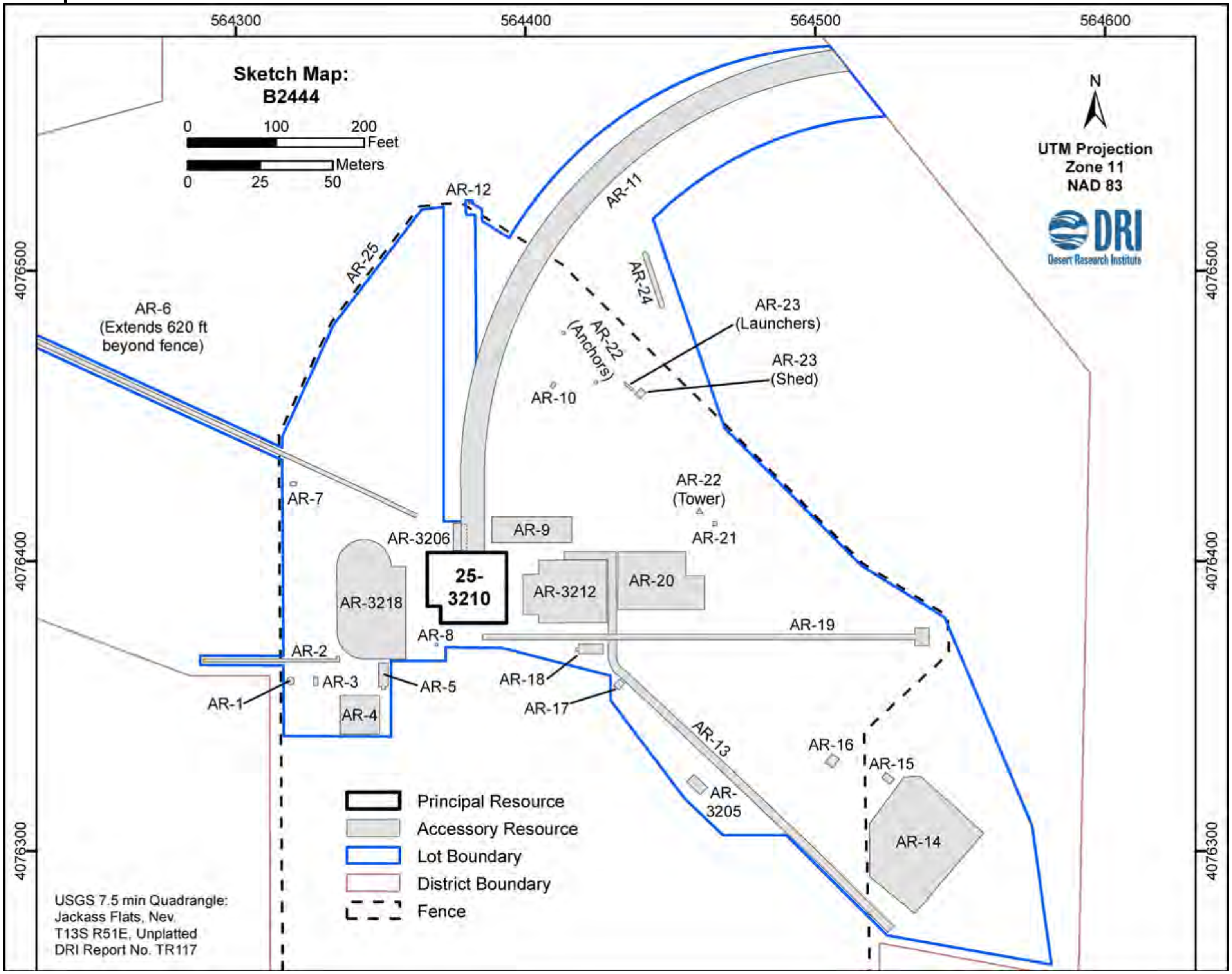
Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

9. Area Location Map

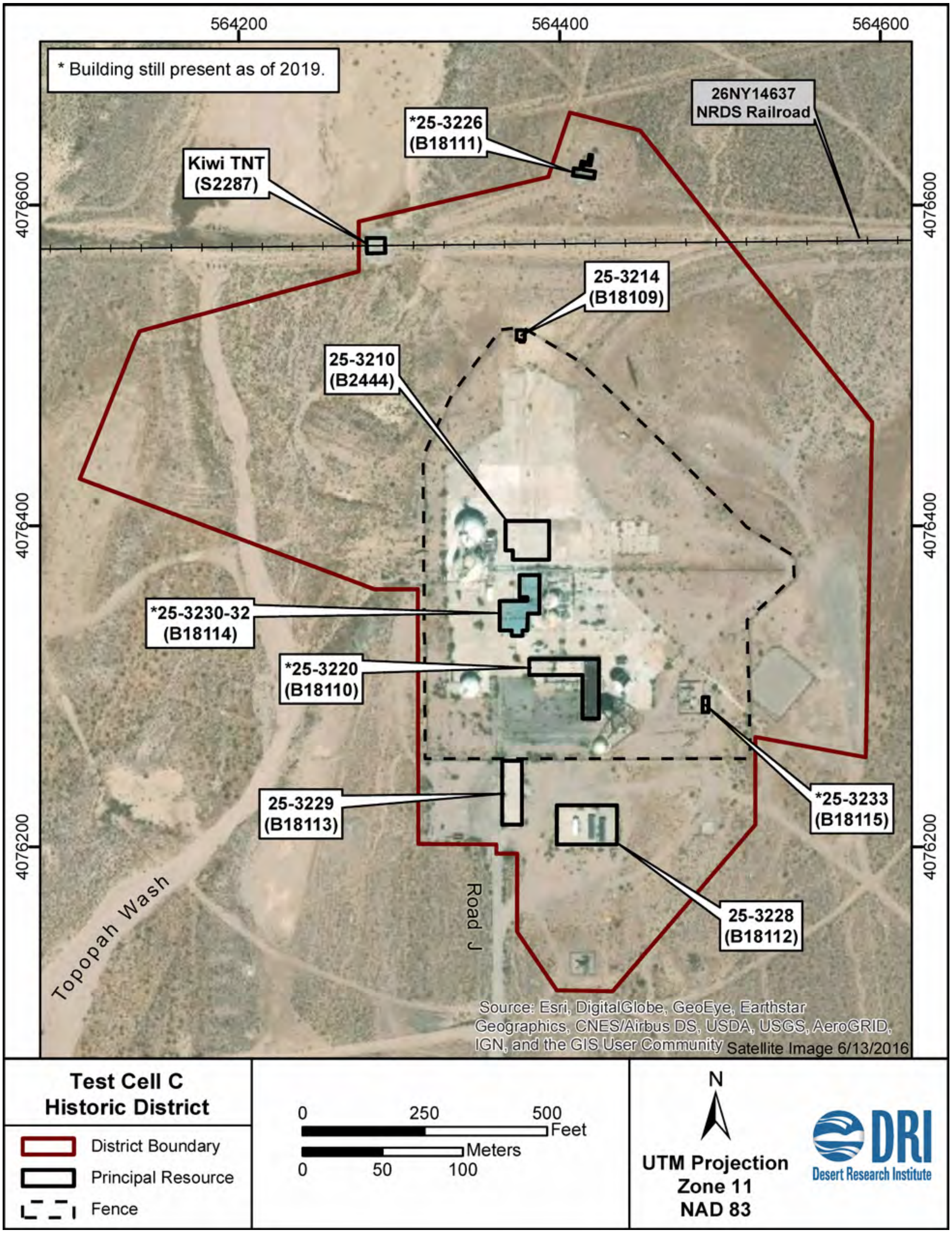
Use a USGS quadrangle map at large extent to show general area of resource.

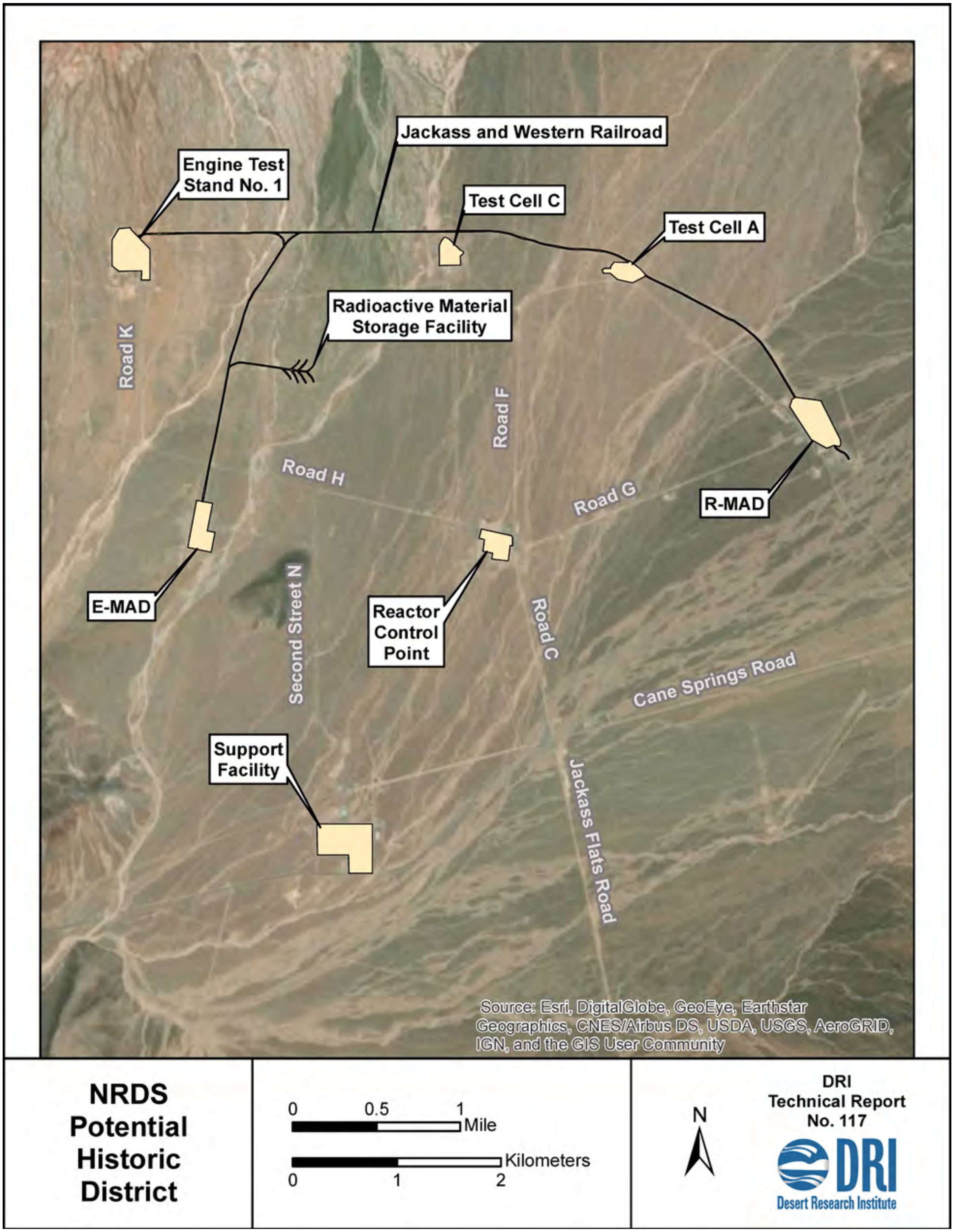


10. Site Plan Map



Not Shown: AR-26, Exterior Lighting System, and AR-27, Water and Fire Suppression System.


564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
*25-3226 (B18111)
26NY14637 NRDS Railroad
Kiwi TNT (S2287)
25-3214 (B18109)
25-3210 (B2444)
*25-3230-32 (B18114)
*25-3220 (B18110)
*25-3233 (B18115)
25-3229 (B18113)
25-3228 (B18112)
Topopah Wash
Road J
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C Historic District
District Boundary
Principal Resource
Fence
0 250 500 Feet
0 50 100 Meters
N
UTM Projection Zone 11 NAD 83
DRI Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
Desert Research Institute

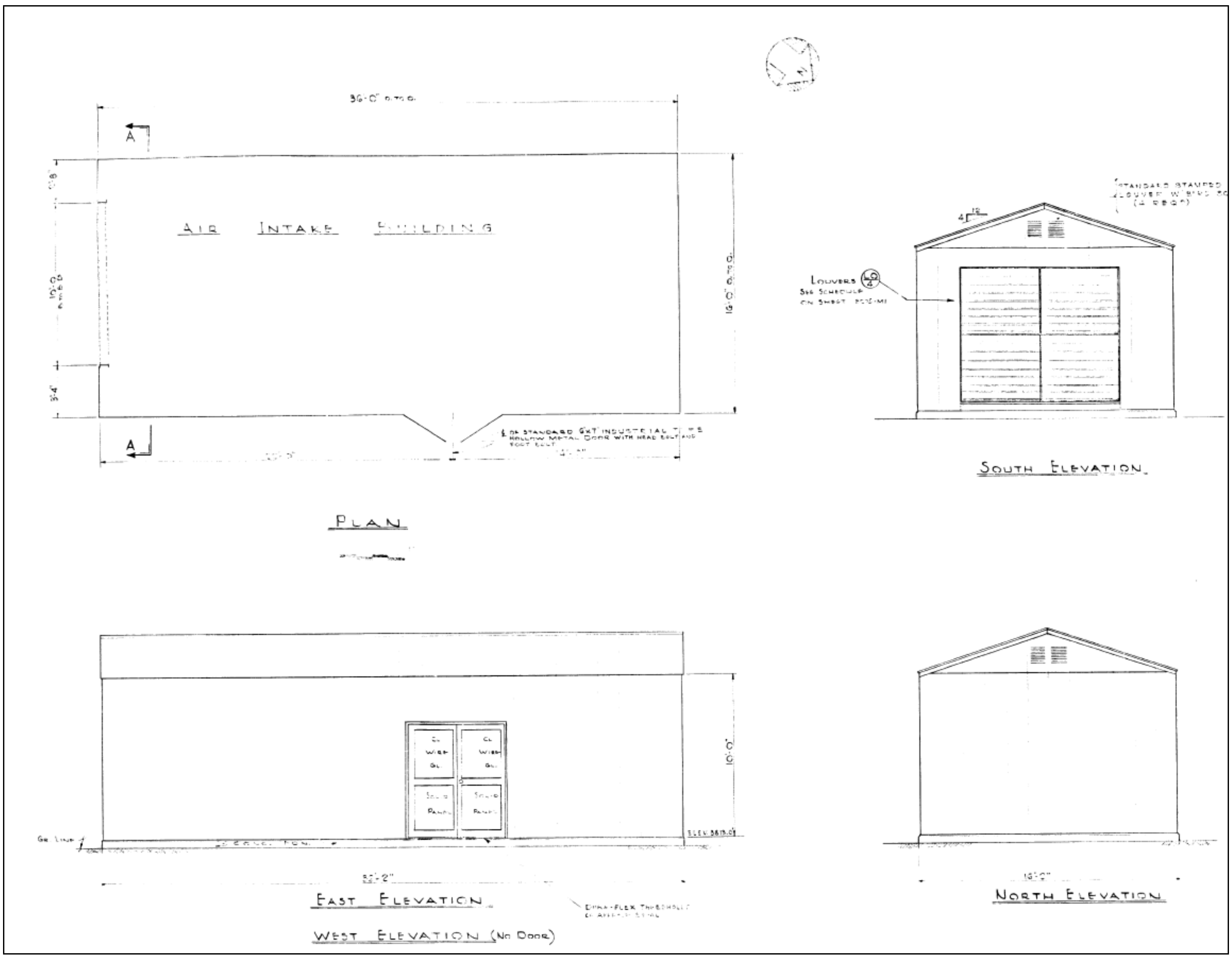
11. **Photographs**

Elevation: N/A Direction facing: Southwest Photographer: DRI (Photo 446) Date: 2019

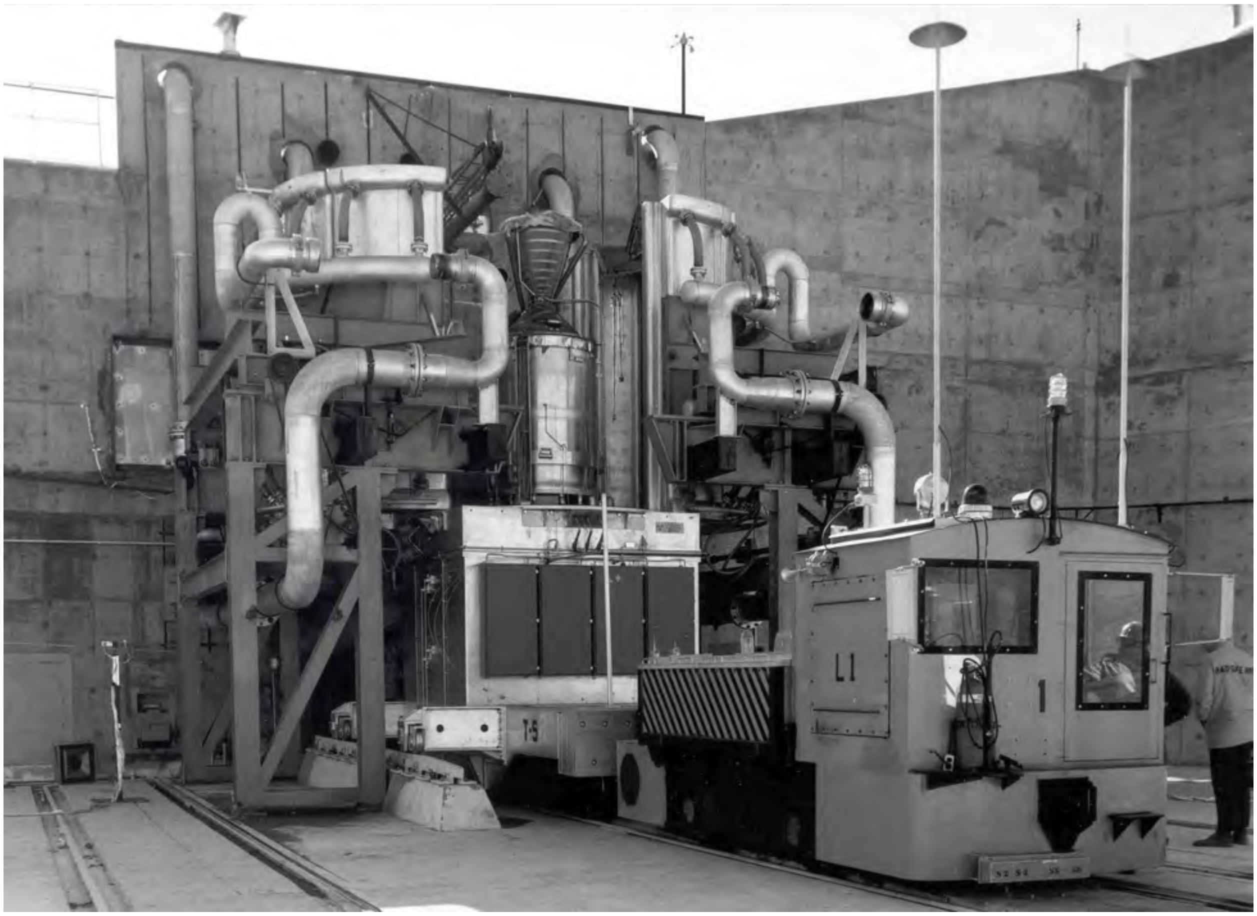
Elevation: N/A Direction facing: South Photographer: DRI (Photo 448) Date: 2019

Overview of Test Cell C area, facing southeast (RSL, 2000). Some of the gabled and concrete buildings that were present at that time have been removed.

AR-3205, Air Intake Building, now demolished, facing south and west (details from REECo Photo 892-5 at left, 1960, and Photo 892-9 at right, 1961).



AR-3205 Air Intake Building plan and elevations (detail from Air Products Incorporated,1960).



AR-3206, Phoebus 1B nuclear test vehicle being placed on the Reactor Pad against the shielding wall by Engine L1 (Photo Source: RSL, 1967).

AR-3218C, the Turbine Energy Source/Exchanger, facing south, showing connections with the west wall of Building 25-3210 on the left (RSL Photo 2009-28, 2009).

AR-11, Railroad Transport System delivering the PEWEE nuclear test vehicle to the Reactor Pad (Photo Source: RSL, 1967).

AR-19, Flare Stack, now demolished (REECo, Photo 1065-7, 1961).

AR-9, Nuclear Furnace Cleanup System, facing southwest (RSL, Photo 2009-5, 2009). The equipment was removed and the shielding wall in the background was demolished.

AR-9, Nuclear Furnace Cleanup System, facing southeast (RSL, Photo 2009-14, 2009).

12. Accessory Resources

Accessory Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3205: Air Intake Building (foundation only)**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564460		Northing: 4076322	

AR-3205, facing northeast (Photo 666, left) and west (Photo 668, right) (DRI 2019). See page 15 for historical photos.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3206: Reactor Pad (foundation only)**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564377		Northing: 4076408	

AR-3206, facing west (Photo 454, left) and south (Photo 458, right) (DRI 2019).

See pages 16 and 17 for historical photographs.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3212: High Pressure Gas Tank Farm (foundation only)**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564415		Northing: 4076390	


AR-3212, facing southeast (Photo 460, left) and south (Photo 464) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

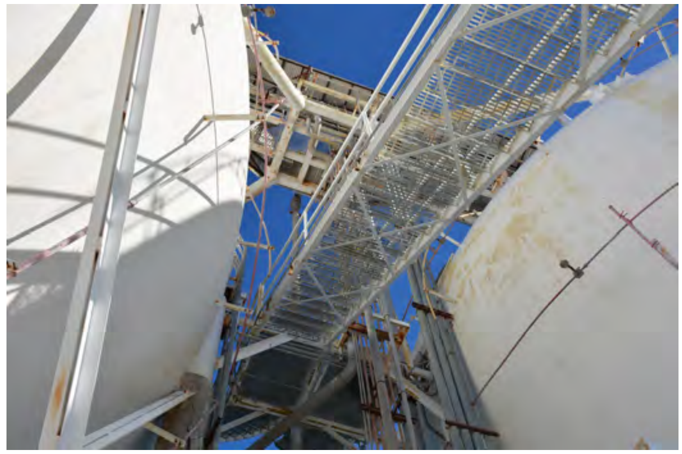
Accessory Resource Overview

Accessory Resource Name	**AR-3218A and B: LH2 Dewars 1 and 2 & AR-3218C: Turbine Energy Source/Exchanger**			
Construction Date	**1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: Dewar 1: 564345 Dewar 2: 564345 TES/E: 564355		Northing: 4076375 4076398 4076380	


AR-3218A and B, facing west (Photo 338, left) and north (Photo 352, right) (DRI 2019).

Photographs continued on next page.

Continued from previous page.



AR-3218A and B, facing southwest (Photo 452, left) and upward between the dewars (Photo 652, right) (DRI 2019).

AR-3218C, facing northwest (Photo 486, left) and southwest (Photo 498, right) (DRI 2019).

(Photo 478)

AR-3218C, detail of expansion joints, facing west (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Circular Concrete Standpipe (foundation only)**			
Construction Date	**1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564319		Northing: 4076359	


(Photo 658)

AR-1, facing southwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-2: Drain**			
Construction Date	**1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564325		Northing: 4076366	


(Photo 362)

AR-2, facing northwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3: Concrete Pad**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564327		Northing: 4076359	


(Photo 656)

AR-3, facing southwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-4: Unloading Ramp**			
Construction Date	**1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564340		Northing: 4076348	


(Photo 360)

AR-4, facing east (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-5: Deluge Pit #3**			
Construction Date	**1960-61**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564350		Northing: 4076360	


(Photo 350)

AR-5, facing northwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-6: Dosage Measurement Aerial Trolley**			
Construction Date	**1962 or 63**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564316		Northing: 4076436	


(Photo 188)

Equipment box with drive motor and sweep, facing northeast (DRI 2019).

Photographs continued on next page.

Continued from previous page.

(Photo 190)

AR-6, Dosage Measurement Aerial Trolley, west static line anchor and equipment box, facing southeast (DRI 2019).

Poles across Topopah Wash, facing southeast (Photo 198, left). Pole inside the perimeter fence with trolley bracket at top and communications/electronic lines below, facing northwest (Photo 372, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-7: Camera Station Pedestal**			
Construction Date	**1962**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564320		Northing: 4076426	


(Photo 1044)

AR-7, facing southwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-8: Vault**			
Construction Date	**1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564369		Northing: 4076371	


(Photo 474)

AR-8, backfilled with concrete (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-9: Nuclear Furnace Filter System (foundation only)**			
Construction Date	**1972**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564400		Northing: 4076410	


(Photo 456)

AR-9, facing east (DRI 2019).


Details of foundation surface (Photo 448, left; Photo 450, right) (DRI 2019).

See pages 18 and 19 for historic photographs.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-10: Camera Station Pedestal**			
Construction Date	**1962**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564410		Northing: 4076460	


AR-10, facing southwest toward Reactor Pad (Photo 532, left) and west (Photo 530, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-11: Railroad Spurs**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564392		Northing: 4076486	


AR-11, at Gates 8 and 9, facing southwest (Photo 92, left) and at the junction with the NRDS Railroad, facing northeast (Photo 100, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-12: Metal Ground Panel**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564380		Northing: 4076523	


AR-12, in relation to nearby Panic Gate 10, facing southwest (Photo 174, left) and detail (Photo 176, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-13: Runoff Channel**			
Construction Date	**1966-67**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564450		Northing: 4076345	


AR-13, facing northwest (Photo 626, left) and facing southeast (Photo 628, right) (DRI 2019).

(Photo 270)

Near the eastern Perimeter Fence, facing northwest (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-14: Tile Field**			
Construction Date	**1962**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564535	Northing: 4076305		


(Photo 68)

AR-14, facing north (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-15: Radioactive Wastewater Vault**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564525	Northing: 4076325		


(Photo 568)

AR-15, facing east (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-16: Radioactive Wastewater Vault**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564506		Northing: 4076330	

(Photo 274)

AR-16, facing northeast (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-17: Electrical Vault**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564432		Northing: 4076357	

(Photo 622)

AR-17, facing northeast (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-18: Deluge Pit #1**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564420		Northing: 4076370	

(Photo 430)

AR-18, facing east (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-19: Flume and Flare Stack**			
Construction Date	**1960-61**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: Flume: 564460 Flare: 564537		Northing: 4076374 4076374	

Flume next to Cryogenic Lab, facing east (Photo 476, left). Flume near Dewar AR-3213, facing southwest (Photo 438, right) (DRI 2019).

Photographs continued on next page.

Continued from previous page.

Dismantled section of flume, facing east (Photo 434, left). Flare Stack Foundation, facing northwest (Photo 564, right) (DRI 2019).

(Photo 562)

Detail of Flare Stack Foundation (DRI 2019).

See page 18 for a historical photograph.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-20: Tank Farm Extension**			
Construction Date	**After 1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564445		Northing: 4076390	


(Photo 466)

AR-20, facing southeast (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-21: Meteorological Station**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564465		Northing: 4076413	


(Photo 548)

AR-21 (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-22: Tower and 2 Anchors**			
Construction Date	**By 1963**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: Tower: 564460 N Anchor: 564413 S Anchor: 564424	Northing: 4076417 4076478 4076461		


AR-22 Tower foundation, facing southwest (Photo 544, left). Mid-height triple guy-wire anchor in JATO berm (Photo 540, right) (DRI 2019).


(Photo 642)

AR-22, grounded anchor for upper four northwest guy cables (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-23: JATO Area**			
Construction Date	**1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564440		Northing: 4076460	


AR-23, JATO Area, facing east, showing berm, rocket canisters, and control shed (Photo 536, left). Detail of JATO rocket canisters (Photo 538, right) (DRI 2019). See the last page of this form for an engineering drawing for the rocket canisters installation.

Accessory Property Type

Building ☐	Structure ☐	Object ☒	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-24: Relocated Steel Tank**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564445		Northing: 4076500	


AR-24, facing north (Photo 90, left). Tank with North Camera Bunker in background, facing northwest (Photo 88, right) (DRI 2019). Tape measures a diameter of 5 feet.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-25: Perimeter Fence and Gates**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564360		Northing: 4076255 (Main Gate)	

AR-25, Main Gate, facing north (Photo 44, left). Signs and controls left of Main Gate, facing north (Photo 48, right) (DRI 2019).

AR-25, Gate 6, an example of a typical double vehicle gate, facing southwest (Photo 82, left). Interior side of Gate 3, an example of a typical panic gate, facing south (Photo 256, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-26: Exterior Lighting System**			
Construction Date	**1960-1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564328	Northing: 4076373 (Pole N of AR-2)		

AR-26, typical poles and floodlights (Photo 364, left). Detail of pole base (Photo 366, right) (DRI 2019).

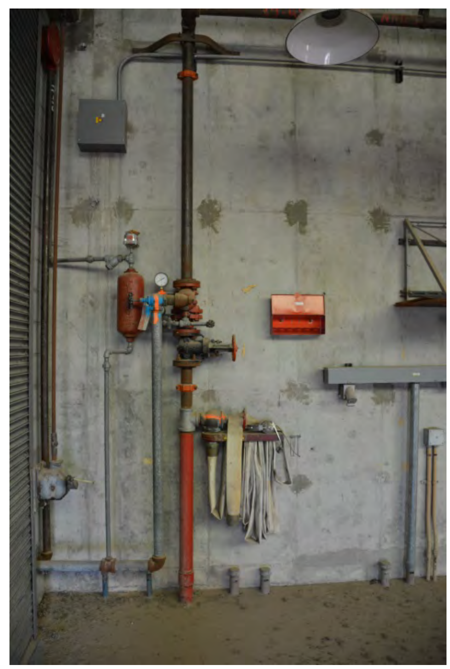
Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

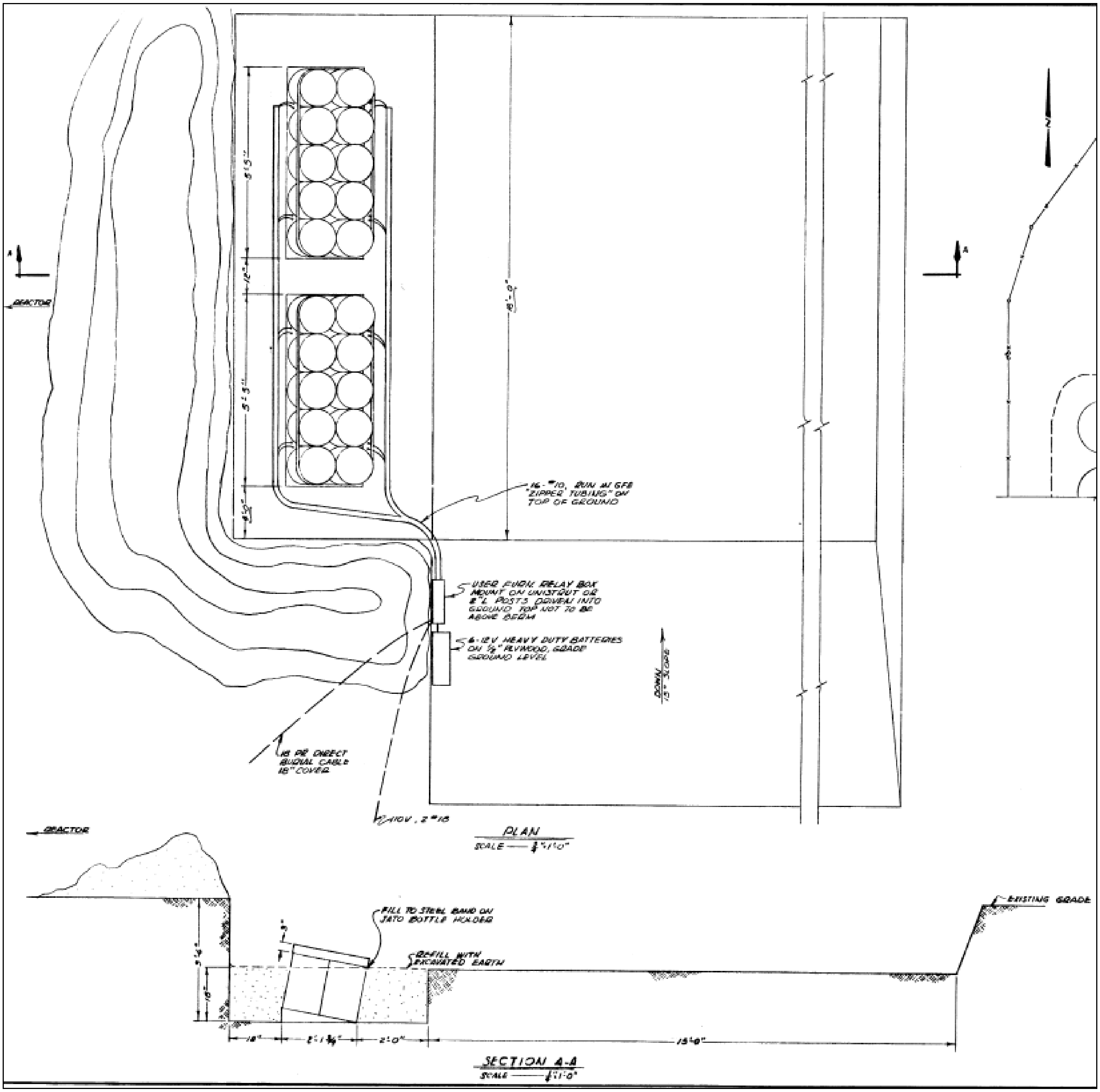
Accessory Resource Overview

Accessory Resource Name	**AR-27: Water and Fire Suppression System**			
Construction Date	**1960 + expansions**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564425		Northing: 4076261 (Hydrant SW of water tower)	



AR-27, details of system components (Photos moving clockwise, starting with top left: 614, 618, 612, 682, 692, 690) (DRI 2019).



AR-23, JATO Rocket Installation plan and section (detail from LASL 1966).

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)					
City, Zip	N/A					
County	Nye					
Assessor's Parcel #	N/A		Subdivision Name	Nuclear Rocket Development Station (NRDS)		
UTM Location (NAD 83, UTM Zone 11 North)		Easting: 564375		Northing: 4076520		
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983		
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐	
Should the property's location be kept confidential?		Yes ☐		No ☒		

3. Architectural Information

Construction Date	1960-1961
Architectural Style	None
Architectural Type	Warehouse
Roof Form	Gable
Roof Materials	Metal
Exterior Wall Materials	Metal
Foundation Materials	Concrete
Window Materials	Steel
Window Type	Unknown
Accessory Resources?	Yes ☒ No ☐
	Number?: 1

Condition of Resource(s)?		
Good ☐	Fair ☐	Poor ☒
Explanation: Reactor Shed and Drive House superstructure demolished, track and most machinery removed.		

(Insert primary photograph below.)

Reactor Shed Funicular Railroad, facing southeast (Detail, RSL, c. 2000). Two phases of slab construction are evident. Both gabled buildings have been demolished.

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: / NRIS #:
Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: / Date listed: / NRIS #:
If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒ No ☐
		If so, is this resource contributing?		Yes ☒ No ☐
District Name: Test Cell C Historic District				SHPO #: D346

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☐	Criterion B ☐	Criterion C ☐	Criterion D ☐			
	Not Eligible ☒	Unevaluated ☐					
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine						
Period(s) of Significance	1960-1972						
Integrity – Does the resource possess integrity in all or some of the 7 aspects?							
Location ☒	Design ☐	Materials ☐	Workmanship ☐	Setting ☒	Feeling ☒	Association ☒	
General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s): 2009-2011			
Threats to Resource:	Demolition, Structural Decay, Equipment Removal						
Historic Name	Shed Drive						
Current/Common Name	Same						
Historic/Original Owner	U.S. Atomic Energy Commission						
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)						
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030						
Historic Building Use	Reactor Shed Drive						
Current Building Use	None						
Architect/Engineer/Designer	Air Products, Inc., Allentown, Penn.						
Builder/Contractor	Unknown						

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6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

Foundations and remnants of the cable drive system survive to the extent that this resource easily qualifies as a contributor to the Test Cell C Historic District. Demolition of both the Reactor Shed and the Shed Drive building has reduced its integrity of Design, Materials, and Workmanship to the extent that this resource is not individually eligible.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

The Shed Drive building is the Principal Resource. The cable-drive system has several components. Only a small T-shaped concrete foundation just inside the northern Perimeter Fence remains of this building. It was a one-story, rectangular-plan, steel-framed building clad with corrugated metal with a low-pitch gable roof. An entry door was in the west elevation. All drive machinery has been removed from this building and gravel has been pushed into the inside of the foundation. A shallow trench continues from the open south end of the foundation.

The Moveable Reactor Shed (25-3211) was built in 1960 and demolished in 2009. If it still existed, it would be the Principal Resource. Although black and white photos were taken of the building by the previous mitigation team (page 11), the building was barely mentioned in the various survey and mitigation documents and was not formally evaluated. Because it was not documented during previous recording efforts, a description of it is provided here. It was a rectangular-plan, steel-frame building clad with corrugated metal with a low-pitch end-gable roof. It stood the equivalent of three-stories tall but was entirely open from floor to ceiling. Wheels in each corner engaged steel rails embedded in concrete. Initially the concrete apron was limited to the immediate vicinity of the Reactor Pad, but it was eventually extended nearly to the Shed Drive building. The front (south) façade was completely open except for siding in the gable end. The sides were blank except for steel panel personnel doors near the corners adjacent to the front elevation. The rear elevation had centered, paired, steel-panel personnel doors. Above these was a steel balcony supported by large corner brackets, which supported an exhaust stack that emerged from the interior at balcony level and then continued up the side of the building. Additional steel framing on the balcony supported the stack. The interior was illuminated by floodlights. Electric controls and boxes were in the northwest corner. A maintenance balcony with pipe railings ran along the interior of the north wall with access via a caged ladder in the northeast corner. A stack ran from balcony level through the roof just inside this wall. The building had no floor and was open to the concrete pad.

AR-1, Track and Cable Drive System: When in operation a continuous three-quarter-inch-diameter twisted drive cable passed through this trench. It too is partly filled with sediment, but the western portion of the cable emerges from the fill to pass over a horizontal roller in a continuation of the trench inset into the northern end of the concrete slab that surrounds the Reactor Pad. The cable then passes by a vertical guide roller before disappearing into a covered passage within the slab. Moving to the Reactor Pad and facing north in the upper photo on page 8 from left to right, several system components are visible that were all backfilled with gravel: the western shed rail, a rectangular pit that held the horizontal cable sheave, the two rails of the railroad spur, and the eastern shed rail (which is emerging from the right center). Returning to the sheave pit, on its far (north) side, only a few feet of the concrete-covered slot for the western cable is visible. To the right of the western cable is the continuous gravel-filled slot for the eastern cable. It was open the entire way because the shed drive coupler, which was permanently attached to the cable, emerged from this slot for attachment to the undercarriage of the Reactor Shed. Returning to the north end of the slab, the eastern cable passed by and over an identical sheave and roller, as mentioned above, on its way to the windlass in the Shed Drive building. This is the simplest kind of funicular railroad system to design because no provision was needed for changing cars and the system is on level ground.

A heavy concrete stop with a steel bumper is at the northern terminus of each track. Shed operational controls are in a galvanized steel box next to the eastern bumper.

The entire system was built in 1960 with the exception of the northern portion of the concrete pad, which was enlarged to its full extent after 1966. The Shed Drive building was demolished between 1998 and 2005.

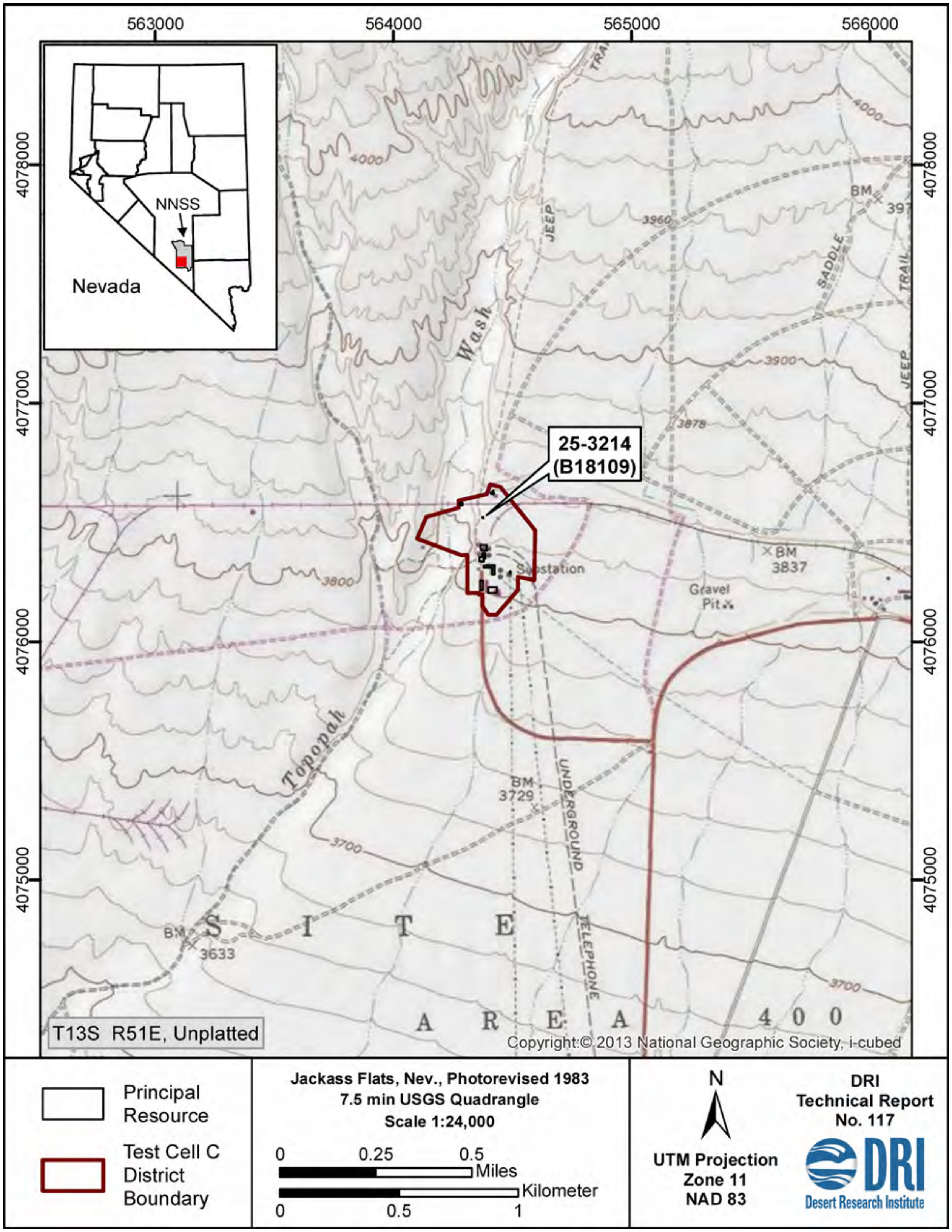
8. References

List references used to research and evaluate the individual property.

Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

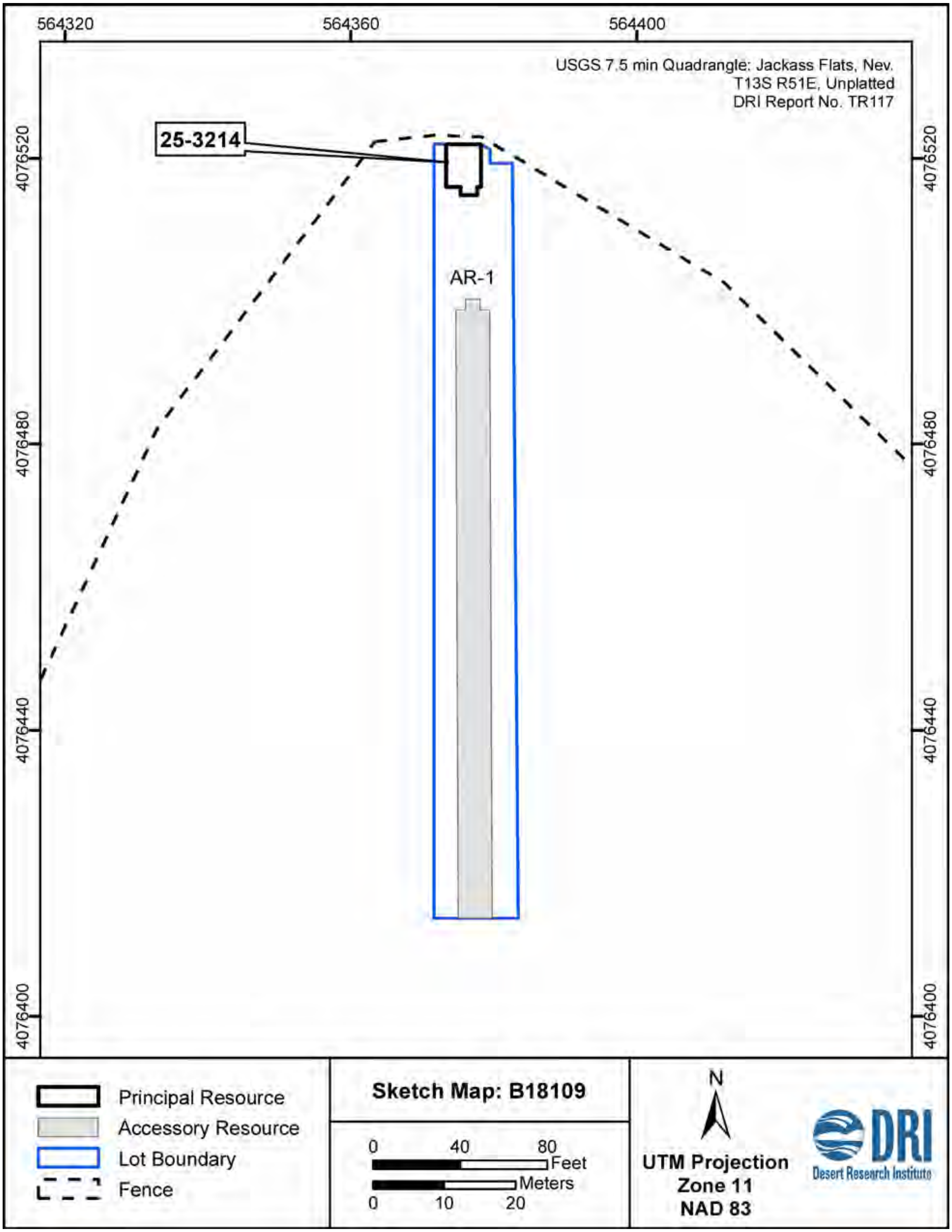
9. Area Location Map

Use a USGS quadrangle map at large extent to show general area of resource.

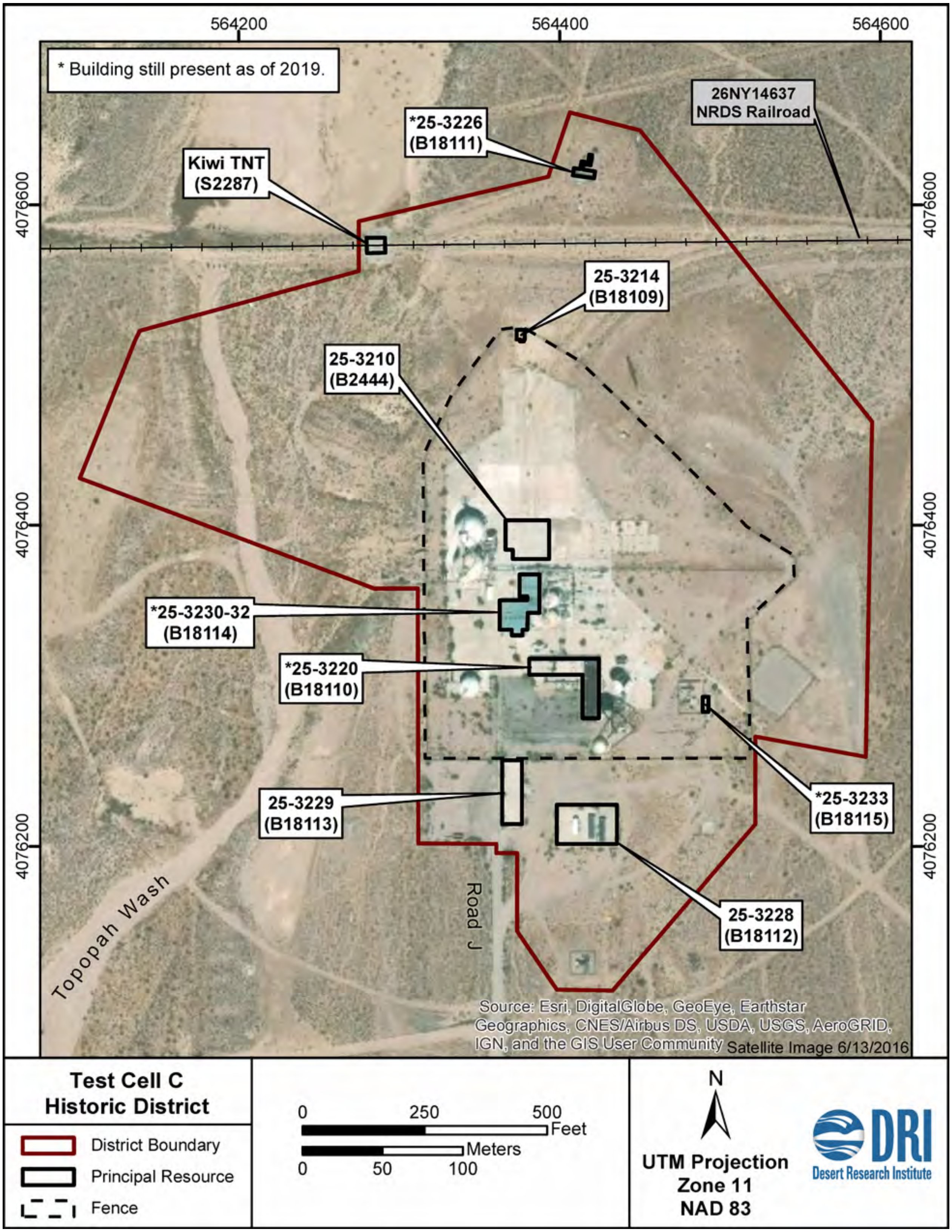


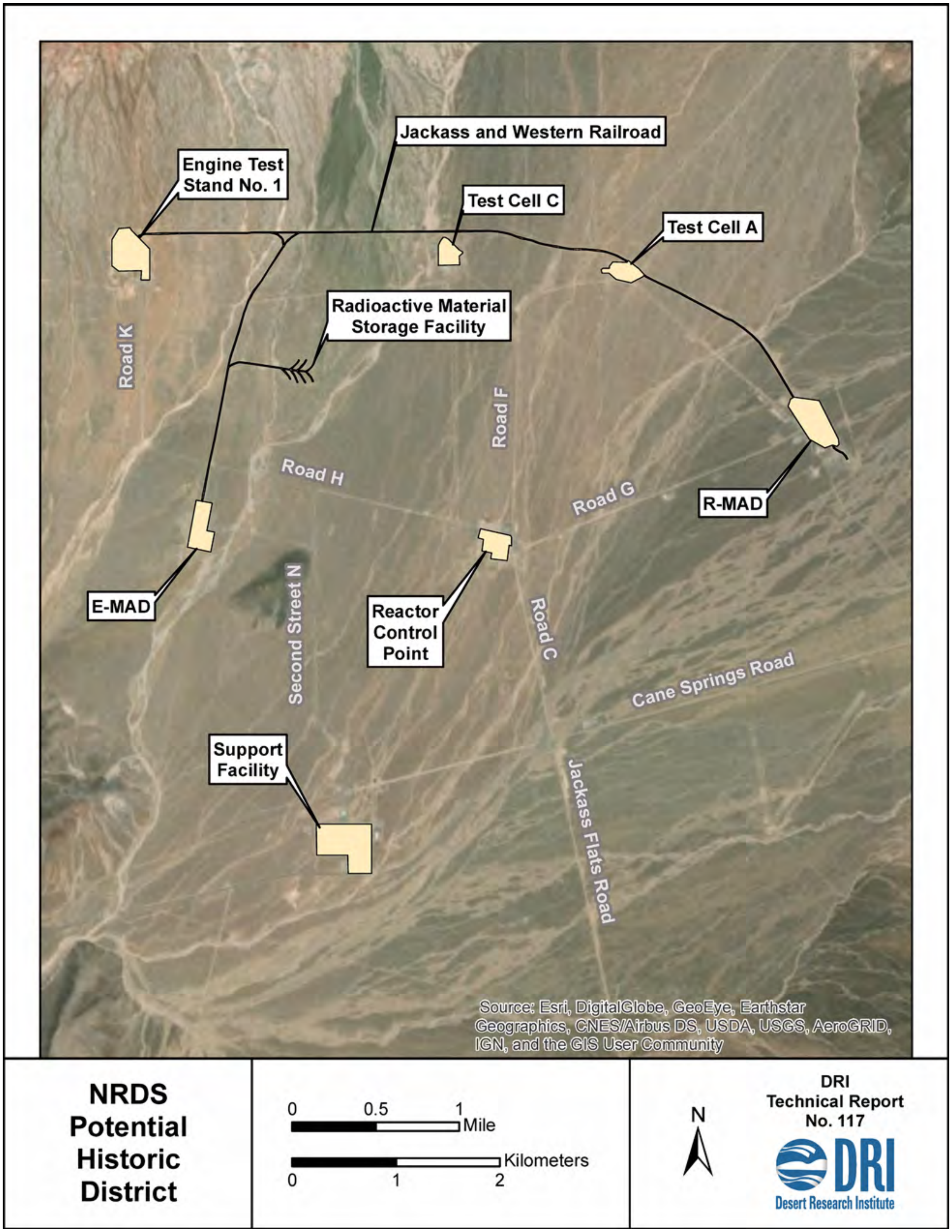
10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.



It's


564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
*25-3226
(B18111)
26NY14637
NRDS Railroad
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
25-3229
(B18113)
*25-3233
(B18115)
25-3228
(B18112)
Topopah Wash
Road J
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
DRI
Desert Research Institute

11. Photographs

Include as many photographs as needed to accurately depict the resource.

Elevation: N/A Direction facing: South Photographer: DRI (Photo 168) Date: 2019
Shed Drive building foundation in foreground with Track and Drive Cable system (AR-1) in background.

Elevation: N/A Direction facing: Northeast Photographer: DRI (Photo 516) Date: 2019
Shed Drive building foundation. Cable trench is at right in foreground.

Cable guide rollers and stop block at the north end of the TCC Facility concrete foundation, facing south (DRI, Photo 508, 2019).

Stop blocks at the north end of the tracks and the control box, facing northwest (DRI, Photo 500, 2019).

Reactor Shed 25-3211, front (south) elevation, facing north. The building no longer exists (RSL, Photo 2009-3, 2009).

West and north elevations of the former Reactor Shed, facing southwest, with the Building 25-3210 shield wall in the left background (RSL, 2009-4, 2009.)

12. Accessory Resources
Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Track and Cable Drive System for moving Reactor Shed**			
Construction Date		Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564375	Northing: 4076470		

Elevation: N/A Direction facing: North Photographer: DRI (Photo 494) Date: 2019
South end of cable drive system adjacent to Reactor Pad. From left to right backfilled with gravel are west shed rail, rectangular cellar for cable-turning sheave, cable system slot (the western cableway is not open to the surface, although it is visible on the slab), pair of rails from the spur, and the east shed rail.

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NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N	Date:			
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A	Subdivision Name	Nuclear Rocket Development Station (NRDS)		
UTM Location (NAD 83, UTM Zone 11 North)	Easting: 564420	Northing: 4076310			
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?	Yes ☐	No ☒			

3. Architectural Information

Construction Date	1960-1961
Architectural Style	None
Architectural Type	Warehouse
Roof Form	Flat and Shed
Roof Materials	Concrete and Asphalt
Exterior Wall Materials	Concrete Block and Concrete
Foundation Materials	Concrete
Window Materials	None
Window Type	None
Accessory Resources?	Yes ☒ No ☐
	Number?: 12

Condition of Resource(s)?		
Good ☐	Fair ☒	Poor ☐
Explanation: Built-up roof badly decayed, equipment removal from Compressor Room.		

(Insert primary photograph below.)

South elevation of Support Building 25-3220, with Fill Station area at left, facing north (DRI, Photo 206, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: Date listed:	NRIS #:

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
		If so, is this resource contributing?		Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☐		
	Not Eligible ☐	Unevaluated ☐				
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine					
Period(s) of Significance	1960-1972					
Integrity – Does the resource possess integrity in all or some of the 7 aspects?						
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒
General Integrity:	Intact ☒	Altered ☐	Moved ☐	Date(s):		
Threats to Resource:	Demolition, Structural Decay, Equipment Removal					
Historic Name	Equipment Building					
Current/Common Name	Same					
Historic/Original Owner	U.S. Atomic Energy Commission					
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)					
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030					
Historic Building Use	Multiple support and control functions for nuclear reactor tests.					
Current Building Use	None					
Architect/Engineer/Designer	Air Products, Inc., Allentown, Penn.					
Builder/Contractor	Unknown					

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

This is one of the premier buildings at Test Cell C. It is mission related, housing a variety of specialized operations, particularly the Compressor Room for moving liquefied gasses and the Local Control Room, which retains much of its original equipment. In addition to contributing to the Test Cell C Historic District, it is individually eligible under Criterion A for its importance in nuclear rocket testing operations and under Criterion C as one of the few examples of a major building designed for nuclear rocket testing. Of special importance in this regard is the incorporation of the solid concrete north wall and roof of the west wing for radiation shielding. Despite the removal of much interior equipment and the poor condition of the east wing roof, it retains all aspects of integrity.

This resource is not eligible under Criterion B, nor does it appear to have special research potential that would make it eligible under Criterion D.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

A variety of functions were housed in Building 25-3220, which was built in 1960 and 1961 as one of the original buildings at Test Cell C and is still standing. This is a one-story, L-plan, 7,493-square-foot building with concrete foundations and concrete slab floors. The roof is flat except for the shed roof over the Compressor Room at the east end of the building. The building was protected from the Reactor Pad by Building 23-3210 and its thick concrete shield wall, but additional protection was provided by the unpainted concrete north wall of the building with no openings. All other walls are pink-painted concrete block. The roof of the north wing, which was occupied during tests, is also concrete. The east wing roof is built up on a corrugated galvanized steel deck, which is badly corroded. Parts of this decking material are scattered about the interior floors of this wing. Personnel doors are steel panel, some with a single light, which are installed singly and in pairs. Most doors to machinery spaces are larger steel-panel double doors. The two doors in the west end of the Compressor Room are overhead rolled steel.
The building is oriented to the south, facing the Main Gate, with the Gas Unloading Area (AR-3219) located in the

exterior corner created by the two wings. The south elevation of the north wing is divided into seven modules by unpainted concrete pilasters. If facing the building looking north, the left three modules of the Compressor Room are taller, with the upper portion of the wall made up of translucent corrugated fiberglass panels. At each corner of this room is a personnel door, with the one at the right elevated on a steel stoop with steel steps and pipe railings. Gas pipes and holes for removed gas pipes enter near the base of the wall between these two doorways. The next three modules are for the Local Control Room, which has double personnel doors at its left end and a single personnel door near its right end. The final module is blank.

The east end of the Local Control Room meets the corner of the building where the east wing begins. This wing has much the same appearance, except that its pilasters are painted concrete block. The first five modules have alternating personnel and large double doors to machinery and shop spaces. The final module is blank.

The narrow south elevation of the east wing has a central double personnel door to the Cryo Bench Lab. At its left is a caged steel ladder to the roof. Above the door and extending nearly to the southeast corner of the building is a steel machinery balcony with pipe railings and angled steel support brackets.

Along the east elevation there is extensive piping outside the Pump Room. A muffled stack is in the wall above the single Pump Room door. To the right of the door is an array of pipes in an area that originally had an outside boiler. Two large louvered vents are in the wall of the Auxiliary Shop. Finally, there is the pair of large doors to the Electrical Shop. This wall has painted concrete block pilasters.

The north elevation of the east wing is flush concrete with some conduit attached. The concrete west wall continues with the same pattern of concrete pilasters as seen on the south elevation. This wing has abundant conduit, gas pipes, and electrical boxes. Most of the conduit and piping emerge from the walls of the Compressor Room and Local Control Room.

Rooms are described in the order of north wing from west to east followed by east wing from south to north. All interior ceilings extend to the underside of the roof deck. Lighting is with suspended incandescent fixtures except where suspended florescent lights are noted.

Compressor Room: Also called the Fill Station Compressor Room, this room formerly housed machinery needed to convey pressurized gas from the adjacent Fill Station to the various holding tanks and dewars. All machinery has been removed, leaving only some installation hardware in the concrete floor and three raised concrete equipment pedestals with associated sweeps. The north wall is concrete and all others concrete block. All are unpainted with multitudes of equipment and pipes on all walls except the west wall, which is nearly all occupied by the two overhead rolling doors manufactured by Kinnear Mfg. Co. of San Francisco. These doors have markings indicated they were delivered to OKLAND CONST. CO. at Test Cell C (the idiosyncratic spelling is correct). The south wall is flush, but the inner surfaces of the concrete pilasters are visible. Gas entry ports penetrate the base of the wall. Exterior light enters via the full-length fiberglass panels along the top of this wall. Vertical steel I-beams along the east wall serve as mounts for piping. Overhead are large air ducts and suspended incandescent lighting typical of the entire building. There are also many brackets for suspended equipment, which has been removed. Prior to the 1965 construction of the northern LH2 unloading dock, all gasses were unloaded here including liquid hydrogen. After that year they were likely confined mostly to liquid nitrogen and helium.

Local Control Room (Fill Station Control Room): Fortunately, most of the equipment still remains in this control room. Near its center is a small communications console completely surrounded by the principal control panels with a built-in desk in the northeast corner. All panels are in free-standing steel cabinets, which are accessible from the rear. The rest of the room is occupied by supplemental electrical cabinets which are both free-standing in north-south rows and mounted to the exterior walls. All walls and the ceiling are clad with white perforated asbestos panels. Cable trays are suspended from the ceiling, which extends to the underside of the roof. Flooring is 8-inch white tiles on concrete. They appear to be replacements of original 8-inch asphaltic tiles laid in a checkerboard pattern. Communications relay panels are attached to the north wall. Both doors are in the south wall, along with many electrical panels. The east wall has the doorway to the Electrical Communications Room and electrical panels, including the bright red Hydrogen Alarm System box. Many electrical panels are on the west wall.

Instruments in the central control panels are arranged by prominently labeled systems. Operational systems include the Process Water System, LH2 Storage System, High Pressure LH2 system, Cooldown LH2 System, Air Conditioning System, Hydraulic System, AGC Turbodrive System, Electric Motor Drive System, and the Shield, Cart, and Shed System.

Systems principally related to safety include the Borated Water System, Nitrogen Inerting System, Deluge & Thermal Spray Systems, Flare System, Gas Effluent Cleanup System, and the Atmospheric Monitoring System.

Electric Communications Room (also Electronic Maintenance Room): The ceiling and all walls except the concrete block south wall are covered by perforated asbestos panels. The south wall has a row of wood peg hangers. All other walls have a mid-height power strip. The entry from the Control Center does not have a door. The door in the north wall to the Air Conditioning Room has a ventilated metal mesh bottom panel and a home-made dart board attached to the center panel. Flooring is the same as in the Control Room.

Air Conditioning Room: This is the final room in the north wing. All walls and the ceiling are unpainted. Floor, north wall, and ceiling are concrete. The remaining walls are concrete block. The south wall has the doorway to the Electric Communications Room along with Johnson Temperature and Humidity Control boxes manufactured by Johnson Service Company of Milwaukee. The doorway to the Electrical Equipment Room is near the right end of the east wall. On the west wall is the Air Conditioning Local Control box. A CARRIER air compressor occupies the rest of the floor directly in front of the wall. Most of the room is occupied by a CARRIER air handler.

Cryo Bench Lab: This lab occupies the south end of the east wing. All walls are concrete block painted pale blue. The north wall has steel cabinets and sink, drying rack, and a testing cabinet in the right corner. The double door entry is in the middle of the south wall. A single door is near the right end of the west wall. Electrical panels and a fire alarm are also on the west wall. The narrow remaining portion of the east wall has the testing cabinet, but most of the testing equipment was inside the Clean Room. Lighting is suspended florescent. Electrical outlet strips are at bench height around all walls.

Aside from the few built-ins mentioned above, all equipment has been removed. The concrete floor is painted gray. Steel plates in the northeast corner and center of the room appear to be over cableways.

Cryo Bench Lab Clean Room: This room was created by erecting light drywall partitions on 2x4 studs in the southeast corner of the Cryo Bench Lab. The exterior of the partitions have 1x4 wood base while the interiors have one-inch cove base. The partitions are eight-feet tall, leaving the ceiling open. The north partition has a flush wood door with wood trim. The door is posted “NO ADMITTANCE CLEAN AREA/AUTHORIZED PERSONNEL ONLY.” The west partition has an electric outlet strip. The concrete block east wall has a metal vent hood and a chemical-resistant sink on a plywood base with a shelf over the sink. The south concrete block wall has an electric strip and conduit attached. Flooring is 8-inch tan tiles on concrete. Lighting is surface-mounted florescent in a wood-framed drywall suspended ceiling. A large air diffuser is mounted in the ceiling, most of which has collapsed due to water damage. A large fan to the exterior is in the east wall above the suspended ceiling of this room.

Electrical Shop: This room is created by means of gray eight foot-tall 2x4 and plywood partitions (north and west walls). Chicken wire continues from the tops of the partitions to ceiling. The remaining two walls are concrete block which are variously painted gray or tan, or are unpainted. The north wall has a door, bulletin board, and fire-extinguisher mount. Pipes and a porcelain custodial sink are on the south wall. The west wall has pegboard along with electrical plugs and conduit. A water heater is adjacent to the east wall. Far above, the steel roof deck here and throughout the rest of this wing is so decayed that it is open to the sky in many places. Lighting is suspended florescent.

This room along with the Pump Shop to the west were created by subdivision of the Water Pump Room in 1967. An existing restroom and janitor’s closet were removed from this space, though the water heater and janitor’s sink were left in place (Los Alamos Drawing 108776, 1967).

Pump Shop: This small room has the same kind of partition walls on the north and east as the Electrical Shop. There is an open pass-through at the base on the west end of the north partition designed originally to clear a belt drive. South and west walls are concrete block. A double door is in the west wall. Ceiling and floor are the same as in the Electrical Shop. Lighting was originally suspended incandescent, which was replaced with florescent. A large vertical steel pressure tank is in the southwest corner of the room.

As noted above, this room was partitioned off in 1967. Its original use was as a storage space for Rocket Dyne.

Water Pump Room: The north wall is formed of a green plywood partition the same as those described above. A door at its left side leads to the Auxiliary Shop. The south wall is also green, the partition for the Electrical and Pump

Shops. The remaining walls are concrete block with attached pipes and conduit. A single door is in the east wall while the west wall has a single and a double door. The floor is concrete with raised equipment pads. There is a cellar under steel plates along the east wall for piping to the outside of the building. Equipment includes four large Peerless (based in Los Angeles and Indianapolis) pumps near the center of the room, two of which have been removed, another pump in the northeast corner of the room, and a large Worthington compressor (built in 1960) at the south end. Three steel electrical cabinets are free-standing just inside the east entrance.

Auxiliary Shop: All walls except the south plywood partition are unpainted concrete block. There is a plywood entry vestibule in the northwest corner. A bulletin board is attached to the vestibule. The northern partition angles to the north near its western end to avoid the exterior double door in the Water Pump Room. A flush plywood door is in this angle and another in the vestibule. The exterior door to the vestibule is the usual steel panel. The north concrete block wall has steel racks and pipes. The east concrete block wall has a large filter to outside in a steel cage mounted high on the wall along with numerous pipes. Lighting is suspended florescent.

Electrical Equipment Room: All walls are unpainted. The north wall is concrete and the rest are concrete block. There is a door in the right corner of the south wall, a large double door in the north end of the east wall, and another door near the center of the west wall. The upper panel of this last door, which leads to the Air Conditioning Room, is steel mesh. The floor is concrete and the room retains the original suspended incandescent lighting.

Near the center is a Pennsylvania 3-phase ventilated transformer, 4160-480/277 v. manufactured by the Pennsylvania Transformer Division of McGraw-Edison, Company, Canonsberg, Pennsylvania. Along the east wall are breaker boxes and another 4160-480 v. transformer made by the I.T.E. Circuit Breaker Company, Philadelphia. North and south walls have more breaker boxes. The main breaker box is in the northeast corner of the room.

Accessory Resources

AR-3203, Cooling Tower: The rectangular Cooling Tower has twin redwood tanks above a series of wood slats and baffles. It is mounted in a concrete containment basin with pumps, pipe manifolds, and a sump at its west end. There is a steel cover on the sump and a steel rung ladder inside. The lower part of the tower is clad in corrugated asbestos cement siding, and the top is clad with corrugated galvanized steel siding. It was built in 1960.

AR-3207, Borated Water System: As a neutron moderator, borated water was used at the site principally for radioactive shielding. This system had four components: a boiler (removed leaving concrete foundations), Mixing Tank, Cooling Tower, and Storage Tank.

The Mixing Tank is cylindrical steel, 16 feet in diameter and the same height, and has spray-on insulation. A monorail crane and steelwork platform are on top of the tank, which is accessed via a steel stairway. This crane was used to hoist boric acid salts to the top of the tank by means of a two-ton capacity forklift attachment made by Downs Crane & Hoist Co. of Los Angeles, California. The tank was manufactured and erected by the Pittsburgh-Des Moines Steel Company in 1966. It has REECo property tag #408354.

The rectangular Cooling Tower is mounted at ground level. Its outer shell is plywood. Open ends reveal a network of internal wooden slats. It was likely also erected in 1966.

The 5,953-gallon Borated Water Storage Tank is 50 feet tall with a diameter of 30 feet, and it was also manufactured by Pittsburgh-Des Moines Steel Company. It has rubber sheet insulation painted white, much of which has exfoliated. A caged ladder accesses the top of the tank, which has a pipe safety rail around its perimeter. It has REECo USERDA/NV property tag #408262. This tank was constructed in 1960.

AR-3208, Conditioned Water System: The 150,000-gallon, silver-painted-steel, elevated water tank is one of the dominant features at the facility. Its supporting tower is square in plan with tubular steel legs and a central riser. Supplementary struts are I-beams with steel-bar cross bracing. A caged ladder ascends the southeast leg. There are separate concrete pads for the legs. The riser terminates in a concrete cellar with an access manhole.

There is a catwalk around the perimeter of the enclosed tank and another ladder to its top. Water softening equipment is on a concrete pad just south of the tower. Well water for the tank was delivered via the underground six-inch Water Line D. The tank was built in 1960.

AR-3209, Moderated/Processed Water Tank: This is a large (250,000 gallon), white steel, spherical tank on pipe columns and angle-iron cross bracing on a concrete slab. Controls are protected by a partial corrugated metal windscreen. Access to the top of the tank is via a steel staircase with pipe railings. The tank was produced by Westinghouse Pumps. Planned in 1964, it was likely installed in 1965.

AR-3217, Substation #6: This substation was located at the west edge of the facility. It has been demolished. Remains include a single, steel power pole with large insulators; a rectangular concentration of coarse gravel; sweeps leading to a metal electrical box; and a small concrete slab with kingbolts. It was built in 1960.

AR-3219, Gas Unloading Area (original LH2 Fill Station): This facility consists of a paved parking area for backing in gas trailers with a three-foot-tall concrete wall at the rear (north) and sides. There are inset lights and stainless steel pipes emerging from this barrier. An additional concrete apron without a barrier immediately to the west has piping leading directly into the Compressor Room. This concrete apron extends the full width of the unloading area, but only the rear tires would have rested on it. The remainder of the parking area to the south is asphalt, which is now quite decayed.

AR-1, Process Water Heater: The large steel water heater is flanked on the east by a complex of raised steel platforms with pipe ladders and railings, as well as a maze of plumbing. Nestled among the pipes on a concrete slab is the steel operating control cabinet. The structure was painted gray, which has largely eroded away leaving it to rust. The Water Heater was fueled by propane and manufactured by Babcock & Wilson. A plate indicates it was installed in 1968. Planning for its installation began in 1964.

AR-2, Water Conditioner: Displaced and now lying horizontally on the ground, the 680-gallon tank was designed to be installed in a vertical position. It is approximately 20 feet long on three I-beam legs. It was built in 1971 by California Tank & Mfg. Co. of Long Beach, California, for the L*A* Water Conditioner Division of Water Treatment Corporation of City of Industry, California, in 1971.

AR-3, Propane Storage Area: In the southwestern corner of the compound are concrete foundations for two Propane Tanks surrounded by pipe bollards. A concentration of manifolds, valves, regulators, and other related equipment mounted on small concrete pads is associated with this resource. The smaller tank is original to the complex. The larger one was planned in 1964 and likely installed during the facility upgrade and expansion in 1965 and 1966.

AR-4, Telephone Vault: This is a concrete vault with a sign next to it that identifies the vault as having access to a Bell Telephone underground telephone line. The cast iron manhole cover is embossed “SEWER” despite the clear use of the vault for communications. It was probably built in 1961.

AR-5, Electrical Vault: A square iron lid covers most of this concrete cellar. The construction date is unknown.

AR-6, Rest Room Foundation: This 8-by-21-foot concrete pad is adjacent to the southern perimeter fence and was once a bathroom, which has been demolished. It has no sweeps or other attachment hardware. The construction date is after 1960, but prior to July 1965.

8. References

List references used to research and evaluate the individual property.

Historic photographs and engineering drawings at end of form:

Air Products Incorporated

1960a Equipment Building Roof and Floor Plans. Drawing No. 3220-S1.1. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

1960b Equipment Building Sections and Elevations. Drawing No. 3220-S2.1. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

1960c Pump House Roof and Floor Plans. Drawing No. 3220-S6.1, Revised As-Built 1962, File 107355. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

Los Alamos Scientific Laboratory (LASL)

1967 Test Cell "C" Layout. Drawing No. SK-125, Revised 1972 (Rev. H). University of California, Los Alamos.

Reynolds Electrical & Engineering Co. (REECo)

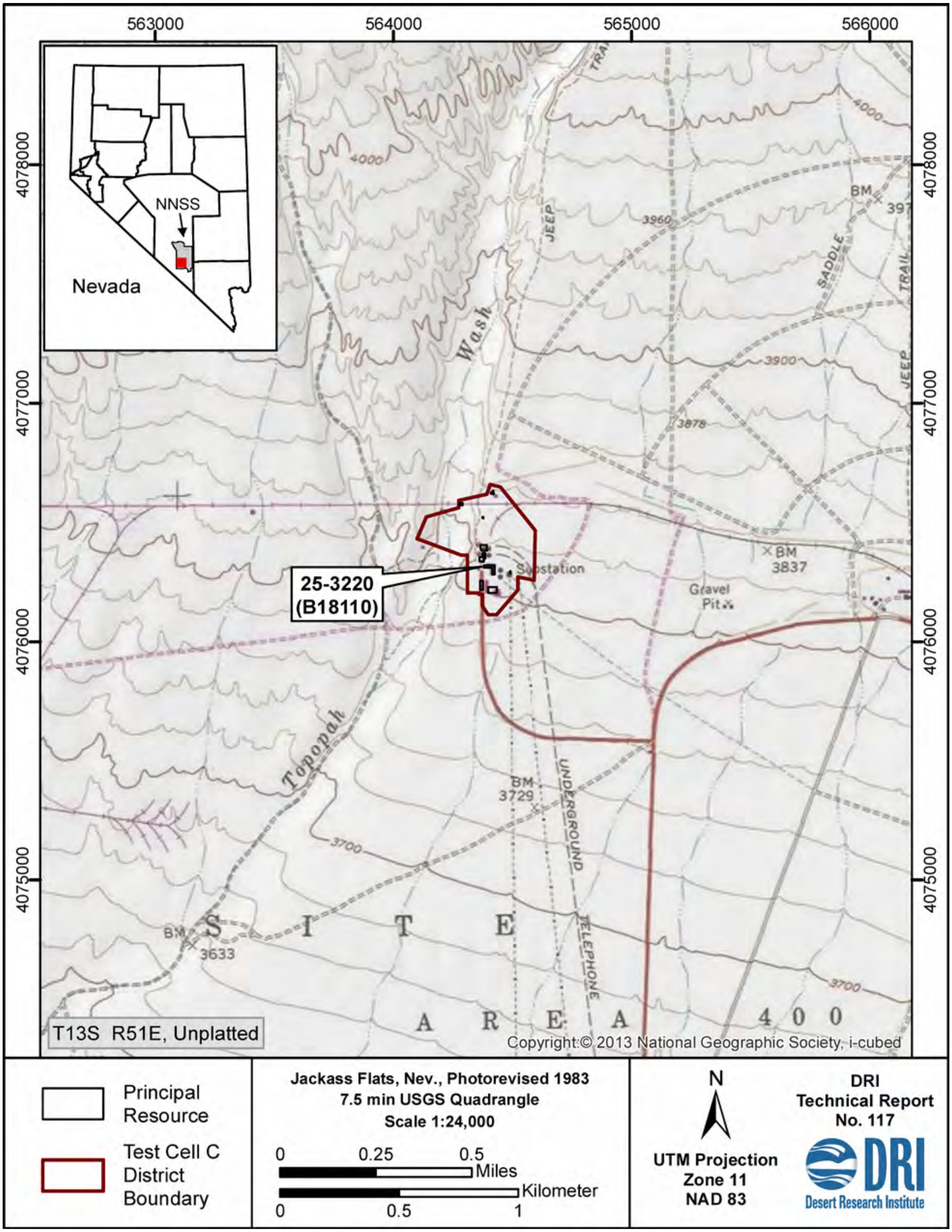
1982 *Photograph Album Index (1958 – 1976)*. Photos and index on file at the Desert Research Institute, Las Vegas.

Engineering drawings and archival maps are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

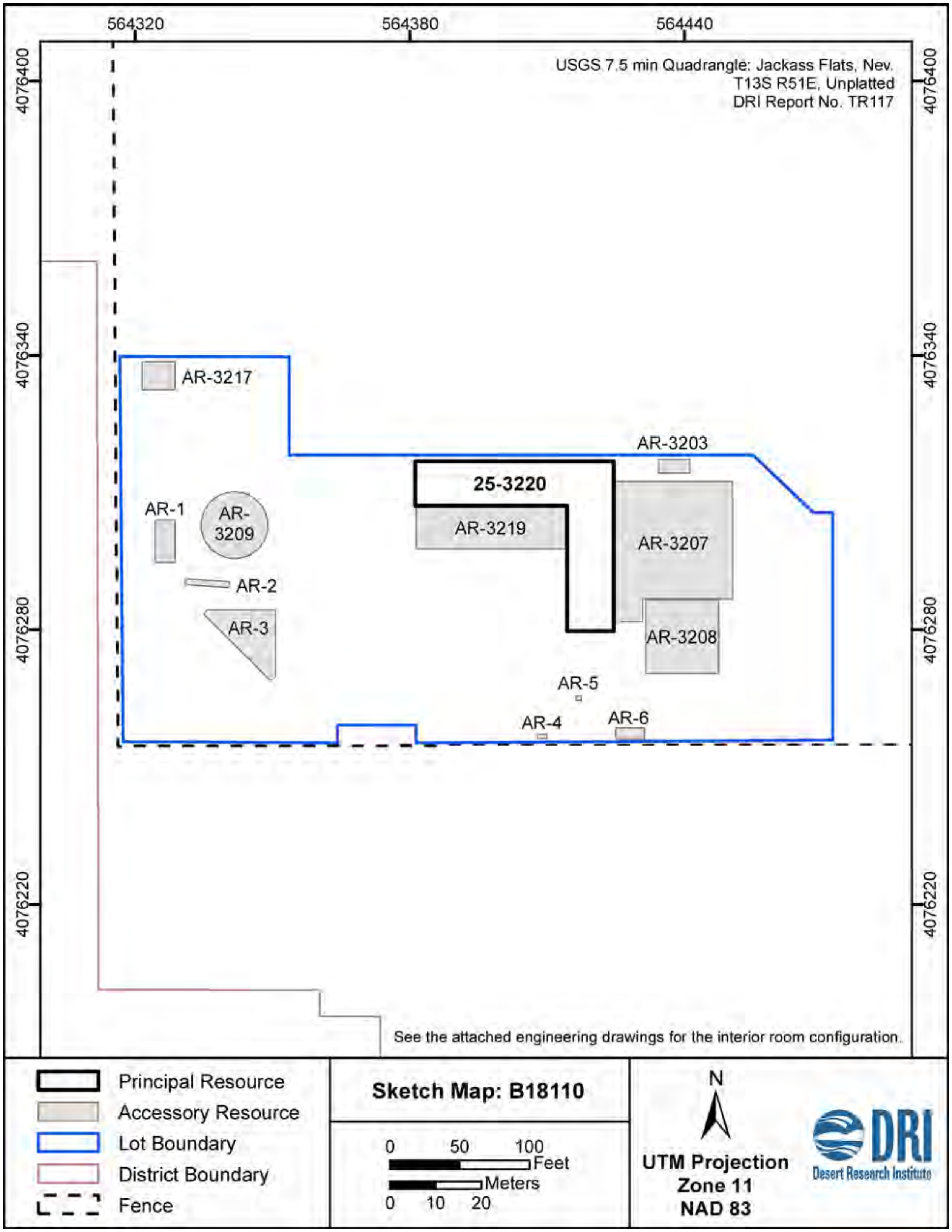
9. Area Location Map

Use a USGS quadrangle map at large extent to show general area of resource.

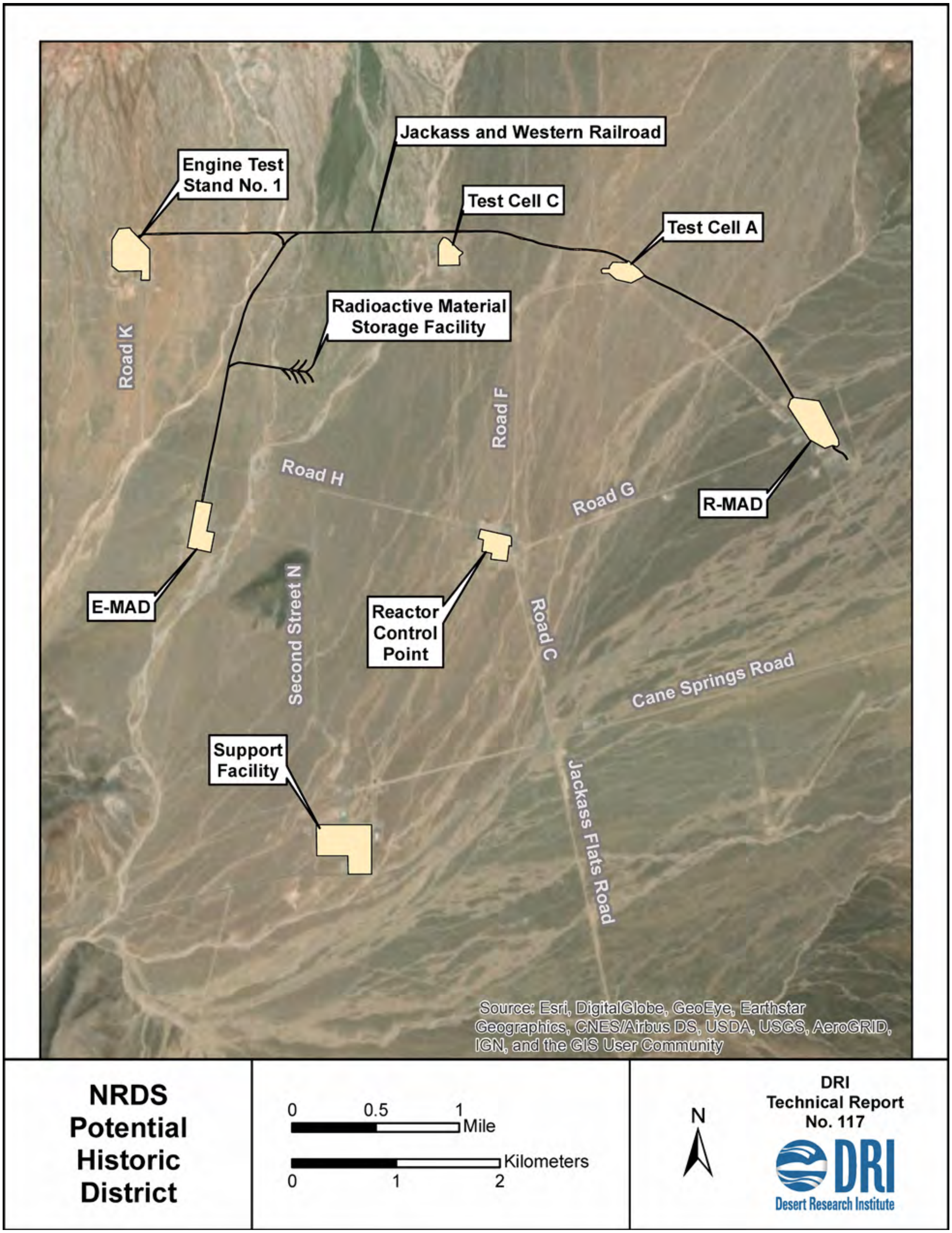


10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.



SHPO Resource #: B18110
Other Resource #:25-3220 Support Building



11. Photographs

Include as many photographs as needed to accurately depict the resource.

Elevation: N/A (Aerial) Direction facing: South Source: RSL Date: c. 1967

Elevation: South Direction facing: North Photographer: DRI, Photo 206 Date: 2019
Gas Unloading Area at left.

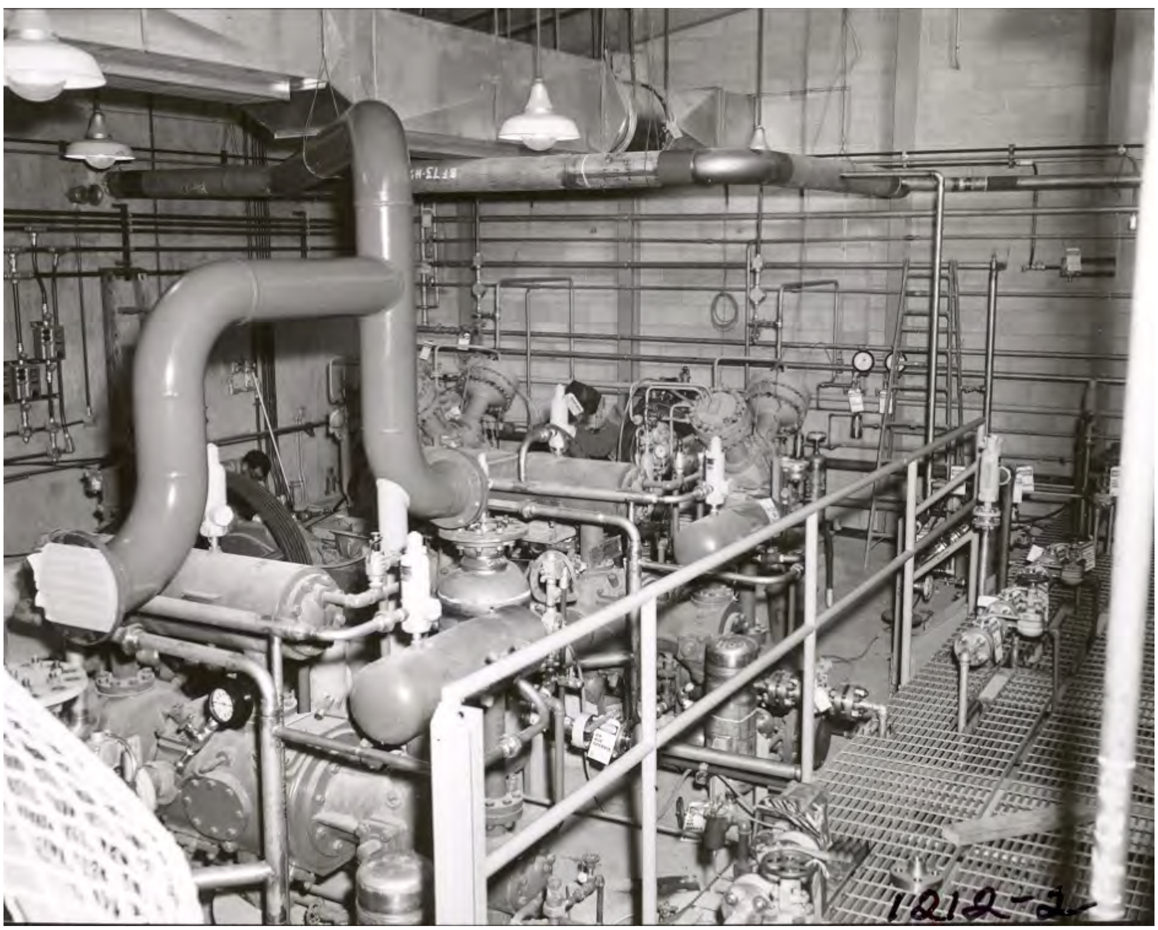
SHPO Resource #: B18110
Other Resource #:25-3220 Support Building

Elevation: South/West Direction facing: Northeast Photographer: DRI, Photo 240 Date: 2019

Elevation: East/North Direction facing: Southwest Photographer: DRI, Photo 224 Date: 2019

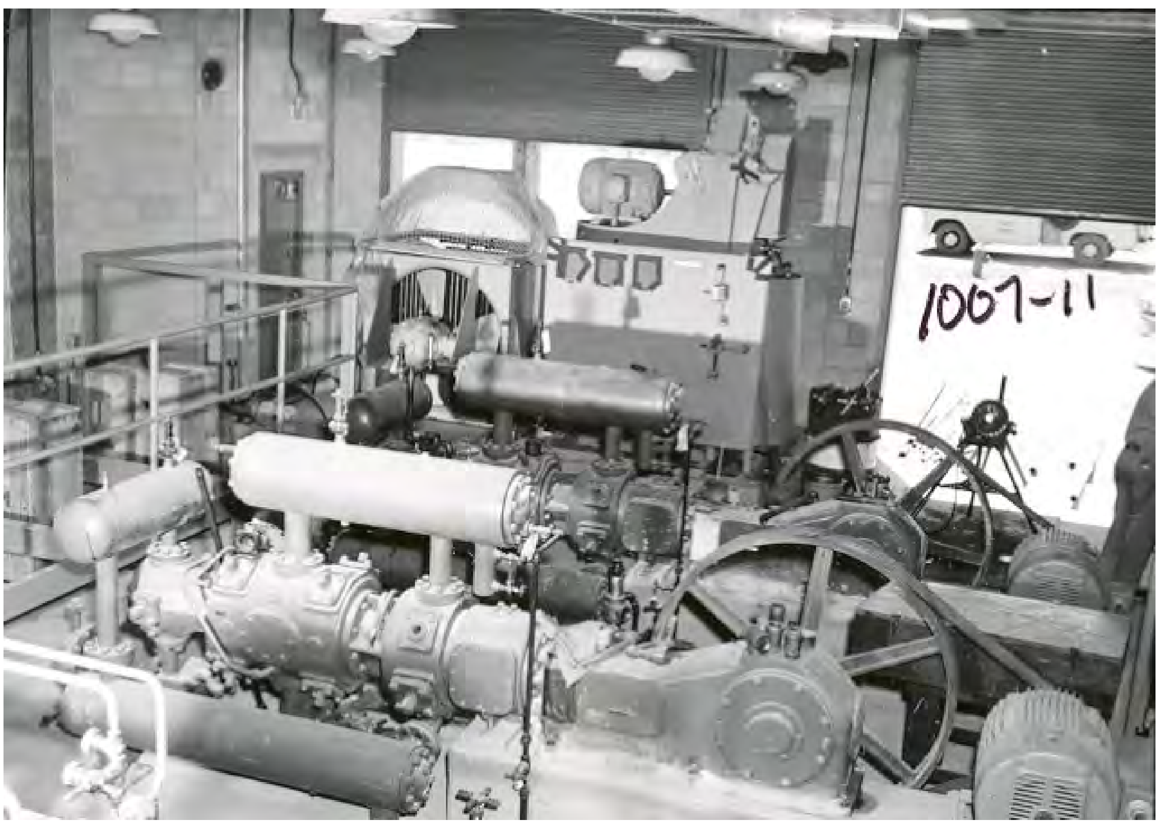
Elevation: North/West Direction facing: East-southeast Photographer: DRI, Photo 234 Date: 2019

Compressor Room, facing northeast (DRI, Photo 674, 2019).



Compressor Room with equipment, facing northeast (REECo, Photo 1212-2, 1962).

Compressor Room, facing southwest (DRI, Photo 678, 2019).

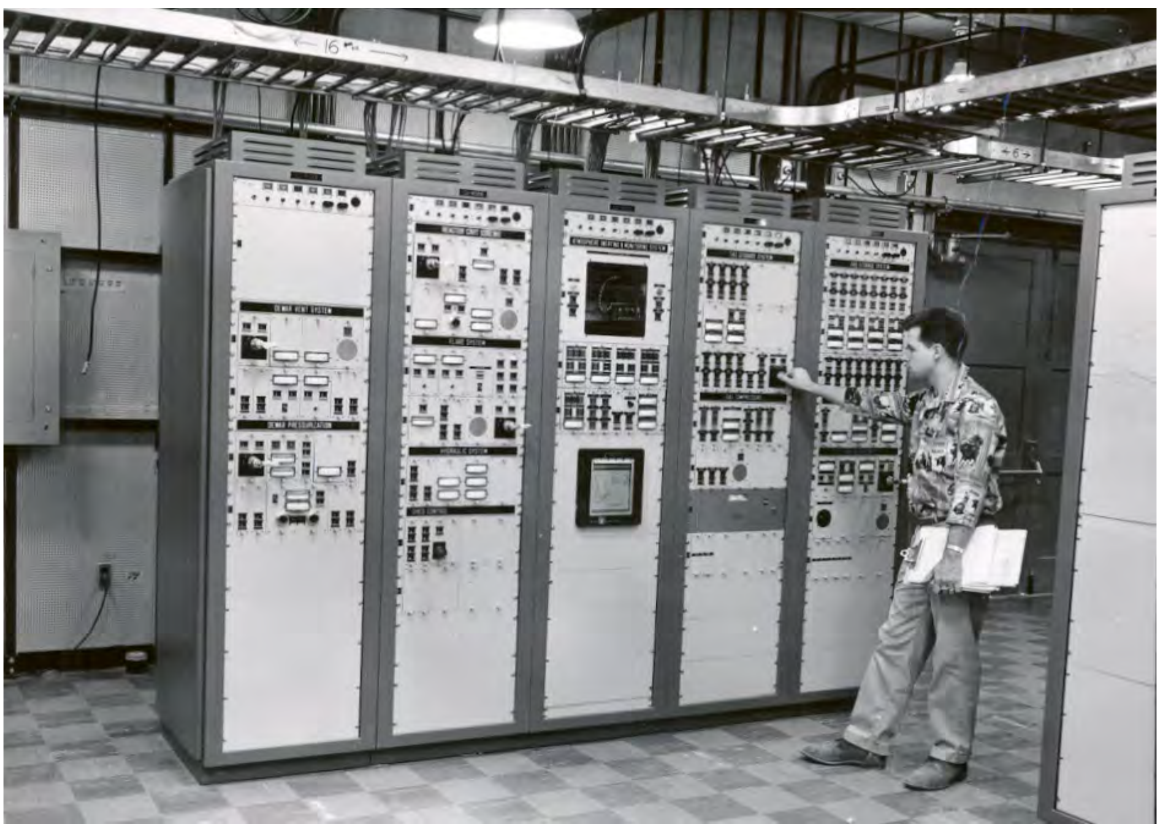


Compressor Room with equipment, facing southwest (REECo, Photo 1007-11, 1961).

Local Control Room: central Communications Console and northern Systems Controls, facing north (DRI, Photo 925, 2019).

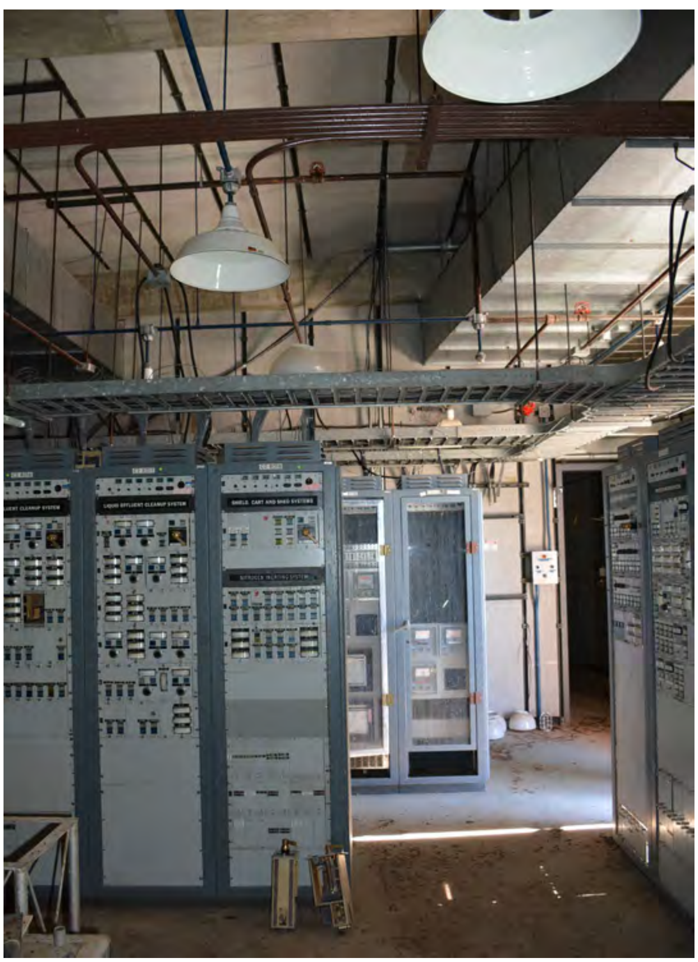
Local Control Room: eastern Systems Controls, facing northeast (DRI, Photo 923, 2019).

Local Control Room: southern Systems Controls, facing south (DRI, Photo 920, 2019).



Local Control Room: original southern Systems Controls, facing southwest (REECo, Photo 1207-2, 1962).

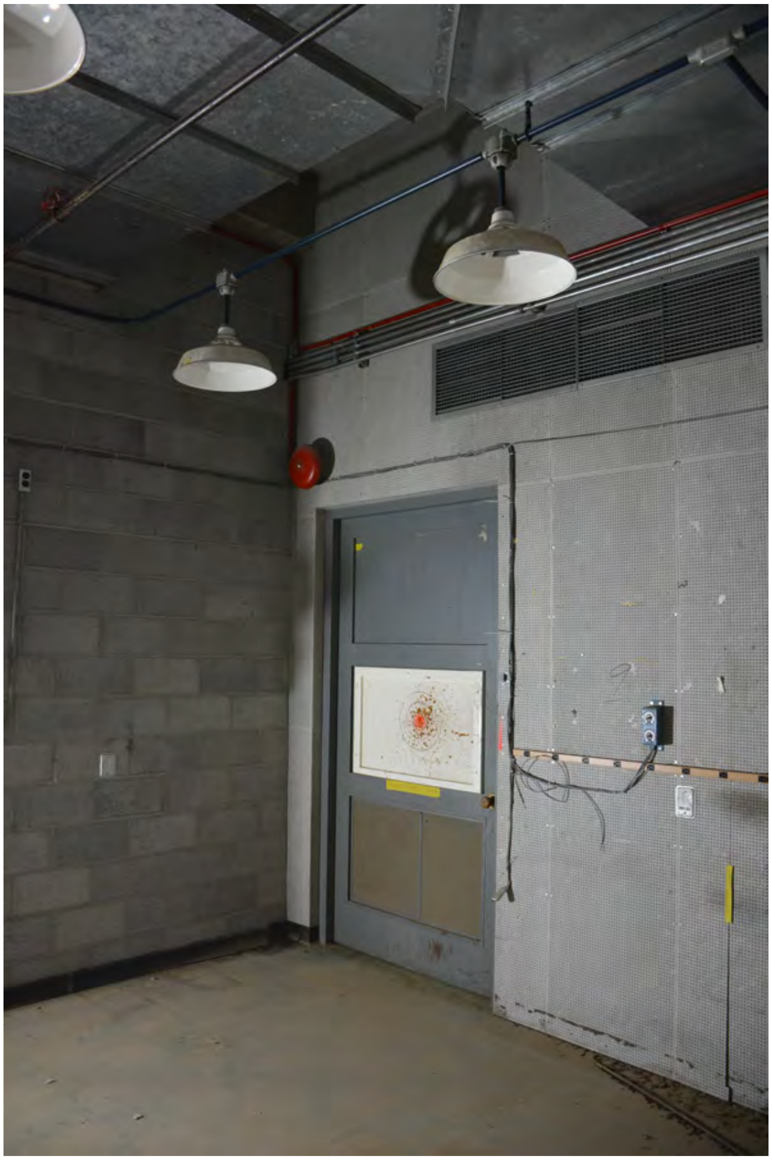
Local Control Room: western Systems Controls, facing northwest, with supplementary electrical cabinets in background (DRI, Photo 927, 2019).



Overview of Local Control Room, facing east, with central Communication and Systems Controls workspace in foreground and supplementary electronics cabinets in background. Note the shielded concrete ceiling (DRI, Photo 944, 2019).

Local Control Room, facing southwest, with supplementary electronics cabinets (DRI, Photo 940, 2019).

Electrical Communications and Maintenance Room, facing northeast (DRI, Photo 892, 2019).



Electrical Communications and Maintenance Room, facing southwest, (DRI, Photo 900, 2019).
Note dartboard on door.

Air Conditioner Room facing west (DRI, Photo 874, 2019).

Air Conditioner Room, northeast corner, facing northeast (DRI, Photo 880, 2019).

Air Conditioner Room, northwest corner, facing northwest (DRI, Photo 884, 2019).

Cryo Bench Lab, facing northwest (DRI, Photo 722, 2019).

730 Cryo Bench Lab, facing north (DRI, Photo 730, 2019).

Cryo Bench Lab, facing east, with Clean Room partition in foreground (DRI, Photo 736, 2019).

Cryo Bench Lab, facing east, with Clean Room partition at right (DRI, Photo 740, 2019).

Lab bench and fume hood in Cryo Bench Lab Clean Room, facing northeast (DRI, Photo 748, 2019).

Electrical Shop, facing north (DRI, Photo 758, 2019).

Electrical Shop, facing south (DRI, Photo 754, 2019).

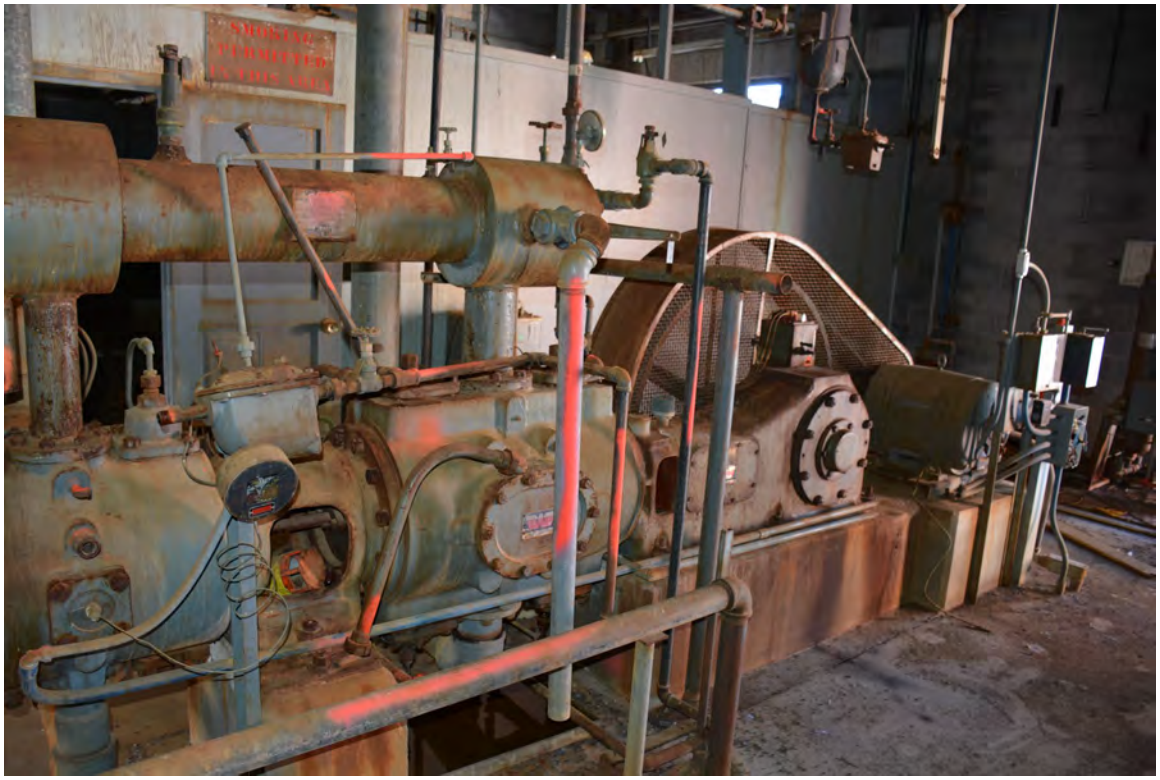
Pump Shop, facing south, with pressurized tank and hose (DRI, Photo 768, 2019).

Pump Shop, facing north, showing north partition with pass-through (DRI, Photo 774, 2019)

Typical double steel panel doors in Pump Shop, facing west (DRI, Photo 780, 2019).

Water Pump Room, facing northeast (DRI, Photo 792, 2019).

Water Pump Room, facing east (DRI, Photo 800, 2019).



Water Pump Room, facing southwest (DRI, Photo 816, 2019).

Auxiliary Shop, facing east (DRI, Photo 832, 2019).

Auxiliary Shop, facing west (DRI, Photo 836, 2019).

North half of Electrical Equipment Room, facing west (DRI, Photo 846, 2019).

Central Transformer Island in Electrical Equipment Room, facing southeast (DRI, Photo 858, 2019).

South half of Electrical Equipment Room, facing east (DRI, Photo 866, 2019).

12. Accessory Resources

Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3203: Cooling Tower**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 565438		Northing: 4076315	

AR-3203, facing southwest (Photo 282, left) and northeast (Photo 284, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3207: Borated Water System**			
Construction Date	**1960-1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564438		Northing: 4076300	

AR-3207, Mixing Tank with overhead crane, facing west (Photo 288, left) and crane forklift, facing west (Photo 594, right) (DRI 2019).

Photographs continued on next page.

Continued from previous page.

AR-3207, Cooling Tower, facing southeast (Photo 598, left) and Storage Tank, facing west (Photo 276, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3208: Conditioned Water System**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564440		Northing: 4076280	

AR-3208, elevated water tower, facing northeast (Photo 101, left) and water softener, facing northeast (Photo 250, right) (DRI 2019).

SHPO Resource #: B18110
Other Resource #:25-3220 Support Building

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3209: Moderated/Processed Water Tank**			
Construction Date	**1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564342	Northing: 4076302		

AR-3209, facing northwest (Photo 210, left) and detail of control shelter, facing north (Photo 316, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3217: Substation #6**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564625	Northing: 4076335		

AR-3217, facing southwest (DRI, Photo 356, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3219: Gas Unloading Area (Original LH2 Fill Station)**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564398		Northing: 4076300	

AR-3219, facing east-northeast (DRI, Photo 398, 2019).

AR-3219, fitting and light fixture in northeast corner (Photo 404, left) and manifolds leading to the Compressor Room, facing north (Photo 720, right) (DRI, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Process Water Heater**			
Construction Date	**1964-1968**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564326		Northing: 4076300	

AR-1, facing northwest (Photo 378, left) and detail of control panel (Photo 390, right) (DRI, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-2: Water Conditioner**			
Construction Date	**1971**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564336		Northing: 4076290	

AR-2, facing northeast (DRI, Photo 384, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3: Propane Storage Area**			
Construction Date	**1965-1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564346		Northing: 4076280	

AR-3, facing southwest (Photo 312, left) and detail of manifolds (Photo 380, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-4: Telephone Vault**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564409		Northing: 4076256	

AR-4, with Gate 2 in the background, facing west (DRI, Photo 572, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-5: Electrical Vault**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564416		Northing: 4076265	

AR-5 (DRI, Photo 576, 2019).

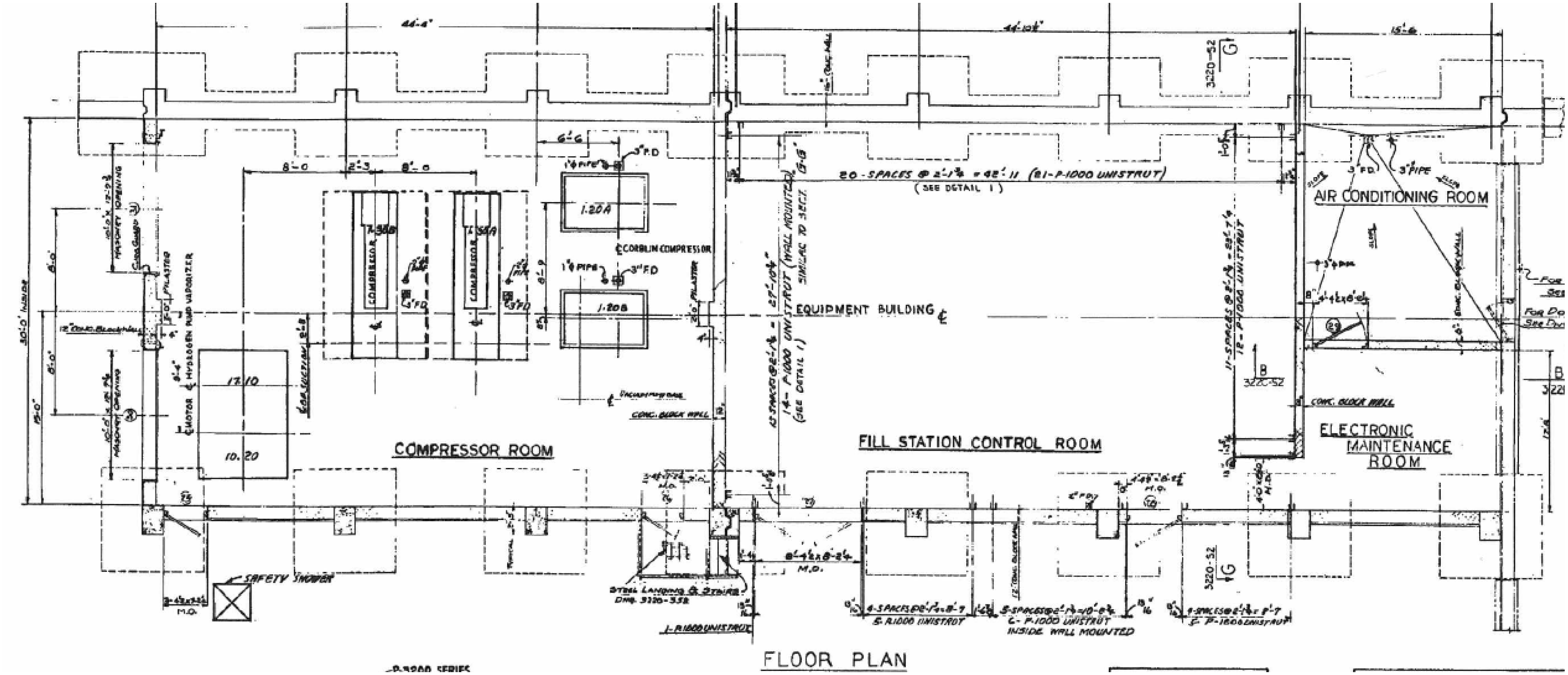
Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

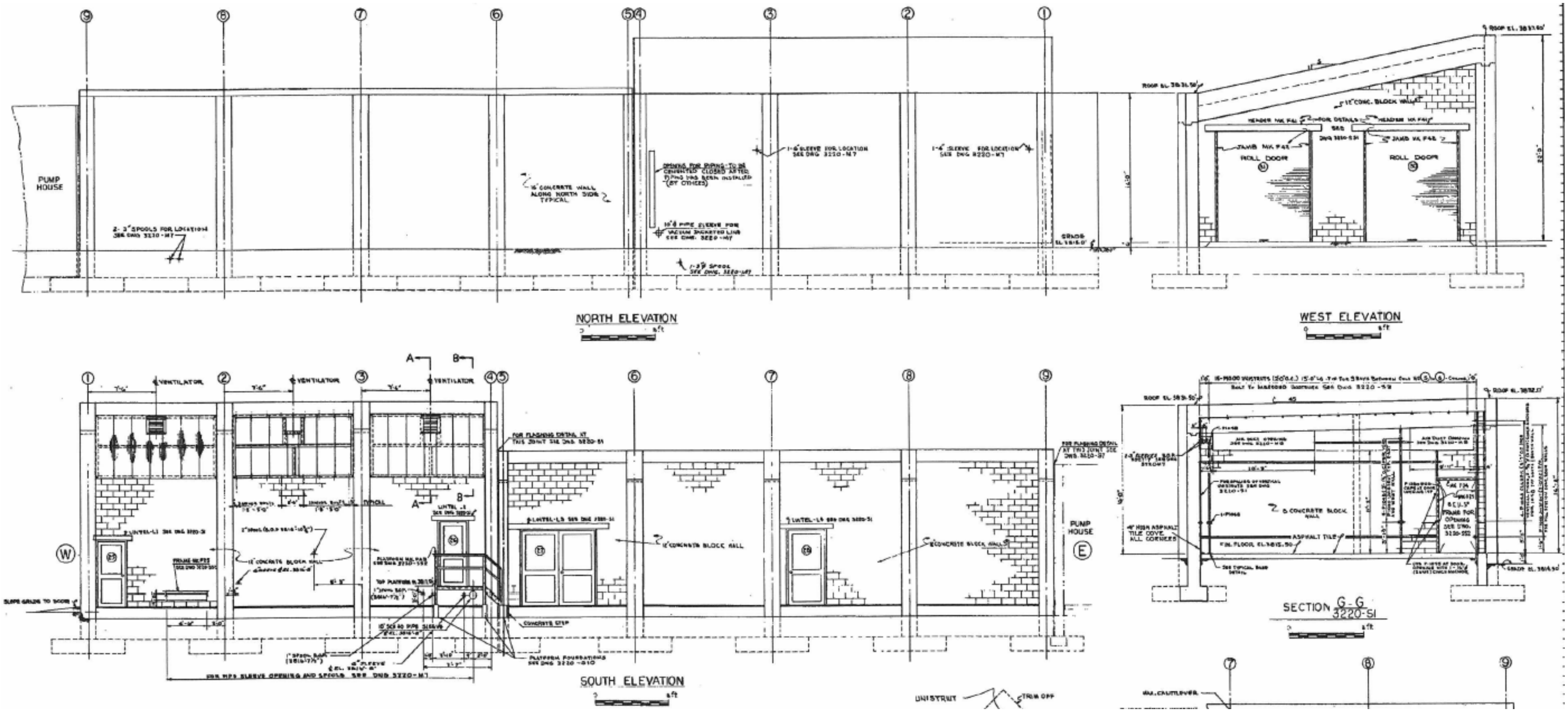
Accessory Resource Overview

Accessory Resource Name	**AR-6: Concrete Pad – Restroom Foundation**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564428		Northing: 4076258	

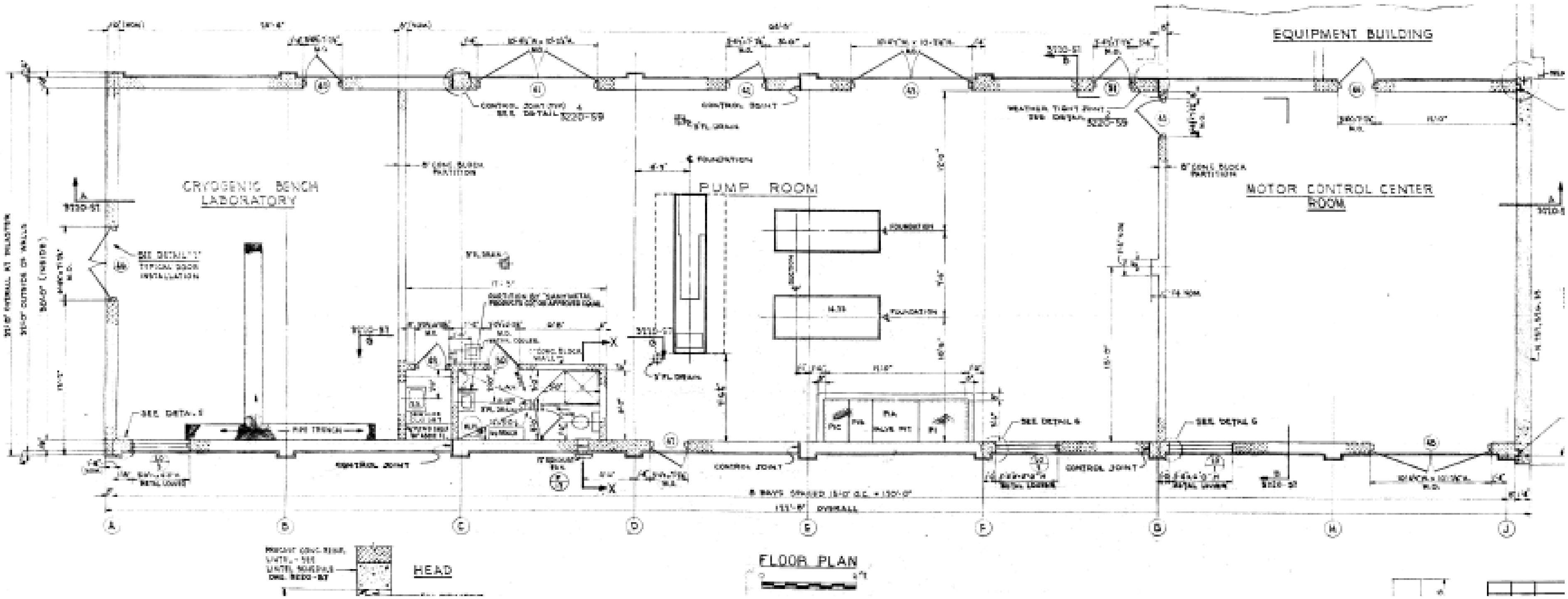
AR-6, facing east (DRI, Photo 578, 2019).



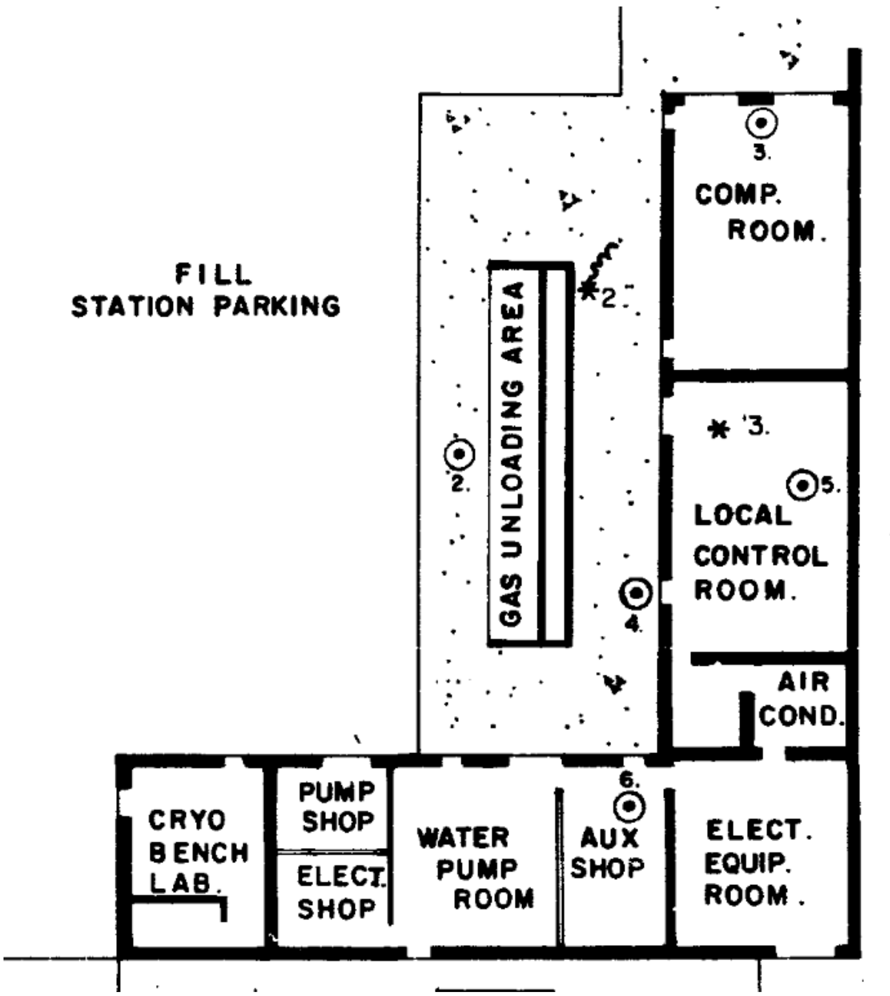
Plan of West Wing of Building 25-3220 (detail from Air Products Incorporated 1960a).



Elevations of West Wing of Building 25-3220 (detail from Air Products Incorporated 1960b).



Building 25-3220 East Wing Floor Plan (detail from Air Products Incorporated 1960c). Partitions for the Cryo Bench Lab Clean Room, Electrical, Pump, and Auxiliary Shops have not yet been installed.



Building 25-3220 final Floor Plan (detail from LASL 1967).

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NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A	Subdivision Name	Nuclear Rocket Development Station (NRDS)		
UTM Location (NAD 83, UTM Zone 11 North)	Easting: 564415	Northing: 4076620			
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?	Yes ☐	No ☒			

3. Architectural Information

Construction Date	1962
Architectural Style	None
Architectural Type	Other
Roof Form	Shed
Roof Materials	Metal
Exterior Wall Materials	Wood and Metal
Foundation Materials	Concrete
Window Materials	None
Window Type	None
Accessory Resources?	Yes ☐ No ☒
	Number?:

Condition of Resource(s)?		
Good ☒	Fair ☐	Poor ☐
Explanation: Some structural decay.		

(Insert primary photograph below.)

Overview, facing northwest (DRI, Photo 116, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: / NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: / Date listed:	NRIS #:

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
			If so, is this resource contributing?	Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☐		
	Not Eligible ☐	Unevaluated ☐				
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine					
Period(s) of Significance	1962-1972					
Integrity – Does the resource possess integrity in all or some of the 7 aspects?						
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒
General Integrity:	Intact ☒	Altered ☐	Moved ☐	Date(s):		
Threats to Resource:	Demolition, Structural Decay, Equipment Removal					
Historic Name	North Camera Bunker					
Current/Common Name	Same					
Historic/Original Owner	U.S. Atomic Energy Commission					
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)					
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030					
Historic Building Use	Photography of reactor tests					
Current Building Use	None					
Architect/Engineer/Designer	Los Alamos Scientific Laboratory					
Builder/Contractor	Unknown					

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

This is one of the premier buildings at Test Cell C. It is mission related, supporting EG&G's famous photography of various nuclear tests through the means of extremely fast interval photography.

In addition to contributing to the Test Cell C Historic District, it is individually eligible under Criterion A for its importance in nuclear rocket testing operations and under Criterion C as one of the best examples of a photographic bunker designed for close-up documentation of nuclear rocket testing. Apart from minor structural decay, the bunker is in excellent condition and retains all seven aspects of integrity to a high degree.

This resource is not eligible under Criterion B, nor does it appear to have special research potential that would make it eligible under Criterion D.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

This is the sole surviving example of three similar camera bunkers at Test Cell C (Figure 59). They are of a Los Alamos design that was already used at Test Cell A. High-speed photography of the tests was done first by EG&G and later by Pan Am. The cameras were arrayed to view the Reactor Pad. Exact focus points could be refined by adjusting the periscope mirrors. The bunker is located slightly to the northeast of the Reactor Pad, so it is oriented slightly to the southwest with a line of sight at 10 degrees east from the pad. It is 700 feet from the Reactor Pad. It is located in a spot that was often downwind of the tests, which made it essential to have extensive radiation barriers to protect the vulnerable camera films. For ease of description, it is regarded as oriented on the cardinal directions. The exterior of the bunker has three components: the Periscope Gallery, Entry Shed, and Berm.

The **Periscope Gallery** is a one-story, rectangular-plan, wood-framed building with a corrugated-metal shed roof. It is constructed on the concrete top of the subsurface Camera Gallery. The lower halves of all walls are plywood and the upper halves are corrugated metal applied horizontally with the framing on the exterior. Five camera bays are located along the south elevation. These bays contain a total of nine camera periscopes (Figures 60 and 61). When not in use, the bays could be closed with drop-down plywood doors. An additional plywood end door provided maintenance access to the portion of the gallery behind the periscopes. Caged incandescent lights are spaced along the gallery for nighttime maintenance if needed. The periscopes vary slightly in size, but all are in the form of truncated aluminum pyramids that are open on the south sides. An adjustable angled mirror was located inside each periscope, and some mirrors are still in place. Directly below the mirror is the circular metal-lined shaft leading down through the thick concrete roof of the bunker proper to a camera that was positioned below in the Camera Gallery. The inner roof of the gallery is half-inch sheet lead covered by 2.5 feet of earth in bins beneath the outer shed roof. There are wall studs on the exterior walls of this part of the building to resist the outward pressure of this fill.

A **Berm** of local sediments approximately six feet tall covers the portions of the subsurface bunker that are not excavated below the surrounding grade. This Berm slopes outward in all directions from the Periscope Gallery and Entry Shed because it has no retaining walls.

The **Entry Shed** is at the rear of the bunker, providing an access point facing directly away from the Reactor Pad. It is of plywood on 2x6 framing, originally painted white. Plywood extending belowground was covered with tar paper. The wooden door has fallen off. It has a flat roof over a small wooden entry landing. The roof then follows the stairs downward. Roofing above grade is no longer present, but is in good condition below ground level. The stairs are made of 2x12s. Roof rafters are 3x8 and subsurface framing material is 4x8. Interiors are painted white. Lighting is by caged incandescent surface-mount fixtures.

Subsurface Hallway: Upon reaching the bottom of the stairs, a hallway turns right, and then left again for a short distance, before entering the Camera Gallery. Electrical panels are mounted to plywood panels attached to the short west wall of the Hallway.

Camera Gallery: The Hallway enters near the west end of the Camera Gallery. The Gallery is made of concrete poured into steel gabion forms, which were left in place. The floor and ceiling are concrete. The walls are two feet thick and the ceiling is a four-foot-thick concrete slab. The room is dominated by a row of metal stanchions with camera mounts under each port, which each lead through the ceiling to an associated periscope. A remote camera operating console was made by EG&G. It has a USAF/NRDS property label. This area is lit by a row of incandescent overhead lights. Most are installed bare, but one has a white enamel reflector. The room is also equipped with a wall phone and electrical outlets. Its interior dimensions are 7 by 40 feet, whereas the concrete roof is 10 feet, 6 inches by 43 feet.

8. References

List references used to research and evaluate the individual property.

Drawings at end of form

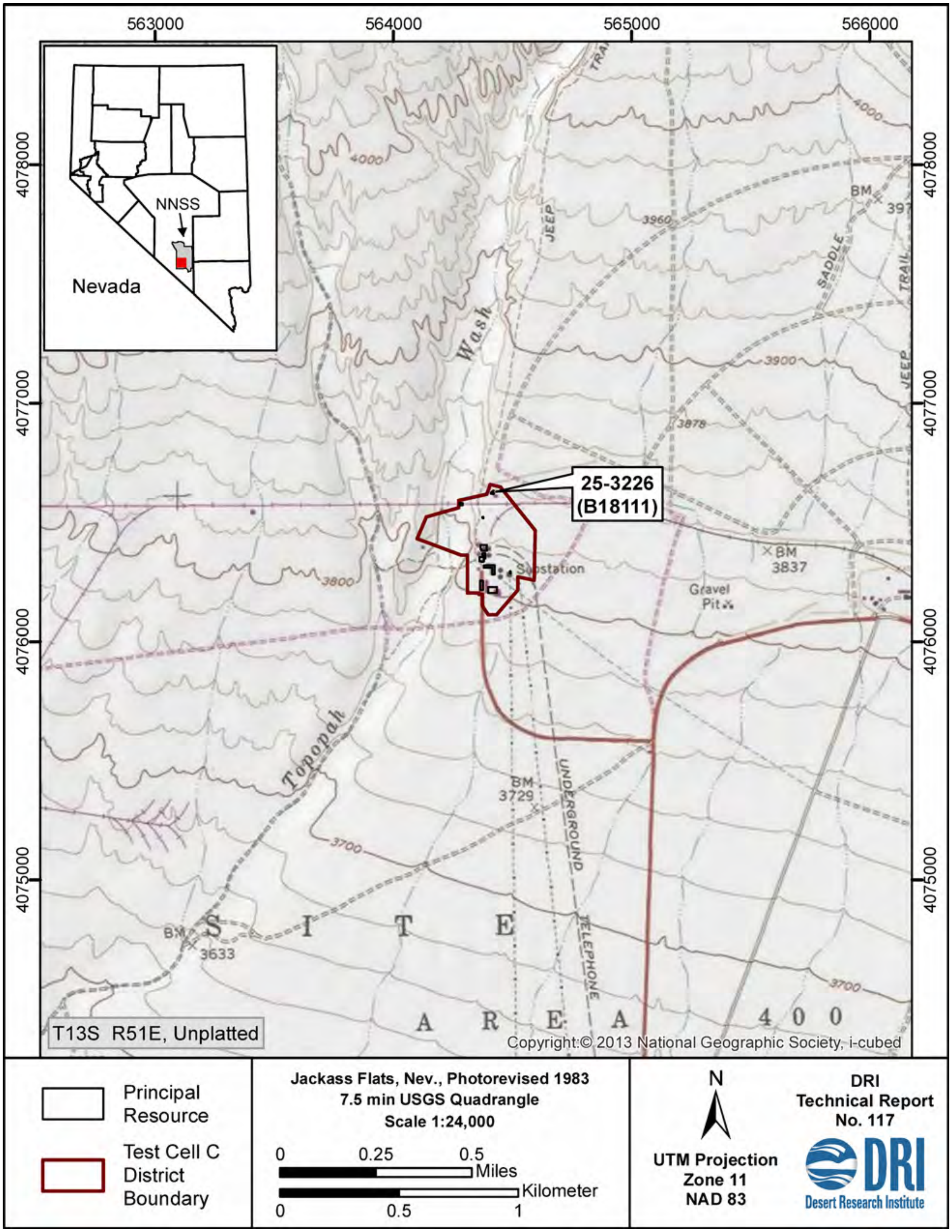
Los Alamos National Laboratory (LANL)
1962 Test Cell “C” Camera Bunkers. Drawing No. J6-SK:JA 246. Los Alamos National Laboratory, Los Alamos.

1963 Test Cell “C” Camera Bunkers Site Plan and Profiles. Drawing No. J6;SK:JA 289B. Los Alamos National Laboratory, Los Alamos.

Engineering drawings are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

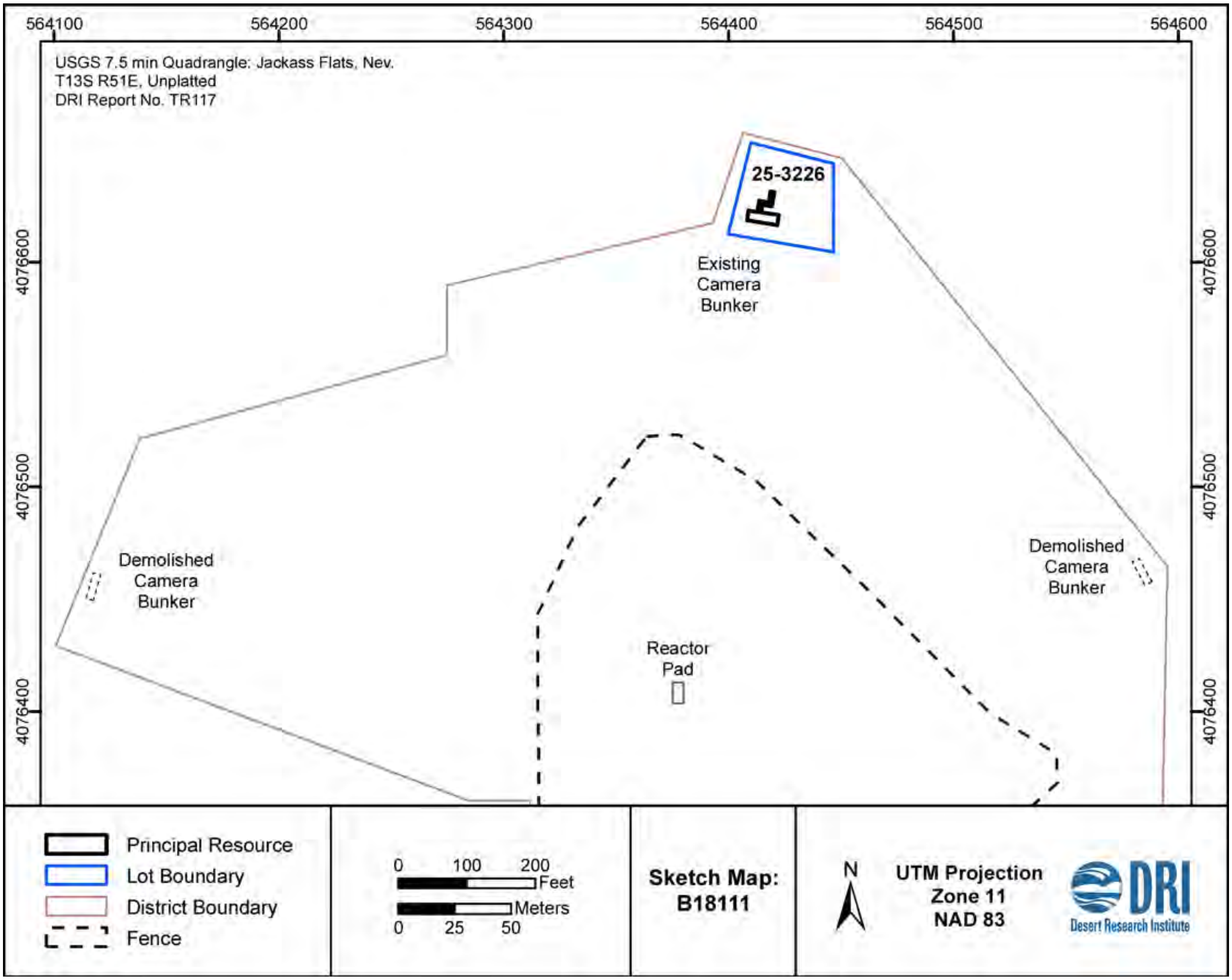
9. Area Location Map

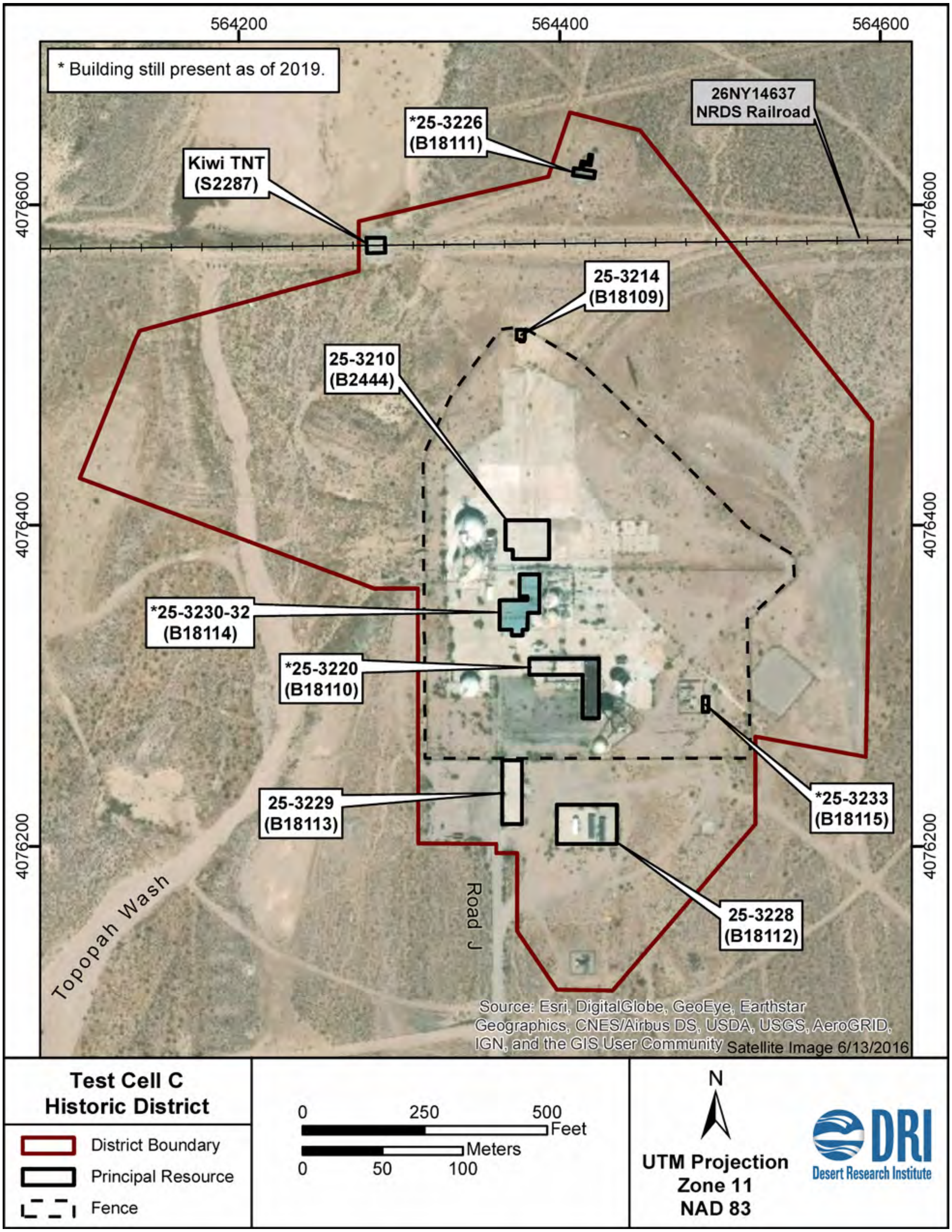
Use a USGS quadrangle map at large extent to show general area of resource.

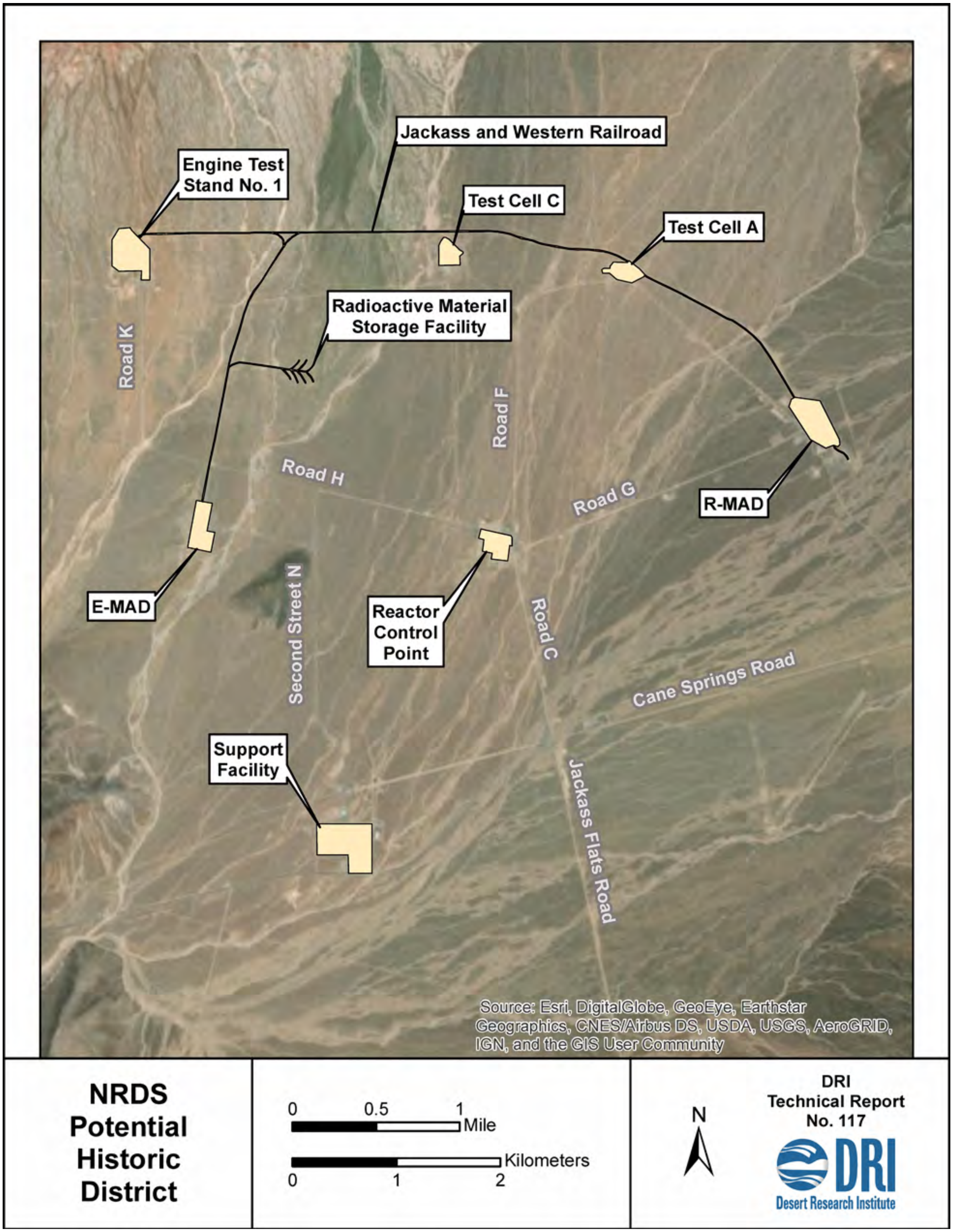


10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
25-3229
(B18113)
*25-3233
(B18115)
25-3228
(B18112)
Road J
Topopah Wash
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
DRI
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
DRI
Desert Research Institute

11. **Photographs**

Include as many photographs as needed to accurately depict the resource.

Elevation: West/South Direction facing: Northeast Photographer: DRI, Photo 202 Date: 2019
Overview of the North Camera Bunker with the bank of Topopah Wash in the foreground. To simplify descriptions, the Camera Station is regarded as facing due south. In fact, it is oriented slightly to the west of south. Test Cell C is off the image to the right.

Elevation: South Direction facing: North Photographer: DRI, Photo 114 Date: 2019

A 2005 image from Google Earth showing the North, West, and East Camera Bunker locations. The eastern bunker has been removed, but the associated ground disturbance is still visible.

Detail of western periscope bay, facing north (DRI, Photo 154, 2019).

View along upper periscope gallery, facing west (DRI, Photo 1066, 2019).

Detail of periscope from outside building with mirror in place (DRI, Photo 158, 2019).

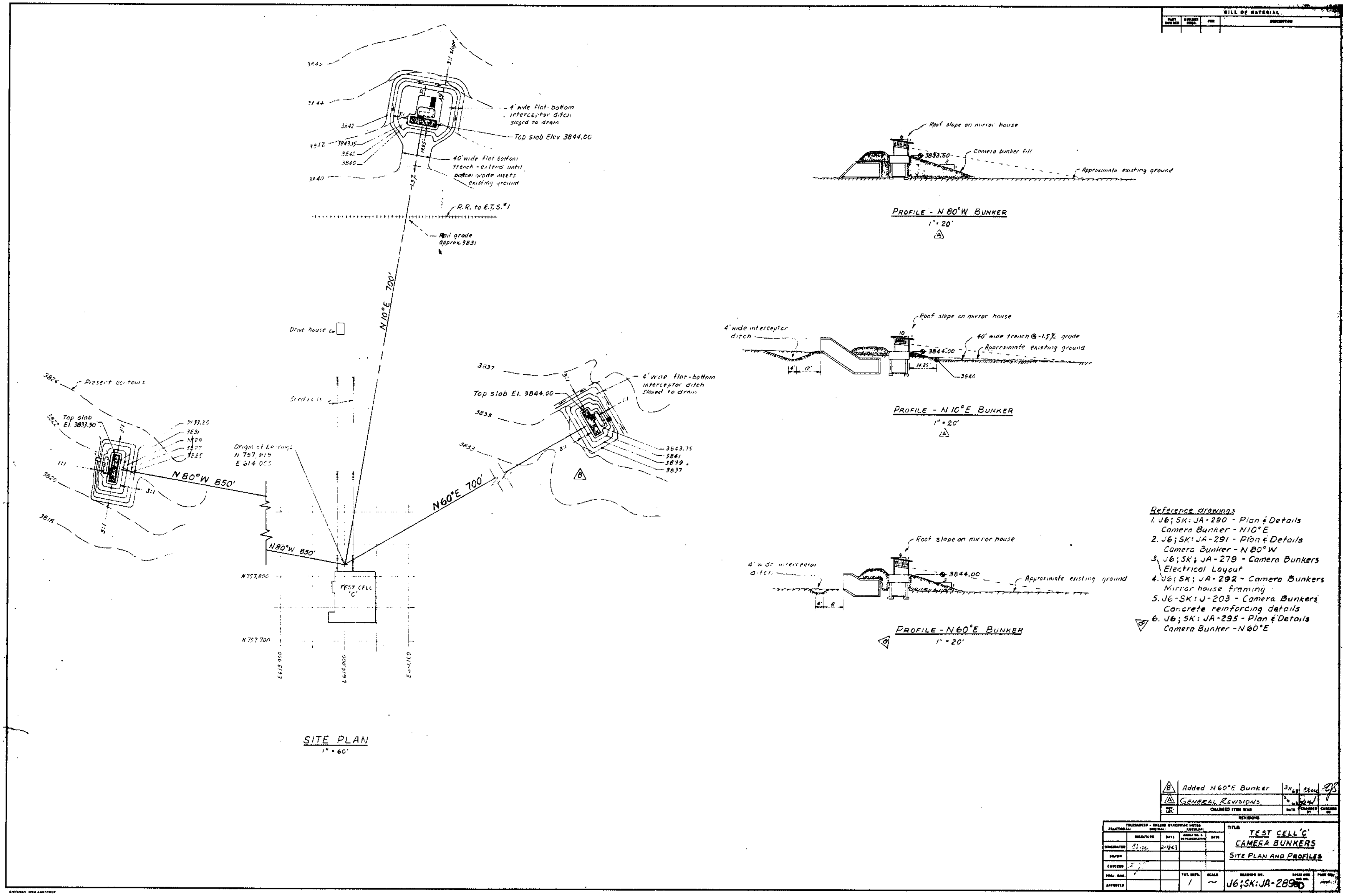
East elevation, facing west (DRI, Photo 120, 2019).

Entry, facing northeast (DRI, Photo 140, 2019).

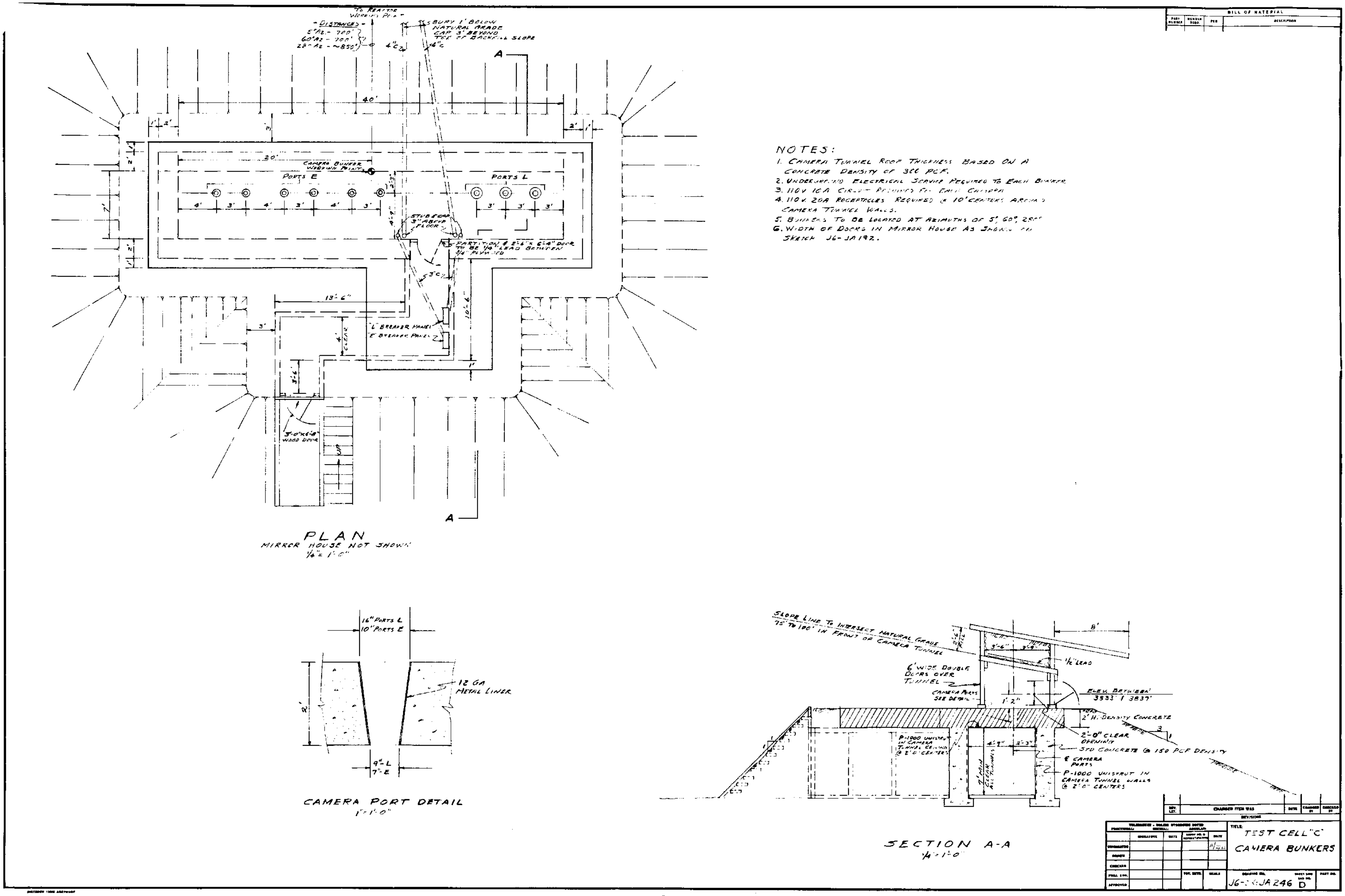
Entry, facing southeast (DRI, Photo 134, 2019).

Oblique view of periscope poles, note viewing ports in ceiling by each pole, facing southeast (DRI, Photo 1096, 2019).

View from doorway of the control cabinet, facing south-southeast (DRI, Photo 1019, 2019).



Site plan and profiles for the Camera Bunkers (LANL 1963). The notes indicate the eastern bunker was added to the original design. Based on the location of the ground disturbance, it appears to have been placed closer to N80°E rather than the N60°E noted in the drawing.



Early engineering plan for a camera bunker (LANL 1962).

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N	Date:			
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)			
City, Zip	N/A			
County	Nye			
Assessor's Parcel #	N/A	Subdivision Name	Nuclear Rocket Development Station (NRDS)	
UTM Location (NAD 83, UTM Zone 11 North)		Easting: 564415	Northing: 4076215	
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒ / Multiple ☐
Should the property's location be kept confidential?		Yes ☐	No ☒	

3. Architectural Information

Construction Date	1966
Architectural Style	None
Architectural Type	Warehouse
Roof Form	Gable
Roof Materials	Metal
Exterior Wall Materials	Metal
Foundation Materials	Concrete
Window Materials	Unknown
Window Type	Unknown
Accessory Resources?	Yes ☒ No ☐
	Number?: 4

Condition of Resource(s)?		
Good ☐	Fair ☐	Poor ☒
Explanation: Building demolished, only foundation remains.		

(Insert primary photograph below.)

Foundation with recent trailers, facing northeast (DRI, Photo 12, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: / NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: / Date listed:	NRIS #:

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
		If so, is this resource contributing?		Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☐	Criterion B ☐	Criterion C ☐	Criterion D ☐		
	Not Eligible ☒	Unevaluated ☐				
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine					
Period(s) of Significance	1966-1972					
Integrity – Does the resource possess integrity in all or some of the 7 aspects?						
Location ☒	Design ☐	Materials ☐	Workmanship ☐	Setting ☒	Feeling ☒	Association ☒
General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s): c.1998		
Threats to Resource:	Demolition					
Historic Name	Maintenance/Warehouse					
Current/Common Name	Same					
Historic/Original Owner	U.S. Atomic Energy Commission					
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)					
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030					
Historic Building Use	Warehouse, Maintenance Support, Los Alamos Office, Pan Am Office					
Current Building Use	Trailer Parking					
Architect/Engineer/Designer	Los Alamos Scientific Laboratory					
Builder/Contractor	Unknown					

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

Demolition of the warehouse and the relatively minor nature of its associated resources precludes individual eligibility. The resource does contribute to the Test Cell C Historic District.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

This is the concrete foundation and floor slab on a low cut-and-fill terrace for a building that housed a variety of support facilities (Figure 62 and 63). The original northern portion is nearly square in plan. It was occupied mainly by the Maintenance and Supply facility, but it also housed the EG&G Bench Lab. A full-width addition, with its floor approximately one foot lower than the rest, is on the east side of the original building. Concrete steps and stoops also remain. It is surrounded by a gravel parking area. It is located south of the fenced Test Cell C compound and is accessed via Road J immediately to the west.

The original 80-foot-square, one-story metal building had a very low-pitch gable roof. A row of vents was mounted on the ridgeline. The south façade was symmetrical with an 8/4 awning window and a flush door with one light for each corner office and two surface-mounted sliding bay doors. These major openings in the building were oriented to face away from the Reactor Pad. As originally designed in 1964, the warehouse contained large interior Los Alamos warehouse spaces, as well as two offices (one dedicated to Los Alamos), a Pan Am Electrical Shop, Pan Am Store Room, and a Change Room. It is likely the building was constructed in 1965. Later, this part of the building contained an office and the EG&G Bench Lab. The Los Alamos warehouse was later moved into the addition.

The building was removed prior to 1998. Presently, three vacant office trailers dating to the decontamination and demolition period of the early 2000s are stored on the slabs.

8. References

List references used to research and evaluate the individual property.

Historic photographs and engineering drawings at end of form:

Los Alamos Scientific Laboratory (LASL)

1964 Shops and Warehouse Bldg. No 3228 Plan and Sections. Drawing No. J6-SK: J-221, File 121110. University of California, Los Alamos.

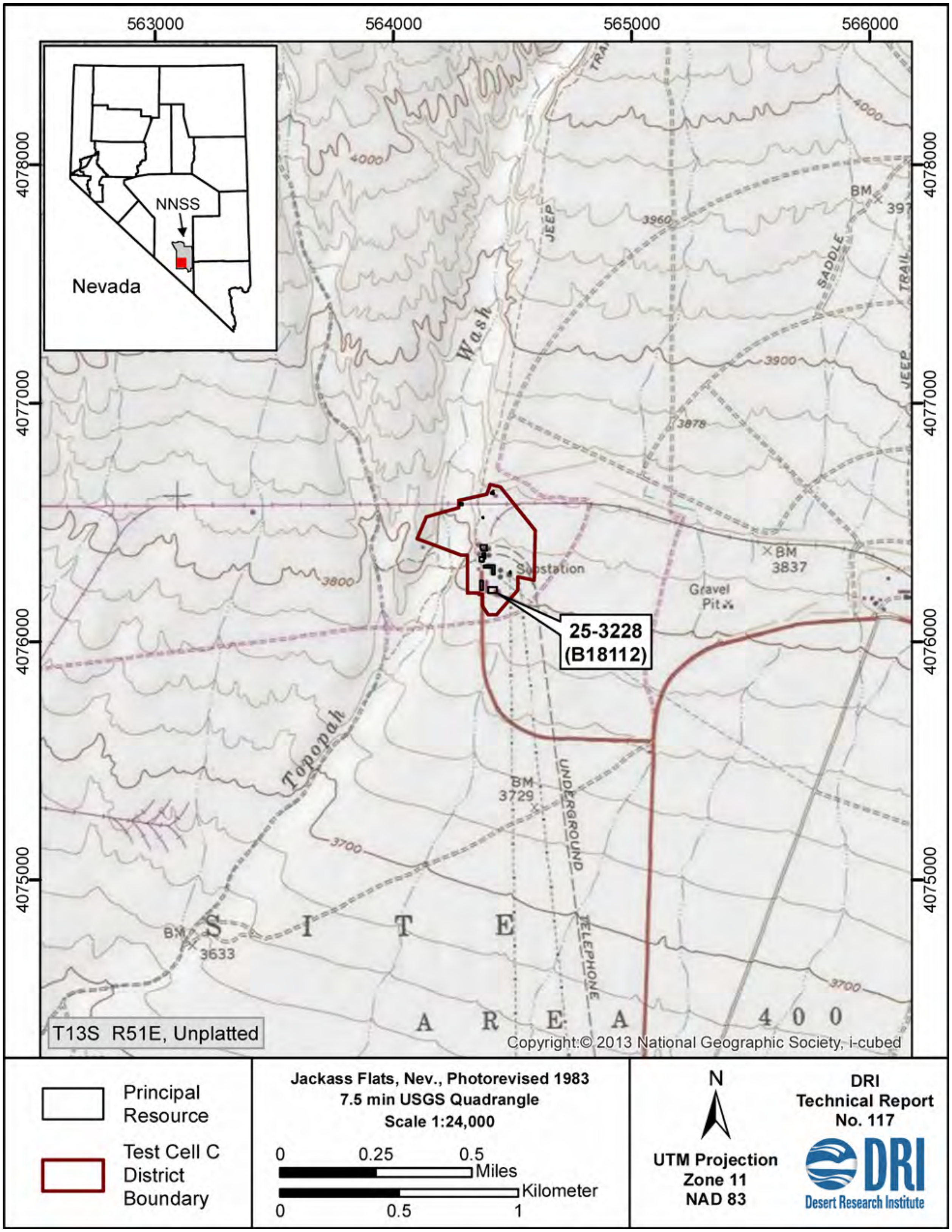
1966 Test Cell “C” Layout. Drawing No. SK-125, Revised 1972, File 108269. University of California, Los Alamos.

Engineering drawings are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

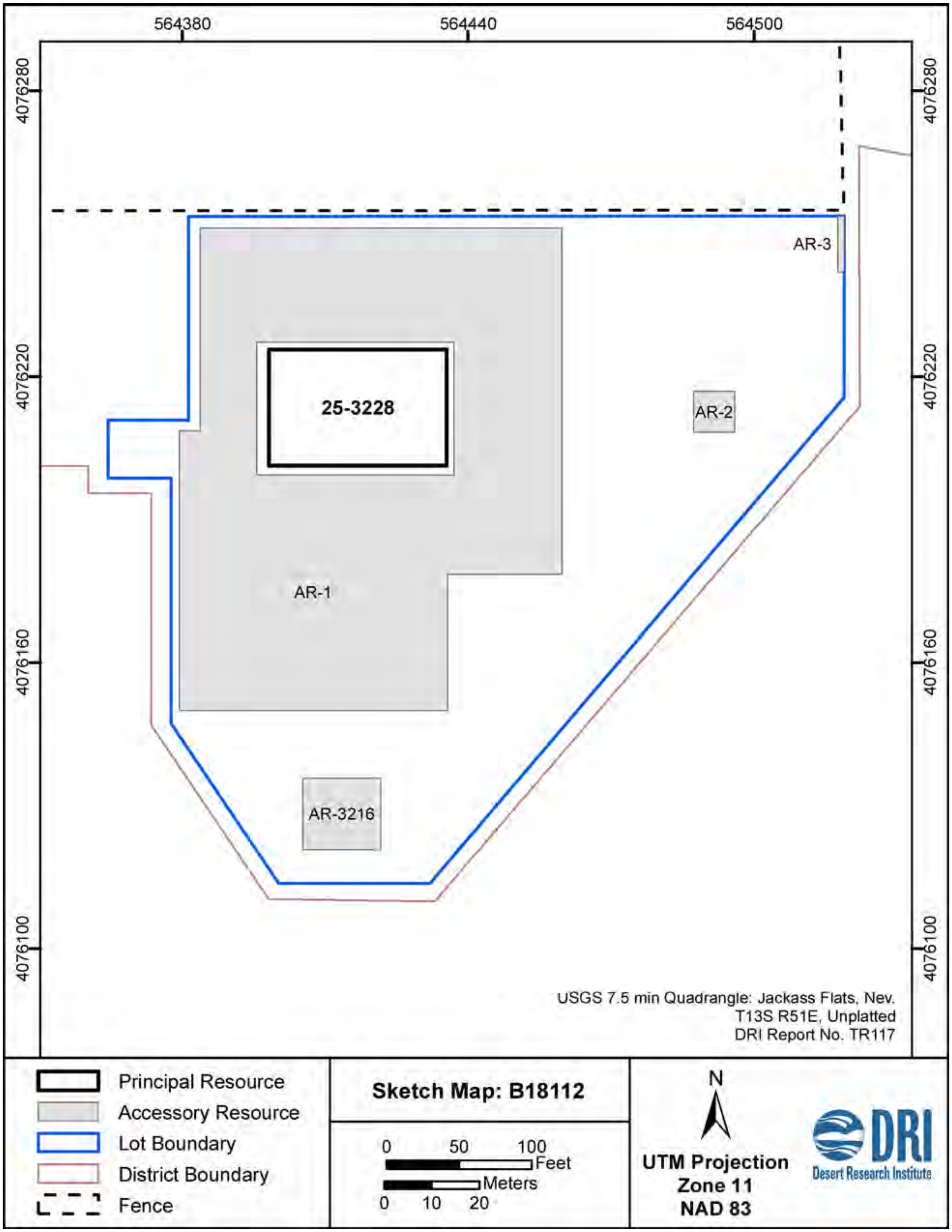
9. Area Location Map

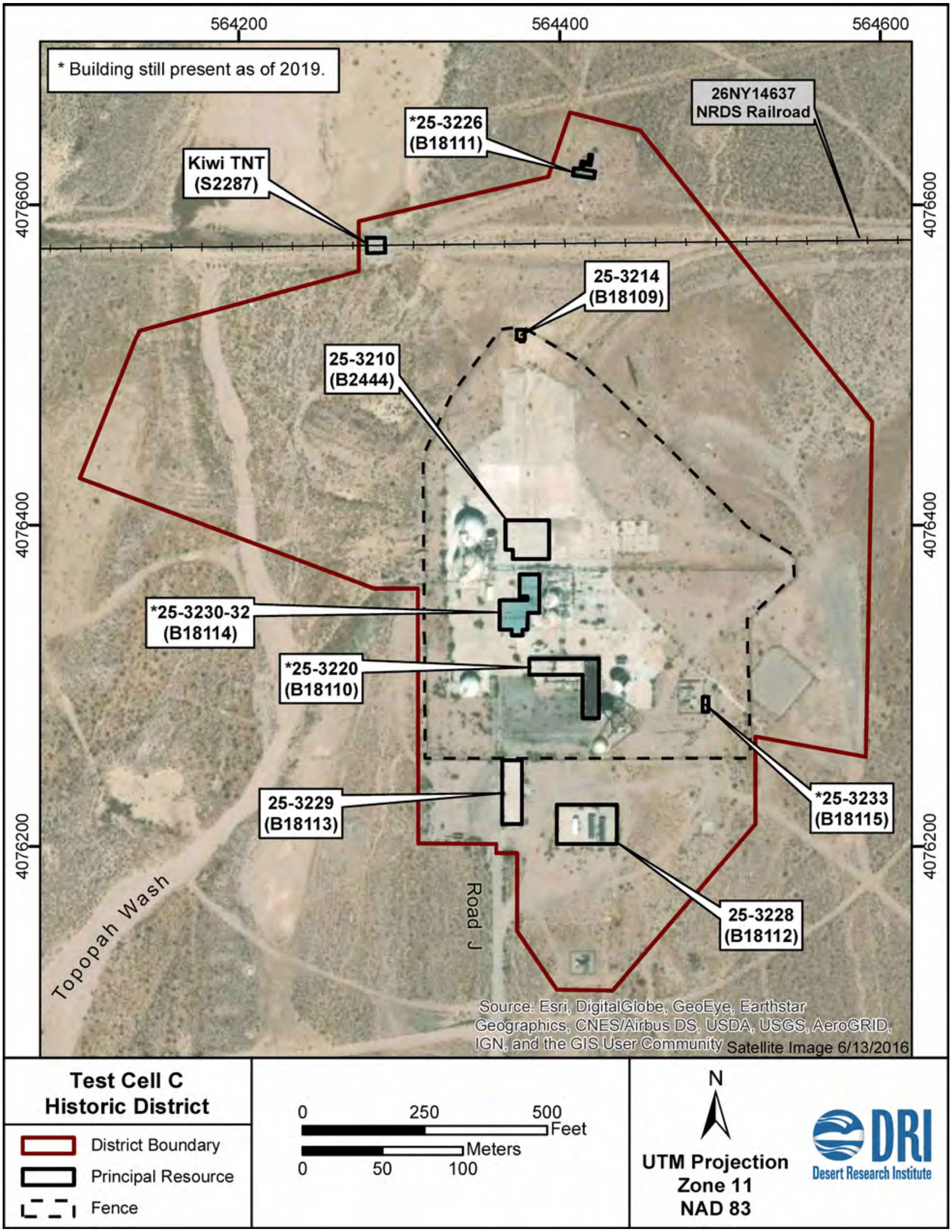
Use a USGS quadrangle map at large extent to show general area of resource.

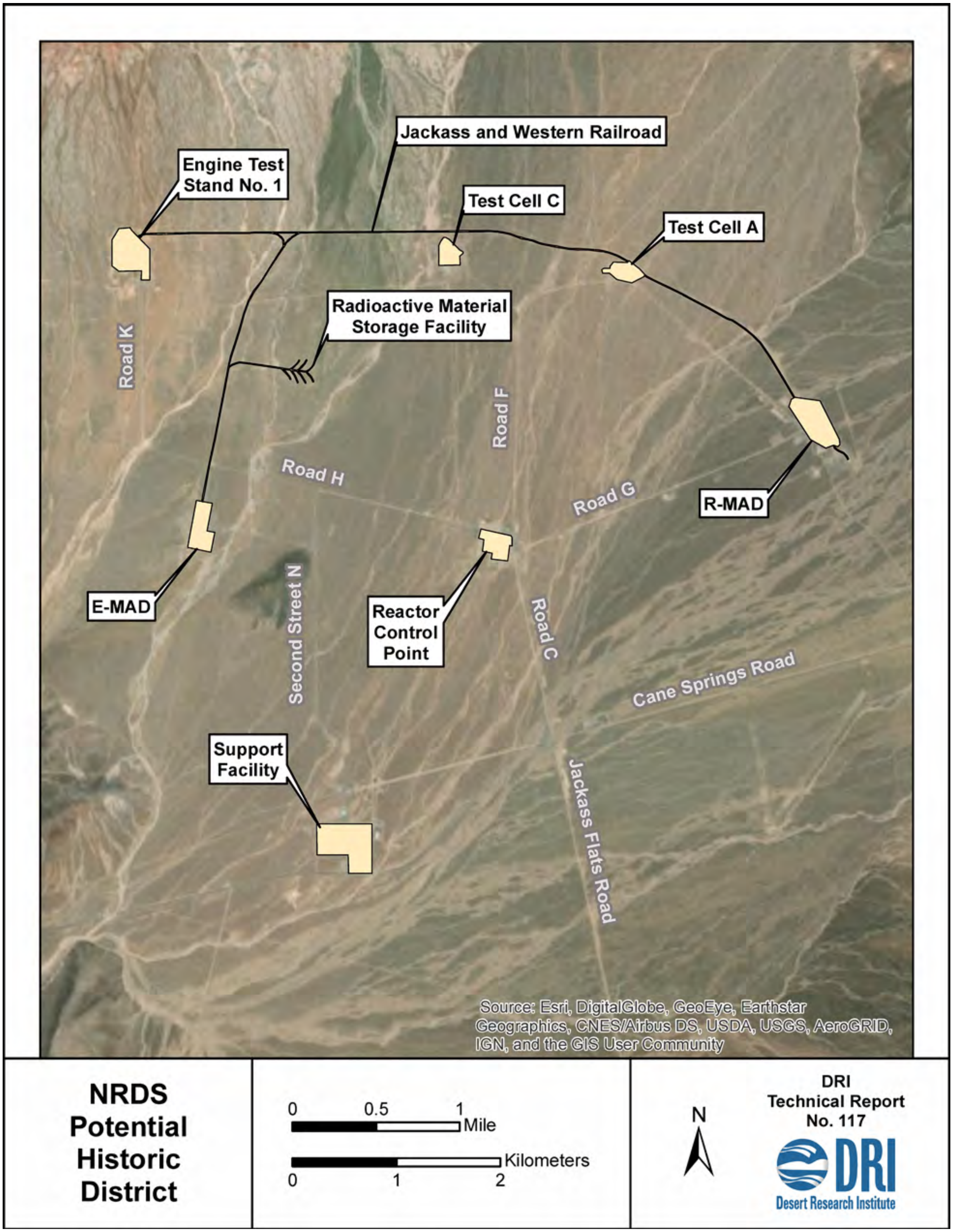


10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
25-3229
(B18113)
*25-3233
(B18115)
25-3228
(B18112)
Topopah Wash
Road J
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
DRI
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
DRI
Desert Research Institute

11. Photographs

Include as many photographs as needed to accurately depict the resource.

Elevation: North Direction facing: South Photo source: RSL Date: c. 1967

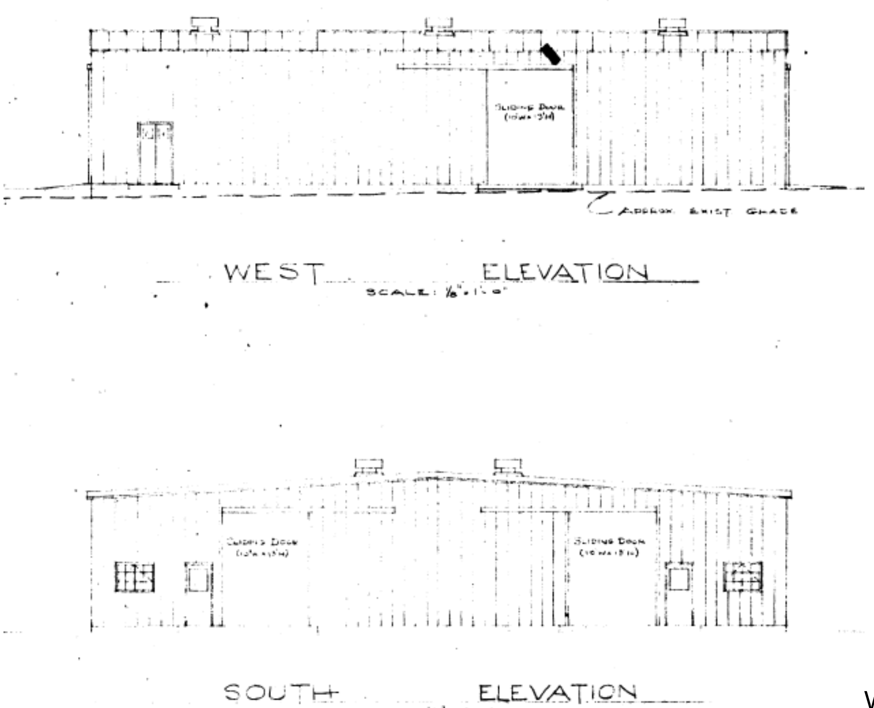
Elevation: North/West Direction facing: South-southeast Photo source: RSL Date: c. 1967

Warehouse 25-3228 is at left, Operations Building 25-3229 is at center, with Guard Hut and Main Gate to right of the center building on Road J, facing south. The Southwest Parking Lot is at right. (Detail from RSL, Test Cell C12 Overview, c. 1967)

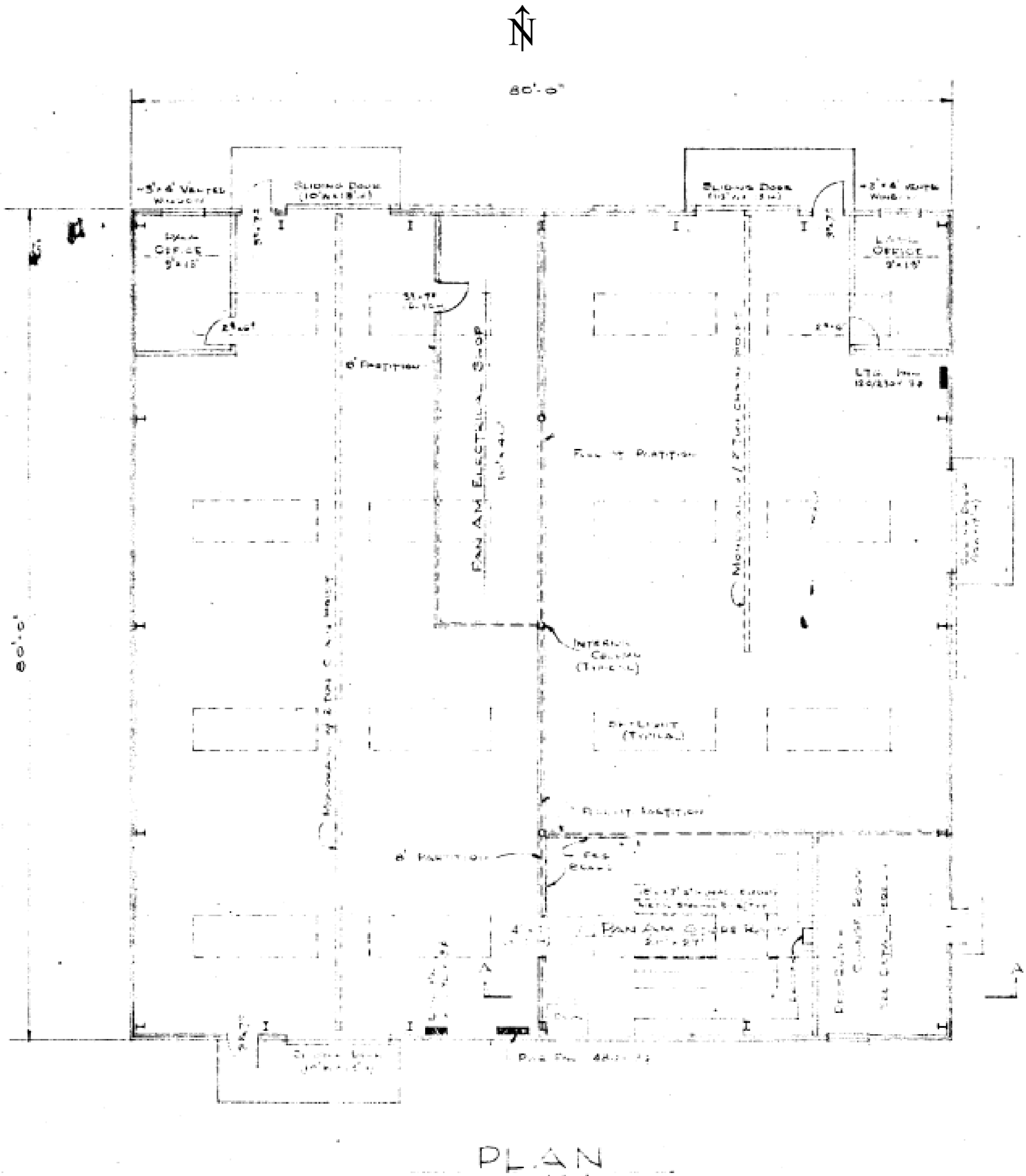
Warehouse 25-3228 is at left, with Substation 5 in the background. Operations Building 25-3229 at right, facing south-southeast. (Detail from RSL, Test Cell C13 Overview, c. 1967)

Warehouse 25-3228 foundation, facing northwest (Photo 4, left) and northeast (Photo 12, right) (DRI 2019).

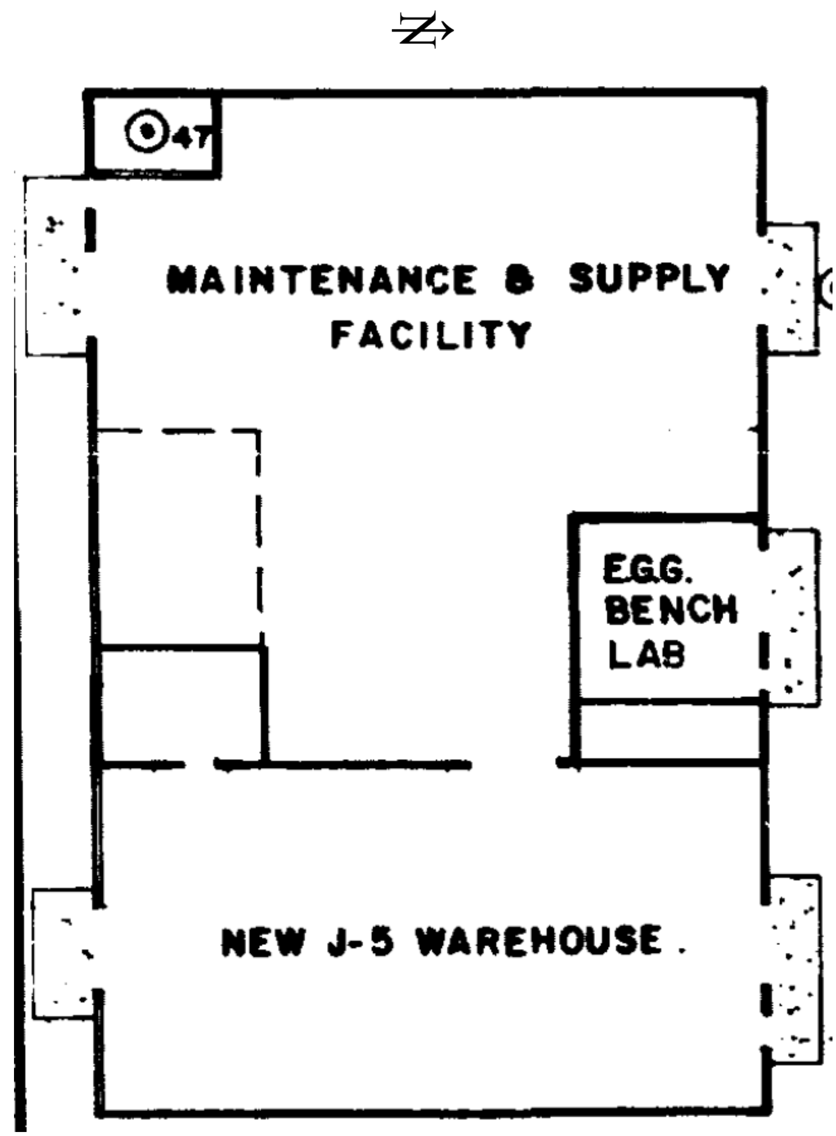
Warehouse 25-3228 foundation, facing southeast (Photo 14, left) and southeast corner, facing southwest (Photo 10, right) (DRI 2019).



Warehouse elevations (Detail from LASL 1964).



Warehouse Plan (Detail from LASL 1964, best available copy).



Modified Warehouse Plan (Detail from LASL 1966 [Rev 1972]).

12. Accessory Resources
Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3216: Substation #5**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564410		Northing: 4076130	

AR-3216, facing southeast. Fence of Southern Parking Area is visible in foreground (DRI, Photo 15, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Southern Fence and Parking Area**			
Construction Date	**1960-1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564400		Northing: 4076180	

AR-1, facing south (Photo 20, left) and facing east (Photo 105, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-2: Radiography Compound (foundation only)**			
Construction Date	**1961-1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564490		Northing: 4076210	

AR-2, facing west (DRI, Photo 64, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3: Southeastern Fence**			
Construction Date	**1961-1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564518		Northing: 4076245	

AR-2, facing north (DRI, Photo 66, 2019).

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A		Subdivision Name	Nuclear Rocket Development Station (NRDS)	
UTM Location (NAD 83, UTM Zone 11 North)			Easting: 564370	Northing: 4076235	
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?			Yes ☐	No ☒	

3. Architectural Information

Construction Date	1966	
Architectural Style	None	
Architectural Type	Other	
Roof Form	Flat	
Roof Materials	Unknown	
Exterior Wall Materials	Concrete Block	
Foundation Materials	Concrete	
Window Materials	Unknown	
Window Type	Sliding	
Accessory Resources?	Yes ☒	No ☐
	Number?: 2	

Condition of Resource(s)?		
Good ☐	Fair ☐	Poor ☒
Explanation: Building demolished -- only foundation remains. Guard Shack removed from AR-1.		

(Insert primary photograph below.)

Operations Building foundation, facing southwest (DRI, Photo 22, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed:
				NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name:	NRIS #:
				Date listed:	

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
			If so, is this resource contributing?	Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☐	Criterion B ☐	Criterion C ☐	Criterion D ☐
	Not Eligible ☒	Unevaluated ☐		

Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine
Period(s) of Significance	1966-1972

Integrity – Does the resource possess integrity in all or some of the 7 aspects?

Location ☒	Design ☐	Materials ☐	Workmanship ☐	Setting ☒	Feeling ☒	Association ☒

General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s): c.2005

Threats to Resource:	Demolition
Historic Name	Operations Building
Current/Common Name	Same
Historic/Original Owner	U.S. Atomic Energy Commission
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030
Historic Building Use	Test Cell C Administration
Current Building Use	None. Cargo containers stored on parking lot.
Architect/Engineer/Designer	Bryant, Jehle & Associates Architects & Engineers, El Centro, California
Builder/Contractor	Unknown

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

Demolition of the Operations Building and the relatively minor nature of its associated resources preclude individual eligibility. The resource does contribute to the Test Cell C Historic District. Even if the building were still standing, it would be individually eligible at most at the local level. Although designed by the architectural firm of Bryant, Jehle & Associates Architects & Engineers of El Centro, California, it was not one of their more creative designs. In fact, the interior arrangement of central hallway with offices along both sides and service areas in the center is exactly the same as that of the very first wooden dormitories built on the NNSS. The similarity is so complete that even placement of all four doorways is exactly that of the Letter Dormitories in Mercury (Reno et al. 2018).

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

This is the foundation and concrete floor slab for the principal administrative building at Test Cell C. Its long axis faced Road J to the west, with parking (AR-21) on the other side of the road. This resulted in an orientation on the fall line. The surrounding ground here is not terraced, so the uphill (north) floor level is barely aboveground and the downhill end forms an impressive plinth. The concrete block foundation rises six courses, which is emphasized by double concrete steps on the centerline. The building is surrounded by a concrete sidewalk interspersed with concrete stoops. A concrete drain parallel to Road J starts in the southwest corner of the building. Decayed asphalt driveways are on all sides of the building. The Test Cell C Perimeter Fence abuts the north end of the building, which is adjacent to the Main Gate, allowing entry from the building directly into the fenced compound.

This was a 40-by-134-foot, rectangular-plan, one-story concrete block building with a flat roof. Continuous metal awnings protected windows along the east and west elevations, both of which were composed of five approximately 13-foot-wide modules on each side of a narrow central module separated by block pilasters. Typically, each module had a centered three-light sliding window. The south end had one-light double doors at the top of the centered staircase. The north end also had a double door, but it was protected by a block shield wall and a flat roof. A typical window was at each side of the north entrance. These windows were equipped with lead shutters.

The building was arranged as a row of rooms on each side of a full-length central corridor. A shorter corridor branched off to access the central western entrance that faced the main parking lot. In addition to doorways at each end of the main corridor, there was an off-center door at the rear (east elevation). It was designed in 1966 by Bryant, Jehle & Associates Architects & Engineers based in El Centro, California, and construction was completed at least by early 1967. Aerial photos indicate the building was demolished between 2005 and 2006.

Accessory Resources

AR-1, Southwest Parking Lot: This is the principal formal parking lot for the Operations Building. Its asphalt paving is now very decayed. A concrete surface drain is at the south end. Three cargo containers are now stored on the lot. The Guard Shack, which no longer exists, was located at the northeast corner of the lot. The north end of the Parking Lot is bordered by the Perimeter Fence. It was probably completed in 1967.

AR-2, Main Entrance Road (Road J): Access to Test Cell C from the NRDS Control Point and all outside areas is by taking Road F northward toward Test Cell A and the R-MAD facility. Road J turns off Road F first to the west, and then north to reach Test Cell C. This is a 24-foot-wide asphalt road with a generally raised bed and center striping. It is still in good condition. The road passes the Operations Building (AR-3229) and ends at the Main Gate. The road was built in 1960.

8. References

List references used to research and evaluate the individual property.

Reno, Ron, Cheryl Collins, and Maureen King
2018 *Evaluation of 1950s-Era Architectural Resources in Blocks 10, 11, and 17, Mercury, Area 23, Nevada National Security Site, Nye County, Nevada.* DRI Report No. SR070918-1, DOE/NV/0003590-20, Desert Research Institute, Las Vegas.

Historic photographs and engineering drawings at end of form:

Bryant, Jehle & Assoc.
1966 Operations Building 3229, Test Cell "C" Floor Plan, Elevations and Schedules. Drawing No. 3229-S-1, Revised As-Built 1967, File 107511. Space Nuclear Propulsion Office – Nevada Extension.

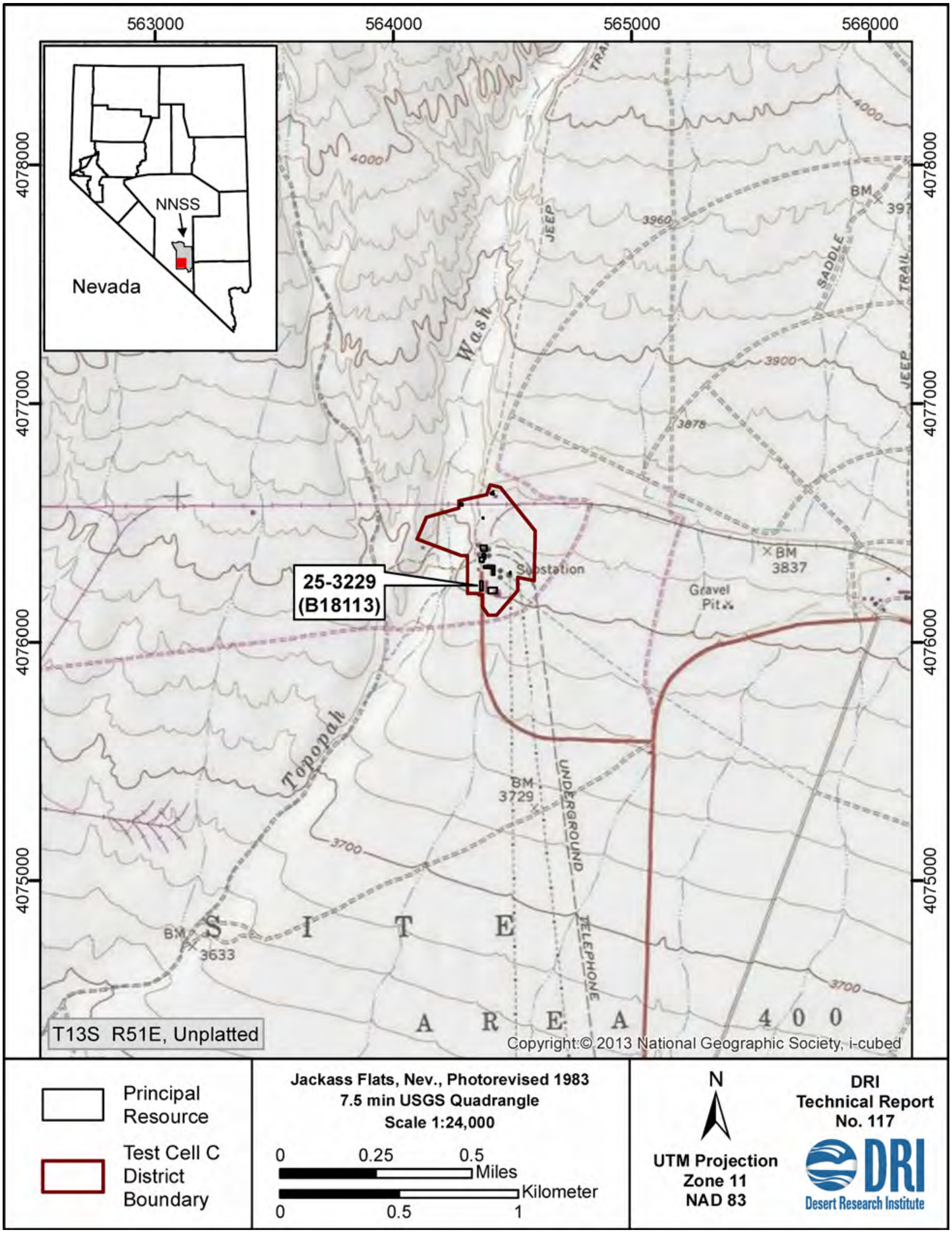
Los Alamos Scientific Laboratory (LASL)
1966 Test Cell "C" Layout. Drawing No. SK-125, Revised 1972, File 108269. University of California, Los Alamos.

Engineering drawings are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

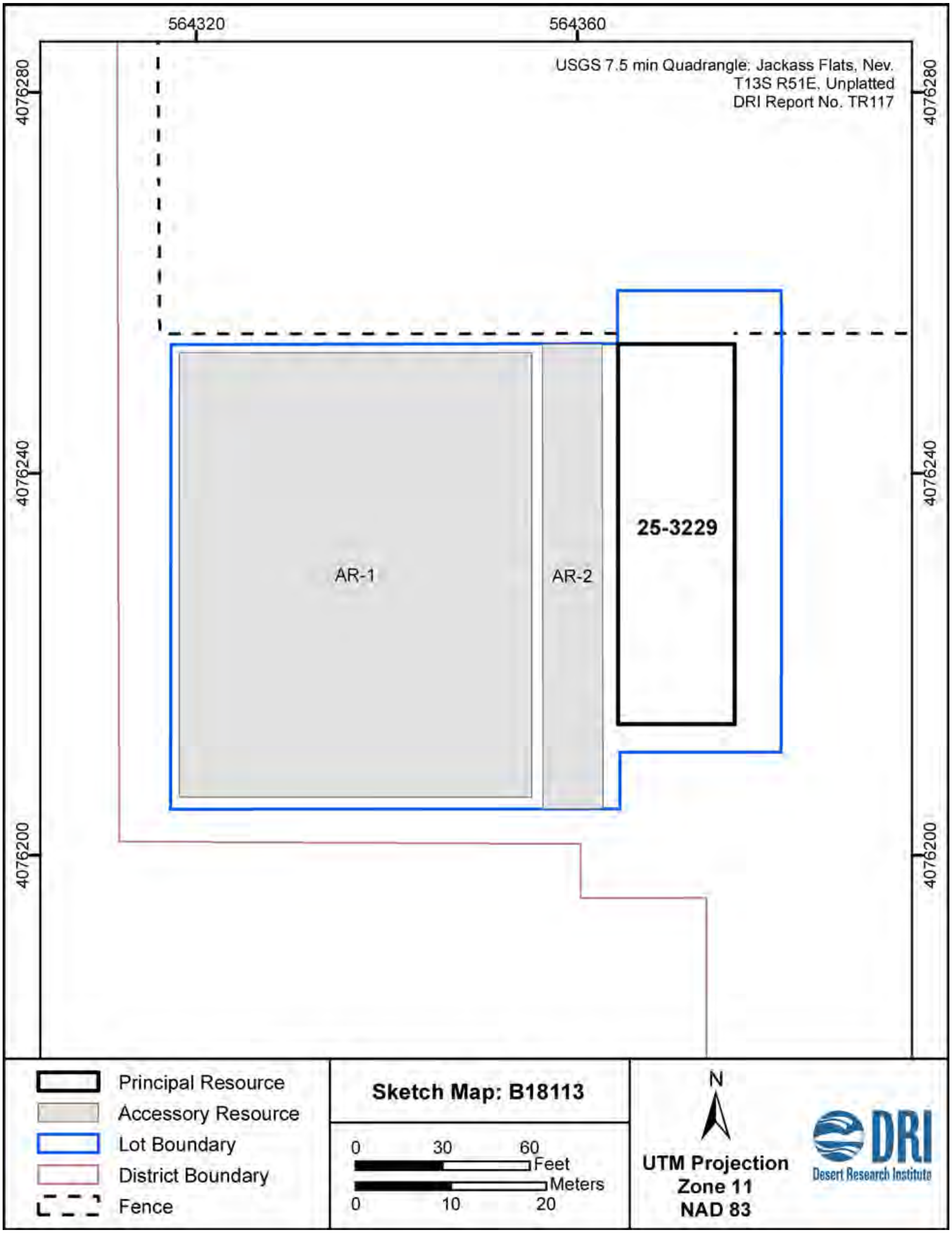
Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

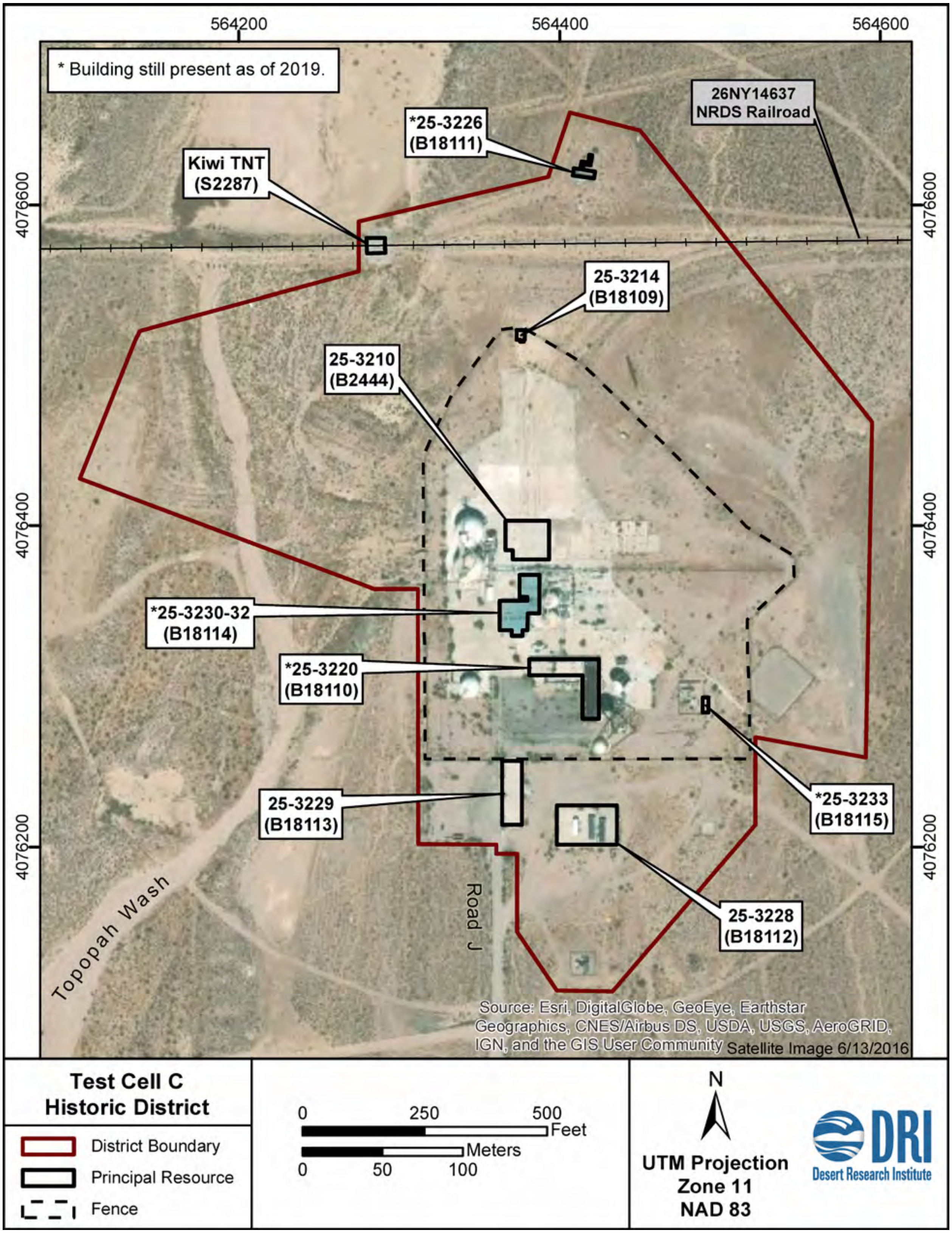
9. Area Location Map

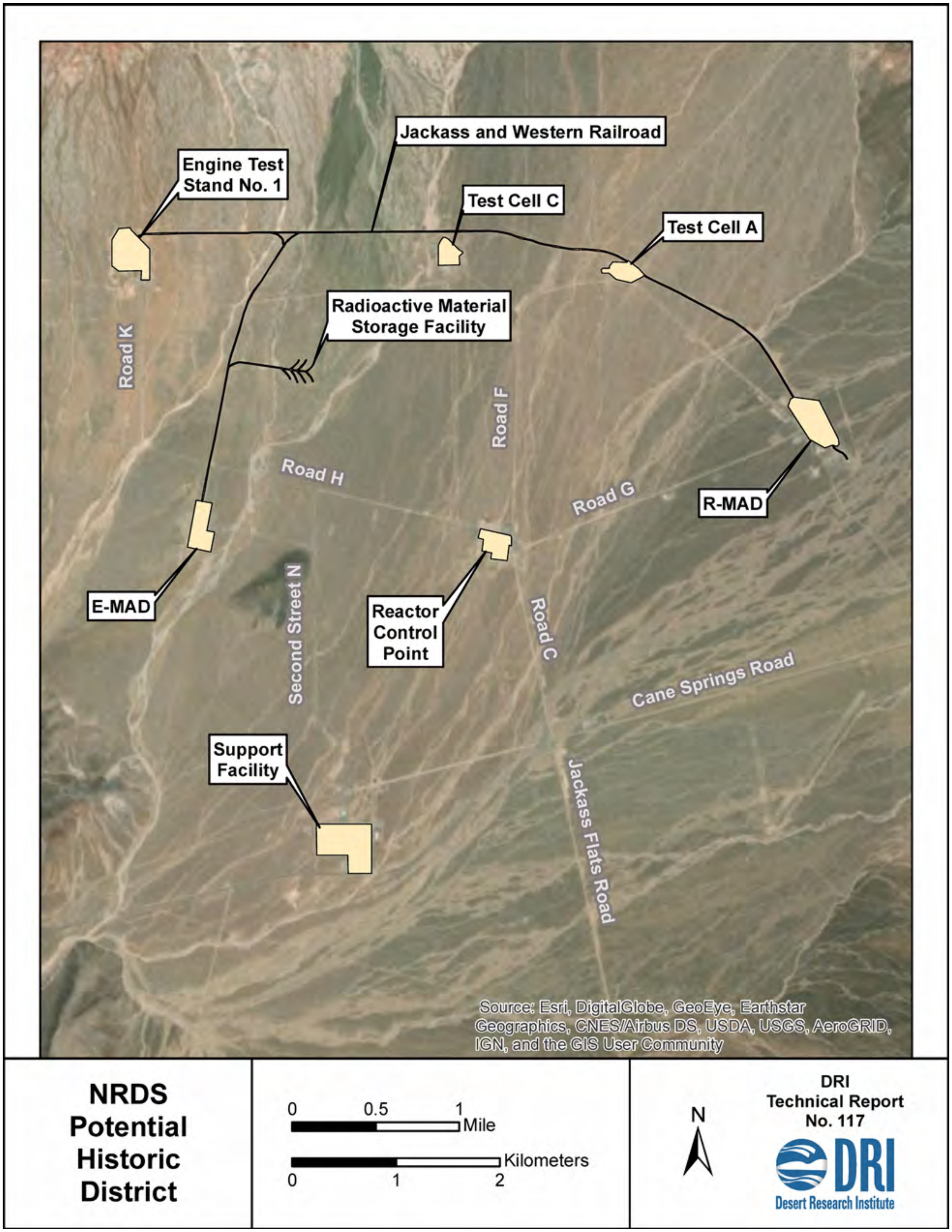
Use a USGS quadrangle map at large extent to show general area of resource.



10. Site Plan Map




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
*25-3233
(B18115)
25-3229
(B18113)
25-3228
(B18112)
Road J
Topopah Wash
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
Desert Research Institute

11. Photographs

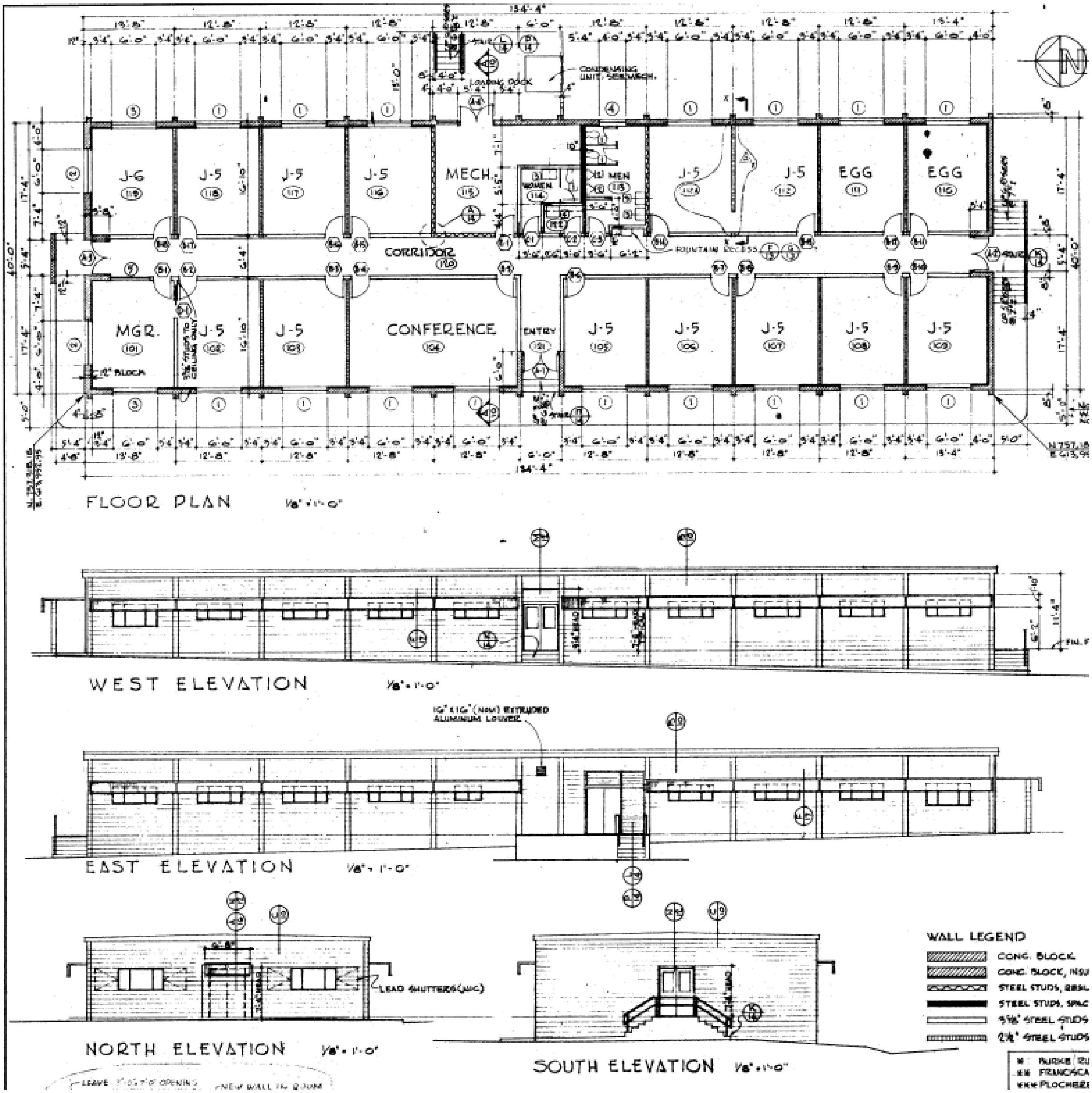
Include as many photographs as needed to accurately depict the resource.

Elevation: North Direction facing: South Photo source: RSL Date: c. 1967

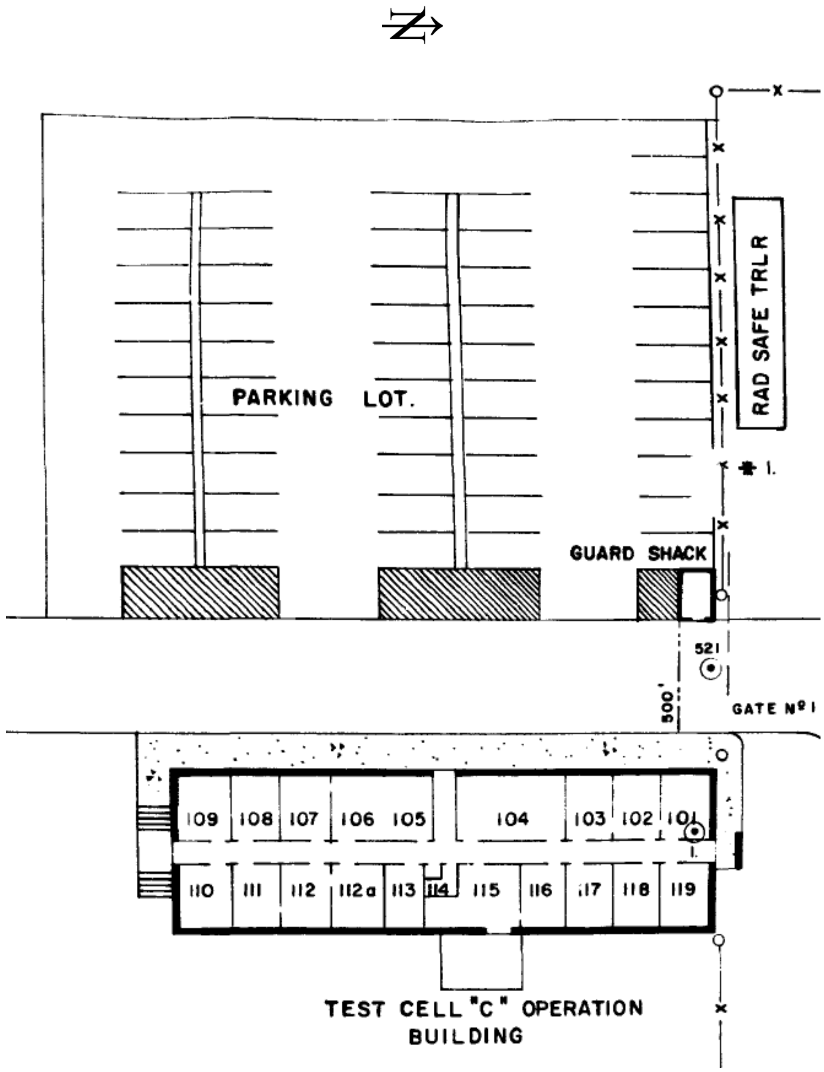
Elevation: North/West Direction facing: South-southeast Photo source: RSL Date: c. 1967

Warehouse 25-3228 is at left, Operations Building 25-3229 is at center, with Guard Hut and Main Gate to right of the center building on Road J, facing south. The Southwest Parking Lot is at right. (Detail from RSL, Test Cell C12 Overview, c. 1967)

Warehouse 25-3228 is at left, with Substation 5 in the background. Operations Building 25-3229 at right, facing south-southeast. (Detail from RSL, Test Cell C13 Overview, c. 1967)



Operations Building 25-3229 plan and elevations (Detail from Bryant, Jehle & Assoc. 1966 [Rev. 1967]).



Operations Building 25-3229 plan and surroundings (Detail from LASL 1966 [Rev 1972]).


TCC Operations Building foundation, facing southwest (Photo 22, left), and southeast (Photo 28, right) (DRI 2019).


Operations Building foundation, facing northeast (Photo 30, left), and northwest (Photo 34, right) (DRI 2019).

12. Accessory Resources

Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Southwest Parking Lot**			
Construction Date	**1966-1967**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564340		Northing: 4076230	

AR-1, facing northwest (Photo 40, left) and southeast (Photo 42, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-2: Main Entrance Road (Road J)**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564360		Northing: 4076230	

AR-2, facing north (DRI, Photo 38, 2019).

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NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A		Subdivision Name	Nuclear Rocket Development Station (NRDS)	
UTM Location (NAD 83, UTM Zone 11 North)			Easting: 564380	Northing: 4076350	
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?			Yes ☐	No ☒	

3. Architectural Information

Construction Date	1960-61	
Architectural Style	None	
Architectural Type	Prefabricated	
Roof Form	Gabled	
Roof Materials	Steel	
Exterior Wall Materials	Steel	
Foundation Materials	Concrete	
Window Materials	None	
Window Type	None	
Accessory Resources?	Yes ☒	No ☐
	Number?: 9	

Condition of Resource(s)?		
Good ☐	Fair ☒	Poor ☐
Explanation: Building envelopes in good condition, but much machinery and most Accessory Resources have been removed or demolished.		

(Insert primary photograph below.)

Detail from an aerial view, facing south, c.1967 (Photo source: RSL). Horizontal dewars at left have been removed.

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed: NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name: Date listed:	NRIS #:

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
		If so, is this resource contributing?		Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☐			
	Not Eligible ☐	Unevaluated ☐					
Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine						
Period(s) of Significance	1960-1972						
Integrity – Does the resource possess integrity in all or some of the 7 aspects?							
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒	
General Integrity:	Intact ☐	Altered ☒	Moved ☐	Date(s):post-2005			
Threats to Resource:	Demolition, Structural Decay, Equipment Removal						
Historic Name	Motor Drive Building/Cryogenic Pump Room/Cryogenic Evaluation Lab						
Current/Common Name	Same						
Historic/Original Owner	U.S. Atomic Energy Commission						
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)						
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030						
Historic Building Use	Cryogenic gas distribution, storage, and analysis.						
Current Building Use	None.						
Architect/Engineer/Designer	Air Products, Inc., Allentown, Penn.						
Builder/Contractor	Prefabricated by INLAND to Stran Steel specifications.						

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

With demolition of Building 25-3210, the Cryogenics (Cryo) Building is now the premier building in the Test Cell C Historic District. In addition to contributing to the District, it is individually eligible under Criteria A and C. The building is completely mission related and typifies construction related to the development of the nuclear rocket under Criterion A.

Although the exterior of the building is, for the most part, a simple prefabricated structure, its interior held several key components of the test complex, all of which are represented by the foundations and remaining equipment inside the three major modules. The Motor Drive Building has foundations indicating the tremendous size and power of the motor needed to drive the turbopump for liquid nitrogen and also has a large generator. The Cryo Pump Room has shielded concrete construction, indicating the dangerous and powerful forces being handled there. It also retains a sample of the elaborate piping and part of the pump drive assembly. Rocketdyne had to create new turbopumps capable of providing such large amounts of liquid hydrogen to the engine. The pumps in the Cryo Pump Building were all of entirely new design. Finally, the Cryogenic Evaluation Lab building retains an abundance of internal piping, although other interior equipment has been removed.

The two large spherical dewars (AR-3213) contribute heavily to this significance. They are imposing structures even though they suffer from comparison with their immense neighbors. These dewars are also the original liquid hydrogen storage facility for Test Cell C.

This resource is not eligible under Criterion B, nor does it appear to have special research potential that would make it eligible under Criterion D.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

This complex building was devoted mainly to conveying and monitoring cryogenic gasses, principally LH2 from storage dewars (double-skinned insulated containers) to Building 25-3210 just to the north for use at the Reactor Pad. It is still standing and consists of three linked rectangular-plan buildings that were all constructed at the same time. Although they are combined into one building, they are sufficiently distinctive in design and function, and therefore are described here under their separate facilities numbers. Together, they create a complex plan. At the center is the smallest element, the concrete (Cryo Pump Room (25-3231). Adjoining it to the west is the much larger Motor Drive Building (25-3230) and to the north is the Cryo Evaluation Lab Building (25-3232). Both of the latter steel buildings incorporate the concrete walls of the Pump Room into their own walls.

Following removal of Building 25-3210, this building now dominates the central portion of the Test Cell C complex. A large concrete apron extends to the west and southwest of the building. A narrow paved alley separates it from Building 25-3220 to the south. The space between it and Building 25-3210 to the north is full of pipes. Immediately to the east is a gas storage area, which includes most Accessory Resources associated with this building. These are dominated by two large spherical liquid nitrogen dewars. Other dewars and equipment in this area have been removed, but their former locations are marked by distinctive foundations.

This building and its large dewars were a prominent part of the first phase of construction at Test Cell C from 1960 to 1961.

Although the three buildings are linked to form a common building, it is convenient to record them separately since they are constructed as if they are in fact three separate buildings.

25-3230, Motor Drive Building

This is a one-story, 56-by-60-foot, rectangular-plan, prefabricated, galvanized corrugated steel building on a concrete foundation and floor. It has a low-pitch corrugated galvanized end-gable steel roof with six large mushroom vents along the ridgeline. There is also a large offset rectangular vent. The drive shaft from the large motor in this building extends directly into the Pump Room.

Specifications for construction required it to be built by Stran-Steel Corporation of Detroit or by another company adhering to Stran-Steel's standards. Because the similar Cryo Evaluation Lab was built by INLAND, it is almost certain that INLAND prefabricated the Motor Drive Building as well.

The front of the building faces west. It has a central, overhead, steel, rolled bay door flanked on each side by translucent green fiberglass panels. At each corner below the fiberglass is a louvered vent where filtered air was brought into the building. These vents have been sealed and the filters removed, their function taken over by the south filter plenum. A four-light steel panel door is to the right of the bay door. Electrical boxes and sweeps are at the left corner of the building.

The south side was originally designed with a continuous band of fiberglass panels along the top third of the wall. Some of these were replaced with metal siding when the metal Filter Room was constructed. Although this room looks like an addition, it was built at the same time as the rest of the building. The entire south wall of this 253-square-foot-shed addition is composed of a louvered metal vent. Entry is via a two-light flush steel door.

The north side had the same fiberglass panel arrangement, but all have been removed and replaced with corrugated aluminum siding. A four-light steel panel door is in the northwest corner. It and the front door have an incandescent light over the top of the doors. Electrical sweeps are attached to this wall.

The south half of the east wall has the typical band of fiberglass panels and an identical door and light arrangement in the southeast corner. The door has concrete steps. The north half of the wall is formed by the concrete west wall of the Pump Room.

The interior of the building is a single large room. All walls have abundant attached piping and control boxes. All metal walls and the roof have aluminum foil/fiberglass insulation, except for the translucent panels and aluminum replacement panels. Roof insulation is kept in place by means of chicken wire. Vents have been added to the south wall adjacent to the addition. The western vents are blocked on the inside.

The northeast corner of the building is occupied by a double concrete pit, approximately seven feet deep, beneath the foundations for the massive pump motor, which has been removed. Kingbolts for the motor remain attached to the concrete. The drive shaft is still in place where it penetrates the concrete wall of the Pump Room, which has two shielded windows. The drive shaft passes through a generator prior to entering the wall.

The center of the room is dominated by a 1750 kw, 5,000 amp Allis-Chalmers (Milwaukee) DC generator. A large maintenance cellar is located under this piece of equipment.

At the south end of the room is a bank of GE electrical cabinets.

The shed addition contains two large blowers. The entire interior of the south wall is covered with frames for air filters. In effect, the entire addition comprises a filter plenum.

25-3231, Cryo Pump Room

This is a 24-by-34-foot, rectangular-plan, one-story, unpainted concrete building with a low-pitch side-gable roof. Its west and north walls are incorporated into the walls of the Motor Drive Building and the Cryo Evaluation Lab. It was built on-site at the same time as the other two prefabricated buildings. Operations within this building were clearly hazardous. Protection for workers and equipment in the adjoining buildings was provided by the concrete walls of the Pump Room, penetrated only by shielded windows through the common walls.

The principal façade faces south. It has a steel panel personnel door with four lights and large flush steel double doors. Electrical conduit is attached to the outside of the wall. The left corner is attached to the Motor Drive Building with a wide galvanized metal flashing over the joint.

The southern portion of the west elevation can only be viewed from inside the Motor Drive Building. It has the pass-through for the pump drive shaft flanked by shielded, fixed, one-light windows with steel frames. The upper part of this wall is nearly covered by attached piping. Below the windows are a number of electrical boxes. The northern portion of the west elevation is visible between the Cryo Evaluation Lab and the Motor Drive Building. It also has attached equipment and piping that runs along the wall between the two metal buildings.

The north wall can only be seen from inside the Cryo Evaluation Lab. This wall also has a shielded window and is penetrated by several pipes.

The east wall is entirely obscured from the south by the maze of piping between this building and Dewars 4 and 5 (AR-3213 of 25-3210). The drive shaft continues straight through the Pump Room to penetrate this wall. A shielded window is near each corner.

The roof is of corrugated galvanized steel with flush gable ends covered with flashing and narrow eaves. It has a large mushroom vent. A raised steel platform with pipe rails has been erected on the roof.

Interior walls are unpainted concrete with many attached pipes, conduit, and boxes. The interior ceiling is the underside of the metal roofing with exposed galvanized steel rafters. There are many suspended pipes. A control cabinet and a manifold for a multitude of small stainless steel tubes are also present in the building. A 1.5-ton monorail crane with a curved track is over the drive shaft. The pump has been removed, although the concrete foundation remains in place.

In addition to the explosive hazard posed by the liquid hydrogen in this enclosed space, there was the danger of suffocation if the building was entered while the pipes were being filled with inert gas to purge them of LH2. A placard on the personnel door warns, “DO NOT OPEN ROOM SEALED FOR INERTING.”

25-3232, Cryogenic Evaluation Lab

This is a one-story, 42-by-42-foot, square-plan prefabricated galvanized corrugated steel building on a concrete foundation and floor. It has a low-pitch corrugated galvanized steel end-gable roof with five large mushroom vents along the ridgeline, which is supplemented with additional mushroom vents near each of the four roof corners.

Structurally, this building is nearly identical to the Motor Drive Building, which was prefabricated at the same time by INLAND. It is the northernmost of the three linked buildings. Although only a single-story, the walls rise to a height equivalent to two stories, allowing abundant overhead space for structures supporting a maze of interior piping. The original design included ribbons of translucent fiberglass panels high on all the walls, similar to those installed on the Motor Drive Building. The building was prefabricated with these panels, but upon installation, it was decided to omit them all. The openings are covered with metal sheets that do not quite match those of the rest of the building. From the inside, there is no trace of the sheets because they are covered by the spray-on insulation that is over all metal interior surfaces.

The front elevation, which faces to the west, has central flush double steel bay doors. A four-light steel panel personnel door is near the southwest corner. An INLAND manufacturer's logo is attached to the end of the ridgeline.

The north side of the building is largely obscured by piping in a steel framework, including the large-diameter horizontal flue of the Hydrogen Flare System. Prior to its demolition, the primary Test Cell C building (25-3210) stood immediately north of this framework. Many of the pipes connected the two buildings.

The lower half of the rear (east) elevation is also largely obscured by piping and by a liquid hydrogen dewar (AR-3213 of 25-3210) and its access staircase.

The lower portion of the south wall is concrete, which incorporates the north wall of the Cryo Pump Room. A shielded window opens into the Pump Room, and many pipes run through the wall between the two buildings. From the outside, only a small portion of the western end of this wall is visible in its entirety, including an additional shielded window. The metal upper portion of the wall is visible above the roof of the Cryo Pump Room.

The interior is illuminated by suspended incandescent lights. Six parallel pipes for water and gasses are attached to all walls except the west wall. The building is equipped with a two-ton bridge crane.

The north wall has valves spaced in the pipelines for six workstations, which have been removed. The south wall had an additional ten workstations. A large rotary dial phone is mounted next to the southwest entry.

A large amount of stainless steel piping for liquid hydrogen and equipped with accordion expansion joints occupies much of the floor space in the south half of the building. Piping continues upward in this area on an array of steel supports and cable trays. Labels identify various gasses within pipelines, including liquid hydrogen, nitrogen, and helium. Throughout the building, instrumentation and associated cables have been removed.

Accessory Resources

AR-3213, LH2 Dewars 4 and 5: Installed in 1960, these were the primary liquid hydrogen dewars prior to 1965. They are spherical and supported by steel frameworks on hexagonal concrete foundations. A steel access stair is to the north of the dewars, which are connected at the top by a steel bridge. A cryogenic line leads from between the two dewars west into the adjacent Cryo Pump Room (25-3231).

AR-3223, Liquid Nitrogen Dewars 6, 7, and 8 Foundations: This entire area is covered by a concrete slab, which held concrete foundations that supported the ends of each horizontal dewar. All of the tanks have been removed. Stainless steel piping is still in place at the north ends of each dewar's location. Planned in 1964, this set of three cylindrical steel liquid nitrogen dewars was likely installed in 1965 or 1966.

AR-3224, Restroom Foundation: A rectangular concrete slab surrounded by the stub of a concrete block foundation broken off to match the surrounding concrete level. The restroom is divided into two parts by a raised concrete partition that rises approximately one foot above general floor level. Plumbing for three commodes is spaced along the south side of the partition.

This was a rectangular-plan one-story concrete block building that was 14 feet, 6 inches by 17 feet, 4 inches with a flat concrete roof. Wall block was laid stacked with tooled joints for a gridiron shadow effect. Entry was via a flush louvered steel door near the north end of the west façade. At the rear was a heat pump mounted on its own concrete pad and an exhaust fan near the top of the wall in the southeast corner. The concrete divider noted above supported an air plenum and pipe chase. In addition to the three commodes with partitions along the south side of the divider, there were two sinks and two urinals along its north side. Planned in 1965, this building was likely erected in 1966 during the major upgrade of the facility. The restroom was demolished prior to 2009. This

AR-1, Deluge Pit #2: In the event of fire or spillage of hazardous materials, the entire complex could be subjected to a major flow of water by the Deluge System, which was controlled from the Local Control Room in Building 25-3220. The principal areas with deluge protection were liquid hydrogen unloading areas, the hydrogen compressor room in Building 3220, liquid hydrogen dewars, high-pressure hydrogen bottles, the propane storage area, and the Cryo Pump and Test Buildings. Water pipes originate at the bottom of the elevated water tank and continue underground throughout the facility.

The system of valves for the network was distributed in three similar 11-by-25-foot rectangular concrete underground vaults called Deluge Pits, which projected to varying heights. The 7.5-foot interiors hold pipes, many valves, and gauges. Each has an interior ladder formed of individual steel rungs embedded in concrete. All have a rectangular access port near one end and a ventilator and pipe projecting from the top of the opposite end. Adjacent to one end is a smaller rectangular concrete valve box with a metal lid. Pit #2 rises approximately 2.5 feet above grade. The top of the valve box is only a few inches above the surrounding grade, and the top cover is pierced for a large valve handle.

AR-2, Southern LH2 Vaporizer Foundation: Two concrete foundations, approximately eight feet square with small perimeter kingbolts, supported the Vaporizers. The northern one (AR-4) was original and the southern one was added later, perhaps around 1965.

AR-3, Utility Gantry: A variety of gasses had to be transferred from the Compressor Room in Building 25-3220 to the north portion of the facility. Similarly, an abundance of communication lines needed to go in the same direction from the Local Control Room in the same building. This was complicated by a vehicular access route between these two areas. The problem was solved by means of a structural steel gantry that spanned this route behind Building 25-3220. Once past the driveway, the pipes and conduit dropped down to continue north on a series of low concrete piers. The awkward gantry and the barrier of the adjoining pipe runway were installed because it was preferable to locate the piping aboveground wherever possible. In the event of explosive gas leakage, the gas could dissipate until repairs could be made instead of collecting in dangerous concentrations. The Gantry was constructed in 1961.

AR-4, Northern LH2 Vaporizer Foundation: This is comprised of three very decayed concrete pads with kingbolts. The foundation is entirely surrounded by later installations. The Vaporizer was constructed in 1960 or 1961.

AR-5, Concrete Pad: Its purpose and construction date are unknown. The pad is approximately 6 by 16 feet with no fasteners or plumbing.

AR-6, Health Physics Portable Building: This rectangular-plan building is constructed on steel I-beam skids with large shackles at all four corners. It has white textured aluminum panel siding and a very low-pitch shed roof. There is a one-light flush metal door at each end. Continuous ribbons of fixed windows span both sides. In faded stencils the trailer is labeled “HEALTH PHYSICS” and “V TUNNEL.” Site personnel identified the use of this unit as a control building during the remediation work in the 2000s. The interior has drop-panel ceilings and panel walls. Safety equipment is still inside the building, which appears to be fully serviceable. It has DOE property tag #202143. Despite the lack of wheels, this is the kind of building regularly called a “trailer” on the NNSS. It was recorded because, based on its degree of weathering, it could be associated with Cold War projects elsewhere on the site. The construction date very roughly appears to be in the 1970s. It was not placed at the Test Cell C facility until sometime between 2006 and 2011.

8. References

List references used to research and evaluate the individual property.

Historic photographs and engineering drawings at end of form:

Air Products Incorporated

1960a Cryogenic Pump and Test Buildings Plan-Sections-Elevations. Drawing No. 3230-S51.3 (Revised, As-Built 1962), File 107457. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

1960b Cryogenic Pump and Test Building Plan, Elevation and Sections. Drawing No. 3230-M4. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

1960c Liquid Hydrogen Dewars Lighting and Grounding Plan and Sections. Drawing No. 3213-PE2. U.S. Atomic Energy Commission, Las Vegas Branch Office, Las Vegas.

Los Alamos Scientific Laboratory (LASL)

1965 Restroom – Bldg. 3224 Floor Plan, Elevations and Details. Drawing No. J6-SK; J-233, File 116043. University of California, Los Alamos.

Reynolds Electrical & Engineering Co. (REECo)

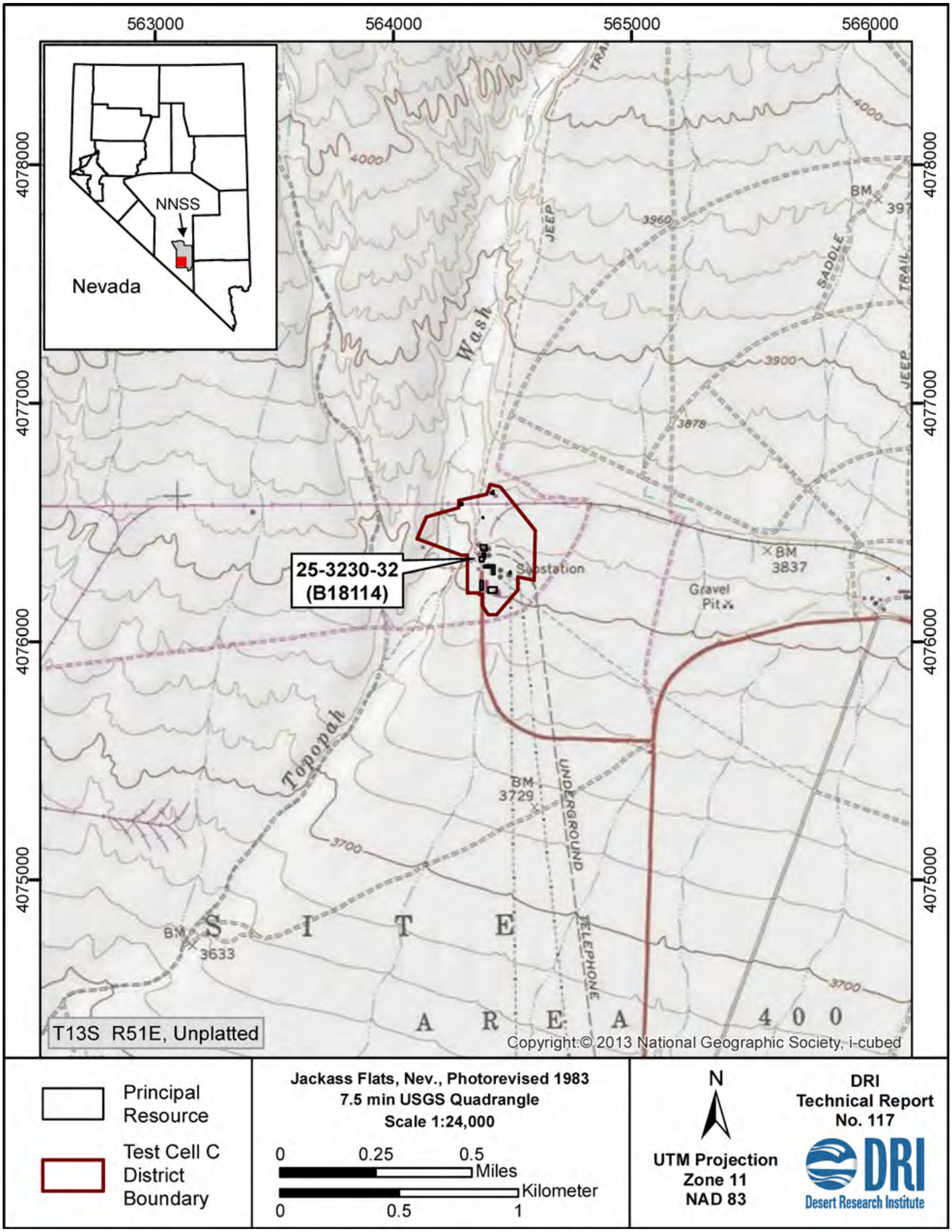
1982 *Photograph Album Index (1958 – 1976)*. Photos and index on file at the Desert Research Institute, Las Vegas.

Engineering drawings and archival maps are on file at the NNSA/NFO North Las Vegas Facility either in digital format or as aperture cards.

Photos credited to RSL are the property of the Remote Sensing Laboratory, Nellis Air Force Base.

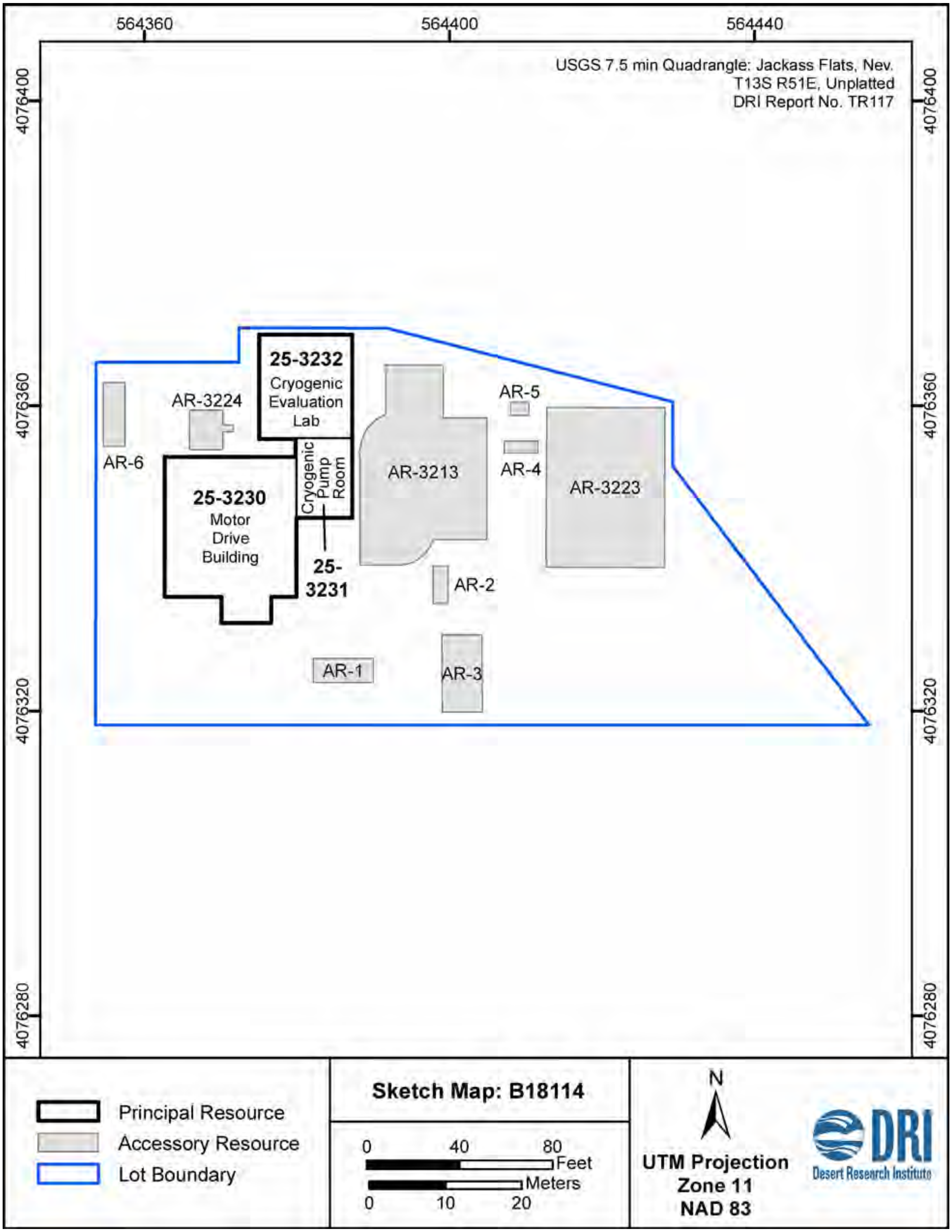
9. Area Location Map

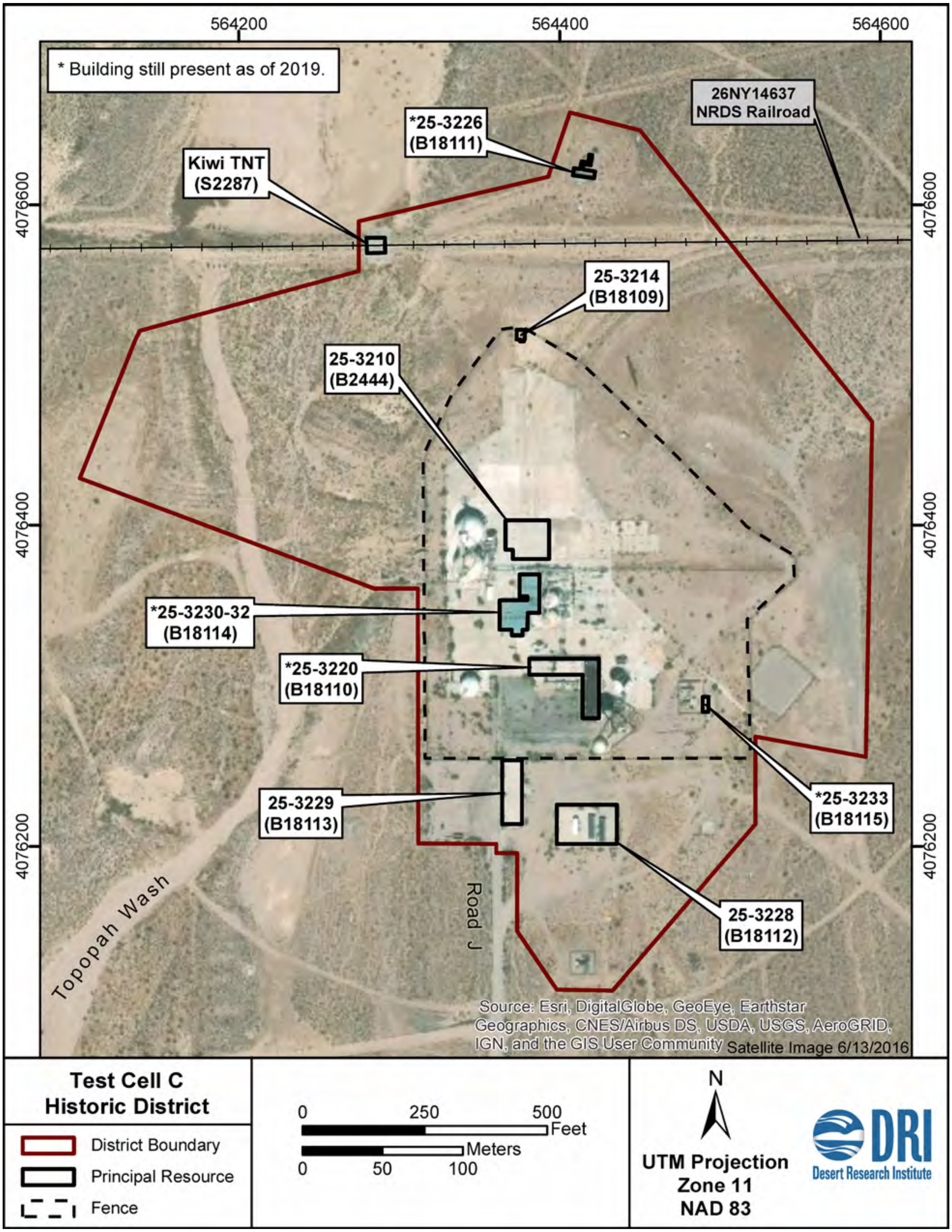
Use a USGS quadrangle map at large extent to show general area of resource.

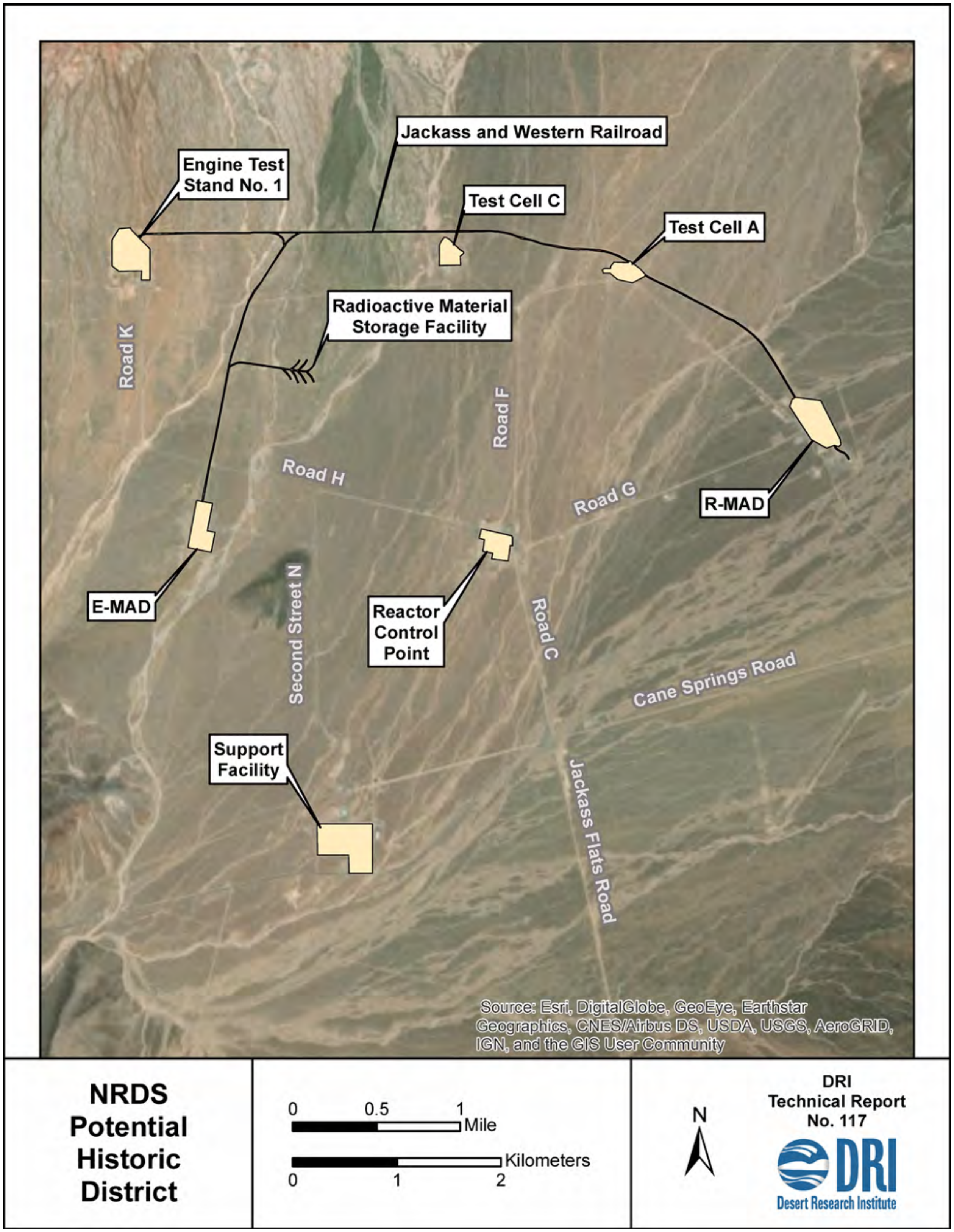


10. Site Plan Map

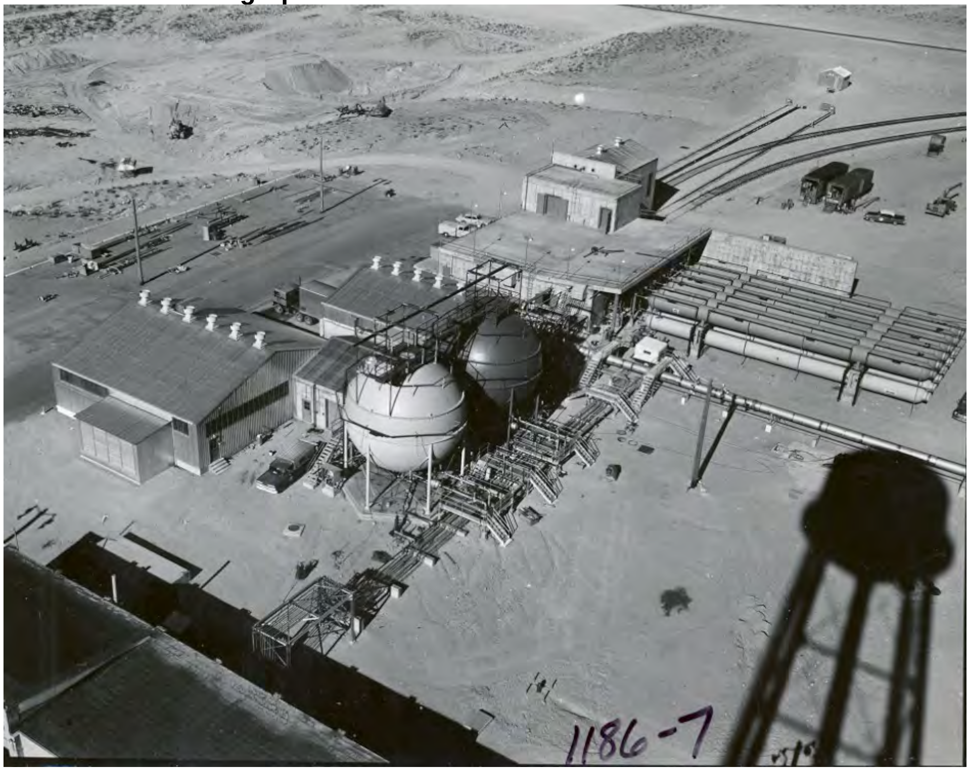
Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
*25-3233
(B18115)
25-3229
(B18113)
25-3228
(B18112)
Topopah Wash
Road J
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
DRI
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Reactor Control Point
Second Street N
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
Kilometers
0 1 2
N
DRI Technical Report No. 117
DRI
Desert Research Institute

11. **Photographs**



Elevation: South/East

Direction facing: Northwest

Photographer: REECo, Photo 1186-7

Date: 1961

Due to present surrounding buildings and structures, it is not possible to obtain a current ground-level overview of the resource. This view above was taken near completion of the first phase of construction in December 1961 from the top of the Water Tower facing northwest. The Principal Resource Cryogenic Building is prominent at left with the two spherical liquid nitrogen dewars immediately to its rear (east). The lot is not yet paved, and the other Associated Resources have not yet been installed. This photo clearly shows the passage of gasses from Building 25-3220 in the foreground to the dewars and on to the main Test Cell C building (25-3210) with its own associated tank farm. The principal purpose of the Cryogenic Building was to provide the immense force necessary to move the cryogenic gasses about the facility.

Motor Drive Building 25-3230.

Elevation: West (Front) Direction facing: East Photographer: DRI Date: 2019

West and southern elevations of Motor Drive Building with Filter Room at right, facing northeast (DRI, Photo 318, 2019).

South elevation of Motor Drive Building, facing north (DRI, Photo 406, 2019).

South and east elevations of Motor Drive Building, facing northwest. Adjoining Cryogenic Pump Room (25-3231) is at right (DRI, Photo 408, 2019).

North and west elevations of Motor Drive Building, facing southeast. Adjoining Cryogenic Pump Room (25-3231) is at left. Just left of the personnel door is the Rest Room Foundation, AR-3224 (DRI, Photo 326, 2019).

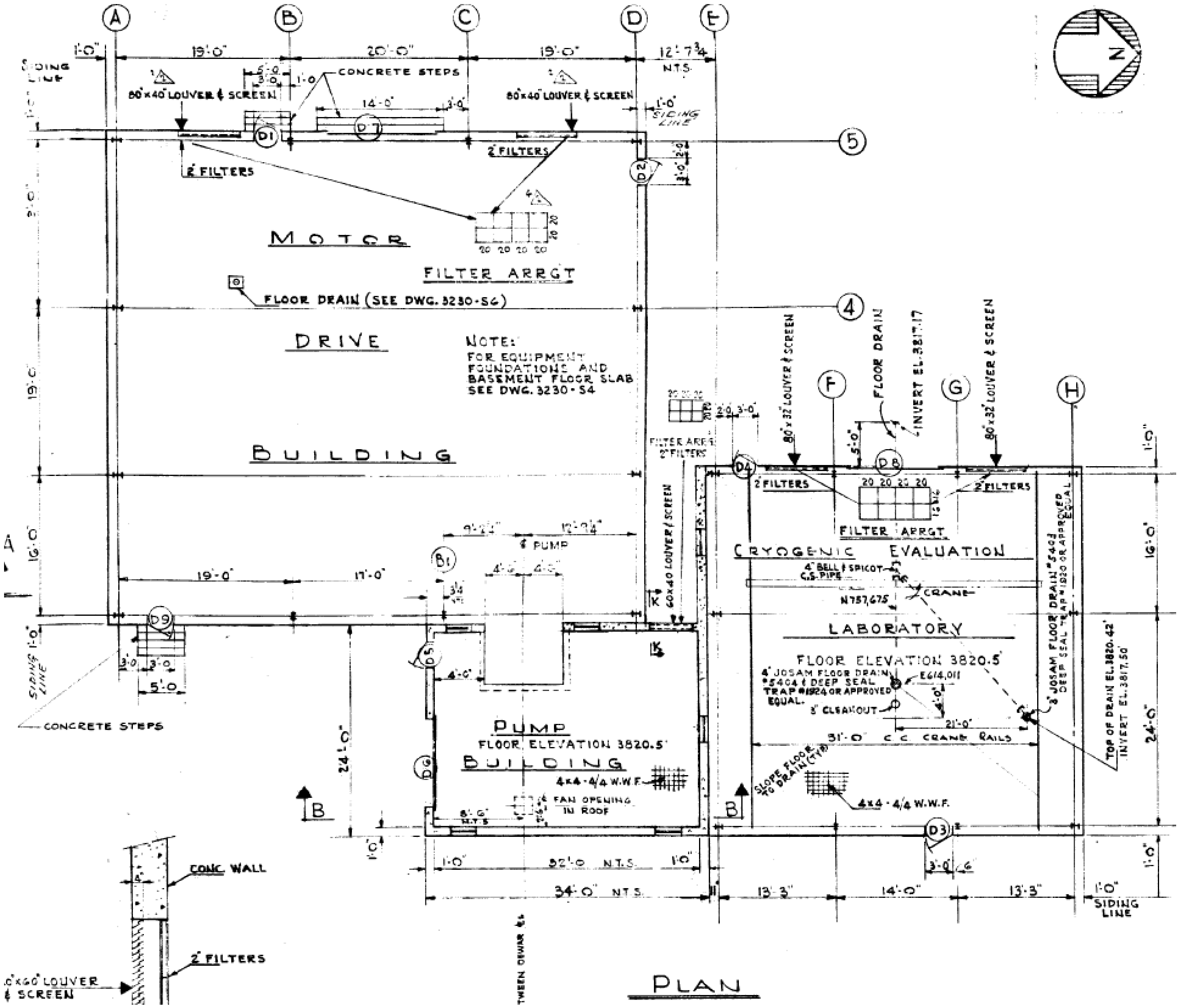
Motor Drive Building motor pit, with generator and electric boxes in background, facing southwest (DRI, Photo 946, 2019).

Motor Drive Building motor pit, with generator and electric boxes in background, facing south (DRI, Photo 948, 2019).

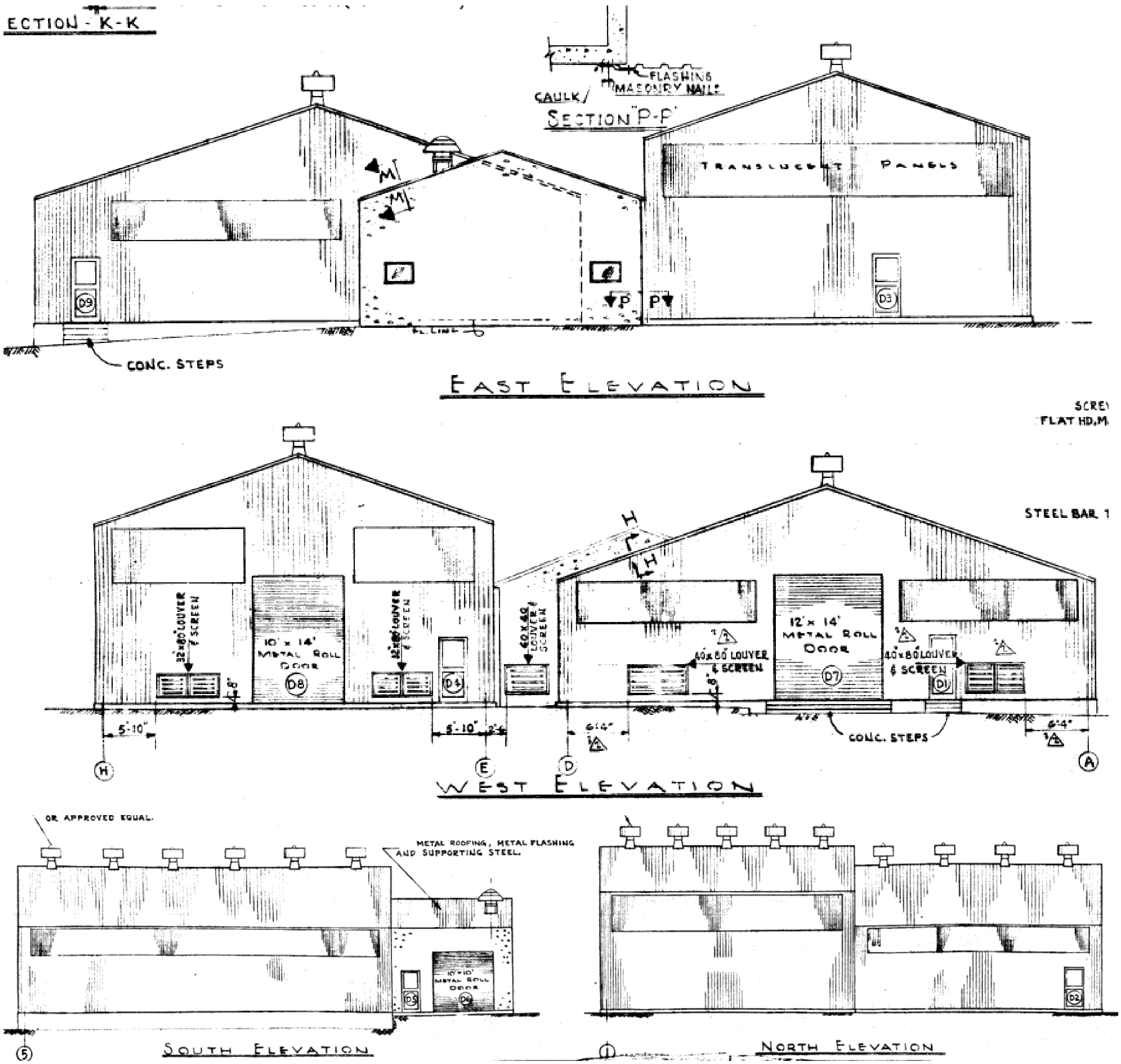
Motor Drive Building motor pit, with concrete west wall of Cryogenic Pump Room in background, which is inset into the rest of the larger building's east wall, facing east (DRI, Photo 952, 2019).

Electrical boxes on the north wall of Motor Drive Building, facing north (DRI, Photo 956, 2019).

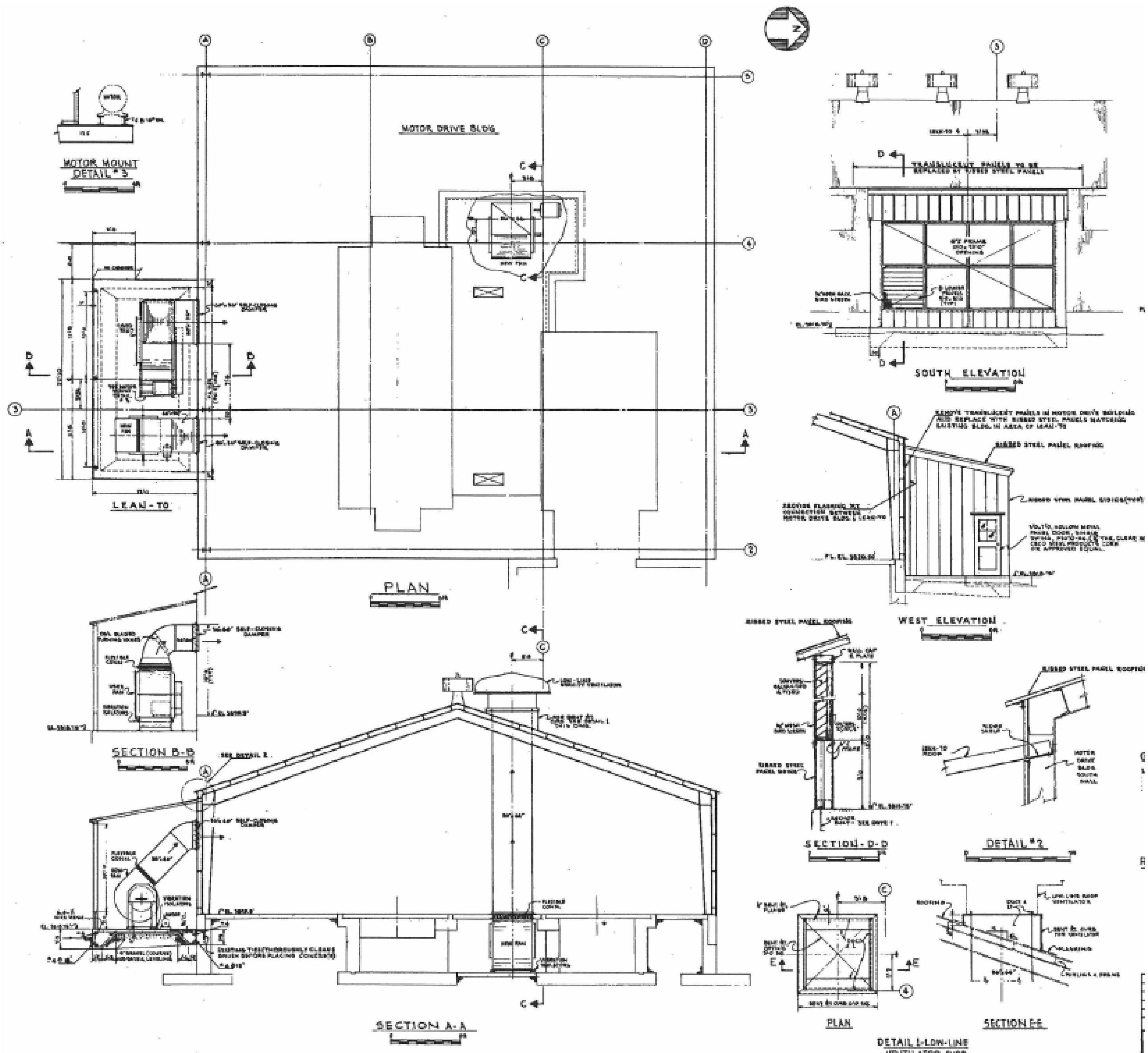
Blowers and filter panels in Filter Room of Motor Drive Building (DRI, Photo 984, 2019).



Plan of Motor Drive Building, Cryogenic Pump Building, and Cryogenic Evaluation Lab (Detail from Air Products Incorporated 1960a). Note that the Filter Room is not on the original plans.



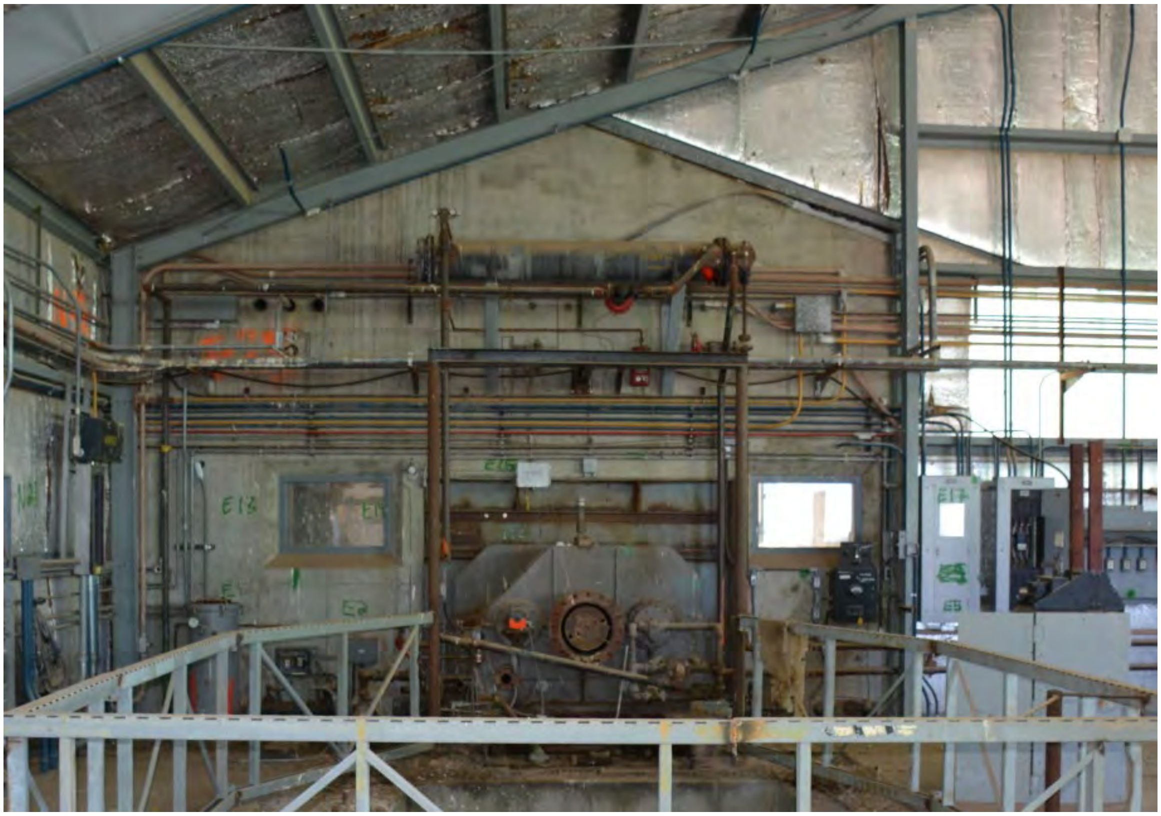
Elevations of Motor Drive Building, Cryogenic Pump Building, and Cryogenic Evaluation Lab (Detail from Air Products Incorporated 1960a).



Motor Drive Building Plan, Elevation, and Sections showing south lean-to and ventilation equipment (Air Products Incorporated 1960b).

South elevation of Cryogenic Pump Building, facing north (DRI, Photo 412, 2019).

North portion of west elevation of Cryogenic Pump Building visible between the Cryogenic Lab and Motor Drive building (DRI, Photo 328, 2019).

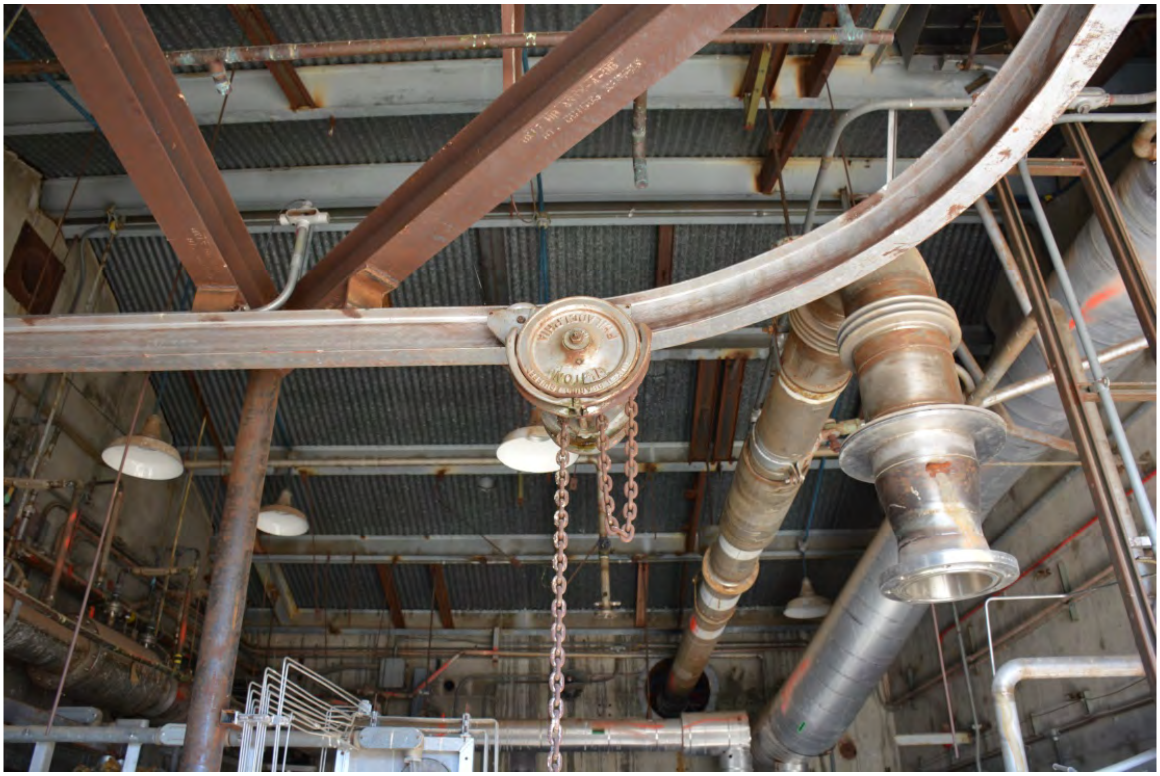


South portion of concrete west elevation of Cryogenic Pump Building visible from inside the Motor Drive Building. Drive shaft at center extends into the Cryogenic Pump Room (DRI, Photo 954, 2019).

Detail of shielded window in west wall of Cryogenic Pump Building from inside the Motor Drive Building (DRI, Photo 964, 2019).

North elevation of Cryogenic Pump Building from inside the Cryogenic Evaluation Lab, facing southeast (DRI, Photo 1016, 2019).

Interior equipment of Cryogenic Pump Building, facing north (DRI, Photo 1000, 2019).



Interior equipment of Cryogenic Pump Building, facing upward and north (DRI, Photo 1002, 2019).

Interior equipment of Cryogenic Pump Building, facing northwest (DRI, Photo 1004, 2019).

West wall and door in southwest corner of Cryogenic Pump Building, facing north (DRI, Photo 1006, 2019). Driveline penetrates wall near center.

Interior equipment of Cryogenic Pump Building, facing northeast (DRI, Photo 1010, 2019).

East wall and double doors of Cryogenic Pump Building near southeast corner, facing east (DRI, Photo 1012, 2019).

West elevation of Cryogenic Evaluation Lab, facing east (DRI, Photo 332, 2019).

Northwest corner of Cryogenic Lab, facing southeast (DRI, Photo 334, 2019).

North elevation of Cryogenic Lab, facing south from foundation of demolished Building 25-3210 (DRI, Photo 444, 2019).

Northeast corner of Cryogenic Lab, facing southwest (DRI, Photo 442, 2019).

East elevation of Cryogenic Lab, facing west (DRI, Photo 427, 2019).

Interior equipment Cryogenic Lab, facing northeast (DRI, Photo 1026, 2019).

Interior equipment Cryogenic Lab, facing east (DRI, Photo 1028, 2019).

Corner of the Cryogenic Lab, facing southwest (DRI, Photo 1020, 2019).

12. Accessory Resources
Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

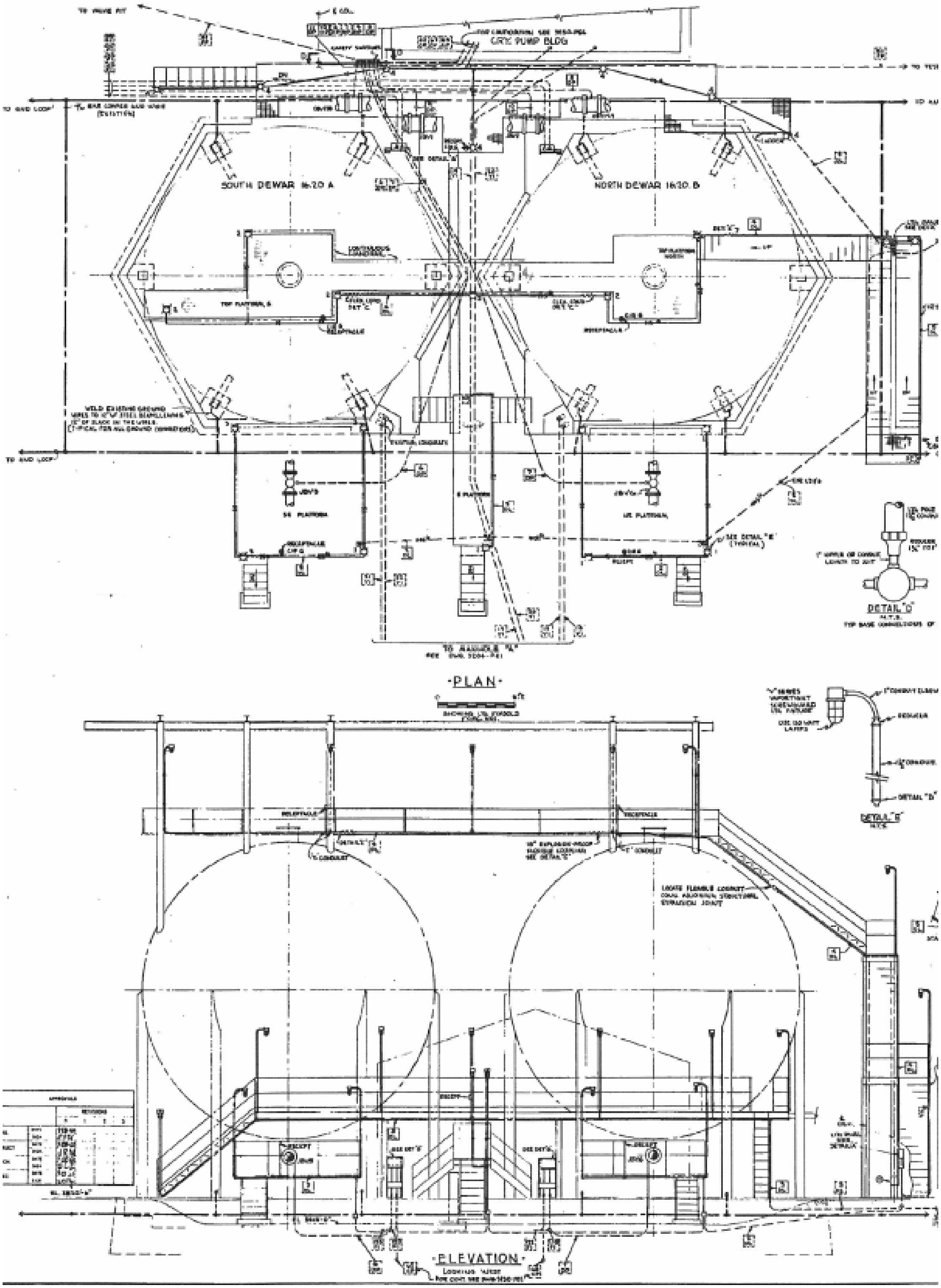
Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3213: Liquid Hydrogen (LH2) Dewars 4 and 5**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564394		Northing: 4076350	


AR-3213, facing northeast (Photo 414, left) and facing northwest (Photo 418, right) (DRI 2019).


AR-3213, facing west (Photo 420, left) and facing southwest (Photo 426, right) (DRI 2019).



AR-3213, Liquid Hydrogen Dewars 4 and 5, Plan and Elevation (Detail from Air Products Incorporated 1960c).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3223: Liquid Nitrogen Dewars 6, 7 and 8 (foundations only)**			
Construction Date	**1965-1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564420	Northing: 4076350		

AR-3223, facing west (DRI, Photo 422, 2019).

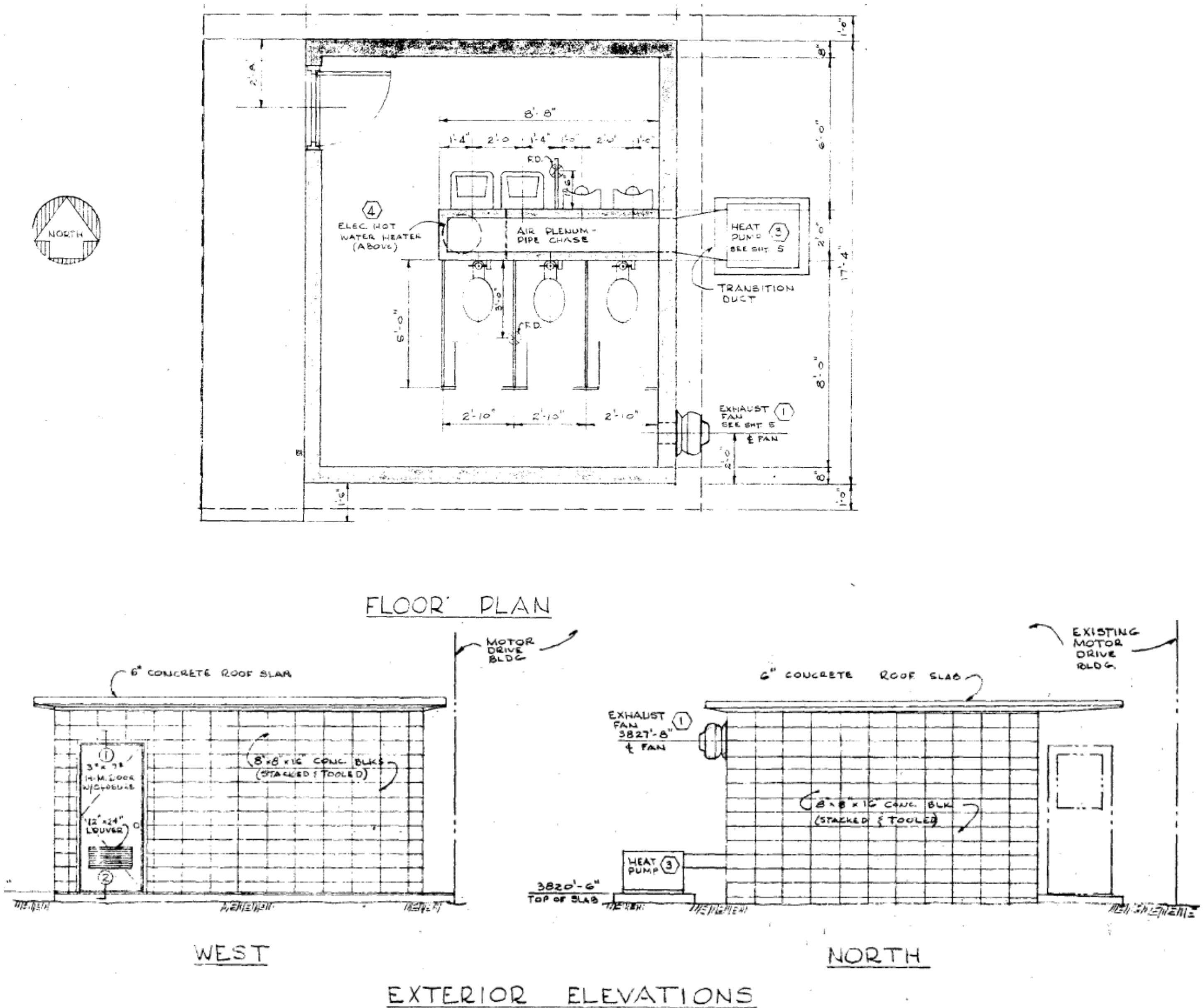
Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

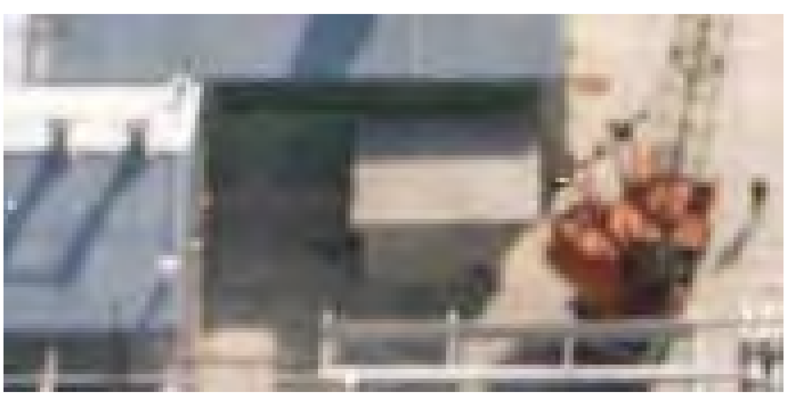
Accessory Resource Overview

Accessory Resource Name	**AR-3224: Restroom (foundation only)**			
Construction Date	**1966**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564368	Northing: 4076356		

AR-3224, facing east (DRI, Photo 330, 2019).



AR-3224, Restroom Plan and Elevations (Detail from LASL 1965).



AR-3224, Detail of aerial view showing Restroom before demolition, facing south (Photo source: RSL, c. 1967).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Deluge Pit #2**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564386		Northing: 4076325	


AR-1, facing east (Photo 302, left) and an interior view (Photo 300, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-2: Southern LH2 Vaporizer Pads**			
Construction Date	**1965**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564398		Northing: 4076336	

AR-2, facing northeast (DRI, Photo 632, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3: Utility Gantry**			
Construction Date	**1961**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564400		Northing: 4076325	


AR-3, facing south (Photo 227, left) and southwest (Photo 620, right) (DRI 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-4: Northern LH2 Vaporizer Pads**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564410		Northing: 4076354	

AR-4, facing east (DRI, Photo 636, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-5: Concrete Pad**			
Construction Date	**Unknown**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564410		Northing: 4076360	

AR-5, facing southwest (DRI, Photo 424, 2019).

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-6: Health Physics Portable Building/Trailer** (Likely used for Cold War projects elsewhere on the NNSS - moved to TCC between 2006 and 2011.)			
Construction Date	**1970s**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564356		Northing: 4076360	

AR-6, facing northeast (Photo 346, left) and southwest (Photo 342, right) (DRI 2019).

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☒	Structure ☐	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)				
City, Zip	N/A				
County	Nye				
Assessor's Parcel #	N/A	Subdivision Name	Nuclear Rocket Development Station (NRDS)		
UTM Location (NAD 83, UTM Zone 11 North)	Easting: 564490		Northing: 4076290		
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983	
Ownership	Private ☐	Public-Local ☐	Public-State ☐	Public-Federal ☒	Multiple ☐
Should the property's location be kept confidential?		Yes ☐		No ☒	

3. Architectural Information

Construction Date	c.1970	
Architectural Style	None	
Architectural Type	Warehouse	
Roof Form	Flat	
Roof Materials	Concrete	
Exterior Wall Materials	Concrete Block and Concrete	
Foundation Materials	Concrete	
Window Materials	None	
Window Type	None	
Accessory Resources?	Yes ☒	No ☐
	Number?: 1	

Condition of Resource(s)?		
Good ☒	Fair ☐	Poor ☐
Explanation: Building itself in good condition. Equipment removed and wall vents covered.		

(Insert primary photograph below.)

West and south elevations, facing northeast (DRI, Photo 262, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed:
				NRIS #:

Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name:	NRIS #:
				Date listed:	

If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
		If so, is this resource contributing?		Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☐	Criterion B ☐	Criterion C ☐	Criterion D ☐
	Not Eligible ☒	Unevaluated ☐		

Area(s) of Significance	Engineering, Transportation, Architecture, Health/Medicine
Period(s) of Significance	c.1970-1972

Integrity – Does the resource possess integrity in all or some of the 7 aspects?

Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒

General Integrity:	Intact ☐	Altered ☐	Moved ☐	Date(s):

Threats to Resource:	Demolition, Structural Decay
Historic Name	Power House
Current/Common Name	Same
Historic/Original Owner	U.S. Department of Energy
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030
Historic Building Use	Emergency Generator Powerhouse
Current Building Use	Storage
Architect/Engineer/Designer	Unknown
Builder/Contractor	Unknown

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

The Powerhouse is a contributor to the Test Cell C Historic District. It is not individually eligible for the National Register because it is a late and relatively minor addition to Test Cell C. It has no architectural distinction and it served in a purely support role that was not directly connected with specific testing requirements.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

The Power House is a small, one-story, rectangular-plan, tan building constructed mostly of concrete block with a flat roof. It was built adjacent to existing Substation 4 near the east end of the Test Cell C compound and is still standing.

The south wall is mostly occupied by a rolling steel overhead door with a light above its upper right corner. A concrete retaining wall begins at half height and continues to the east, tapering downward and ending within a few feet next to the berm it supports. A steel ladder topped by a pipe railing ascends the retaining wall adjacent to the building.

The north wall is essentially the same, including the retaining wall, except it has a personnel door in the northwest corner and lacks a ladder. This and the western door are flush steel with small concrete stoops.

The lower half of the east façade is buried beneath a gravel berm between the two retaining walls mentioned above. Between the tops of the walls adjacent to the building is a concrete gutter that also serves as a walkway to a short steel ladder to the roof. The buried portion of the wall is concrete and the top is concrete block with two windows or ventilators that are now covered with galvanized steel patches.

The west wall has three blocked ventilator openings with galvanized steel hoods. A personnel door is to the left of the row of openings.

The flat concrete roof protrudes slightly on all sides. A steel frame for removed equipment is on the roof. The roof has steel railings along the south side and part of the west side.

The interior is painted tan, including the ceiling. The floor is concrete with a raised pad for a generator. Steel-covered utility chases are embedded in the floor by the pad. A rectangular domed skylight above the motor mount presumably replaces an exhaust stack. Lighting is by suspended incandescent fixtures. Conduit and electrical boxes are attached to the walls.

Engineering drawings of this building were not inspected, but it appears that it was constructed around 1970.

25-3233 Accessory Resource

AR-3215, Substation #4: The Power House forms most of the east perimeter of this substation. The rest is a seven-foot chain-link fence with galvanized steel I-posts. Gates are in the north and south sides of the enclosure. Corrugated aluminum panels have been attached to the northern fence.

Substation #4 is at the northern terminus of two parallel powerlines, known as Powerlines M and N. In Test Cell C layout maps from the early 1960s, it was labeled as Substation 1.

Equipment includes an Allis-Chalmers transformer, miscellaneous Westinghouse equipment, and two banks of steel electrical boxes on steel pads.

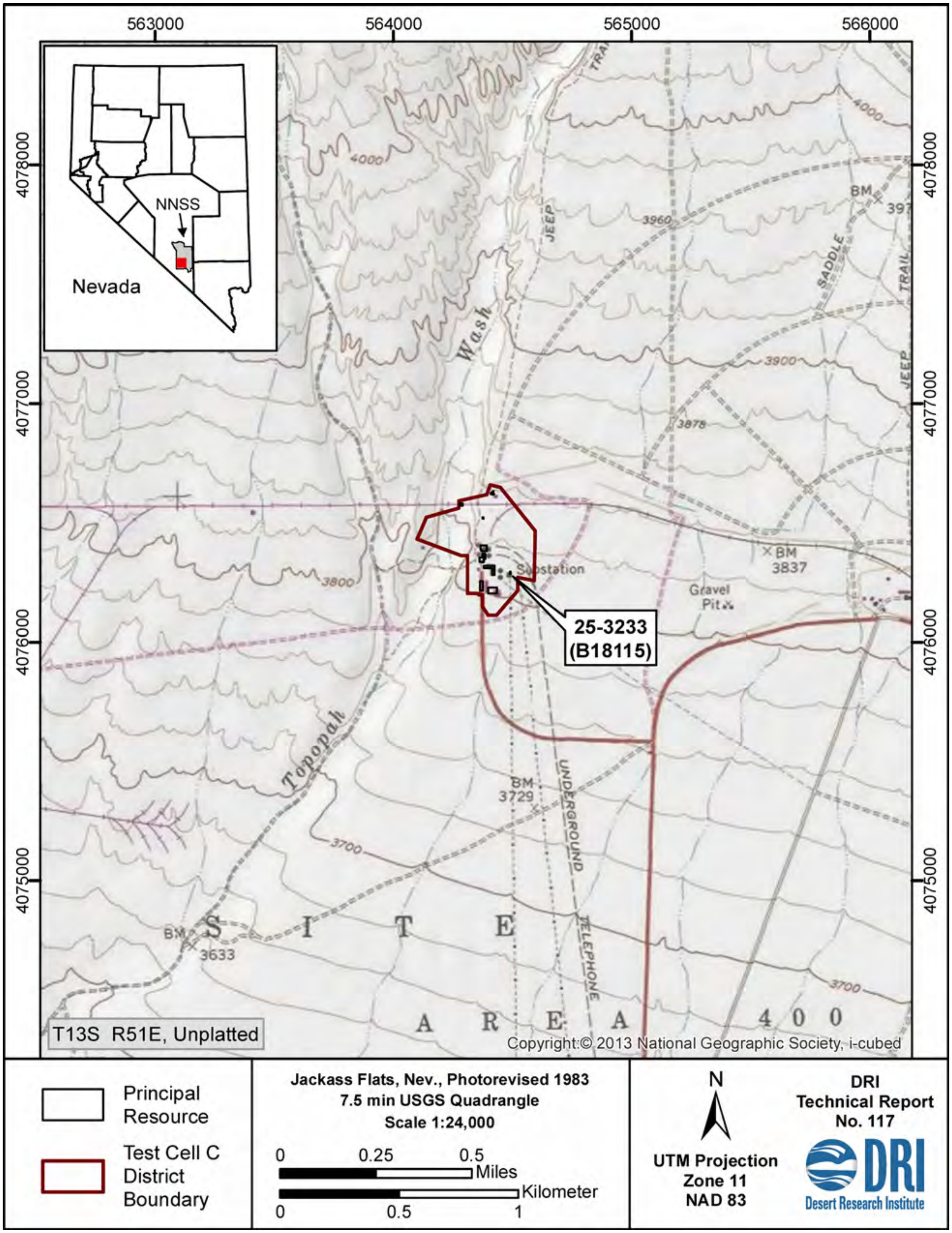
8. References

List references used to research and evaluate the individual property.

None.

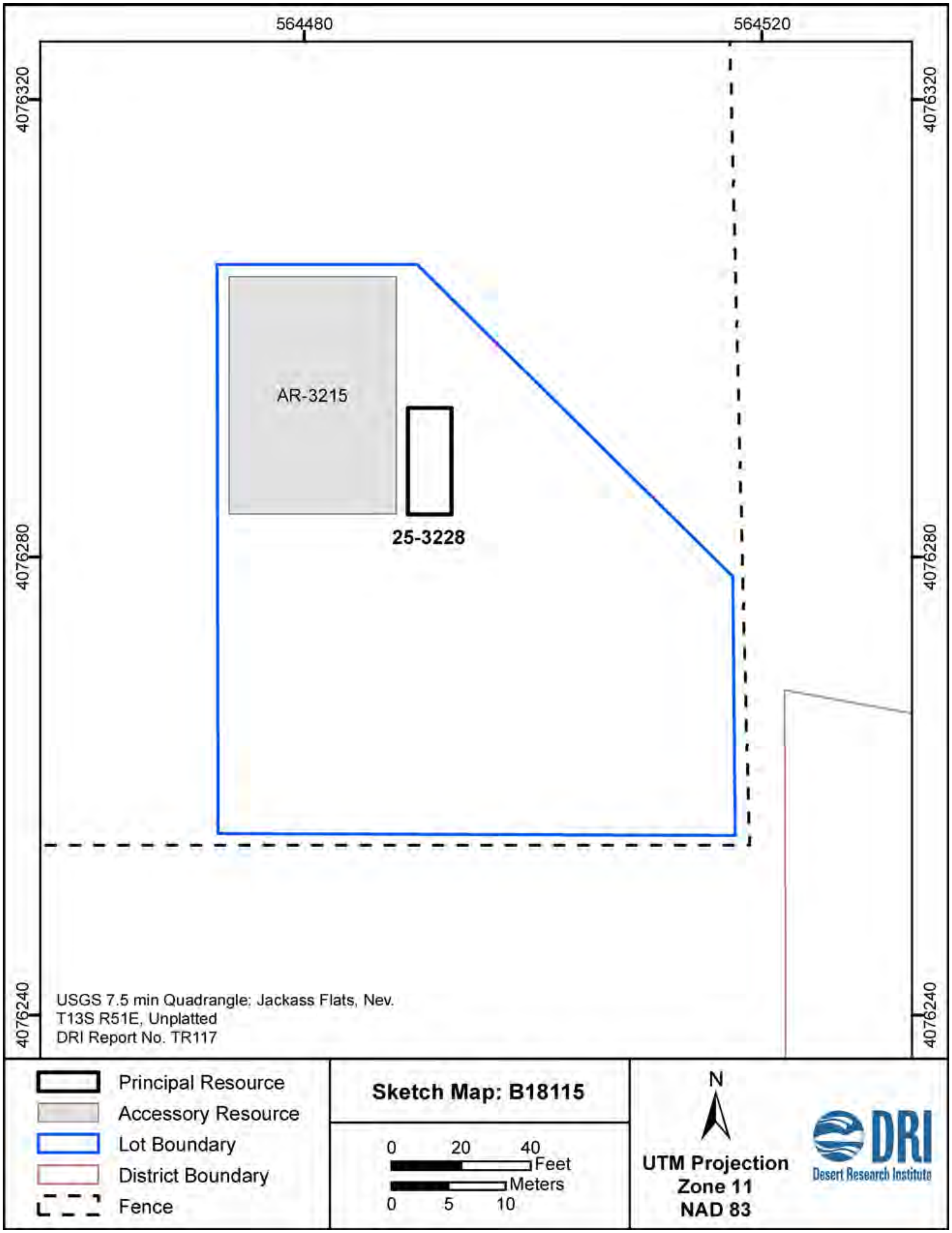
9. Area Location Map

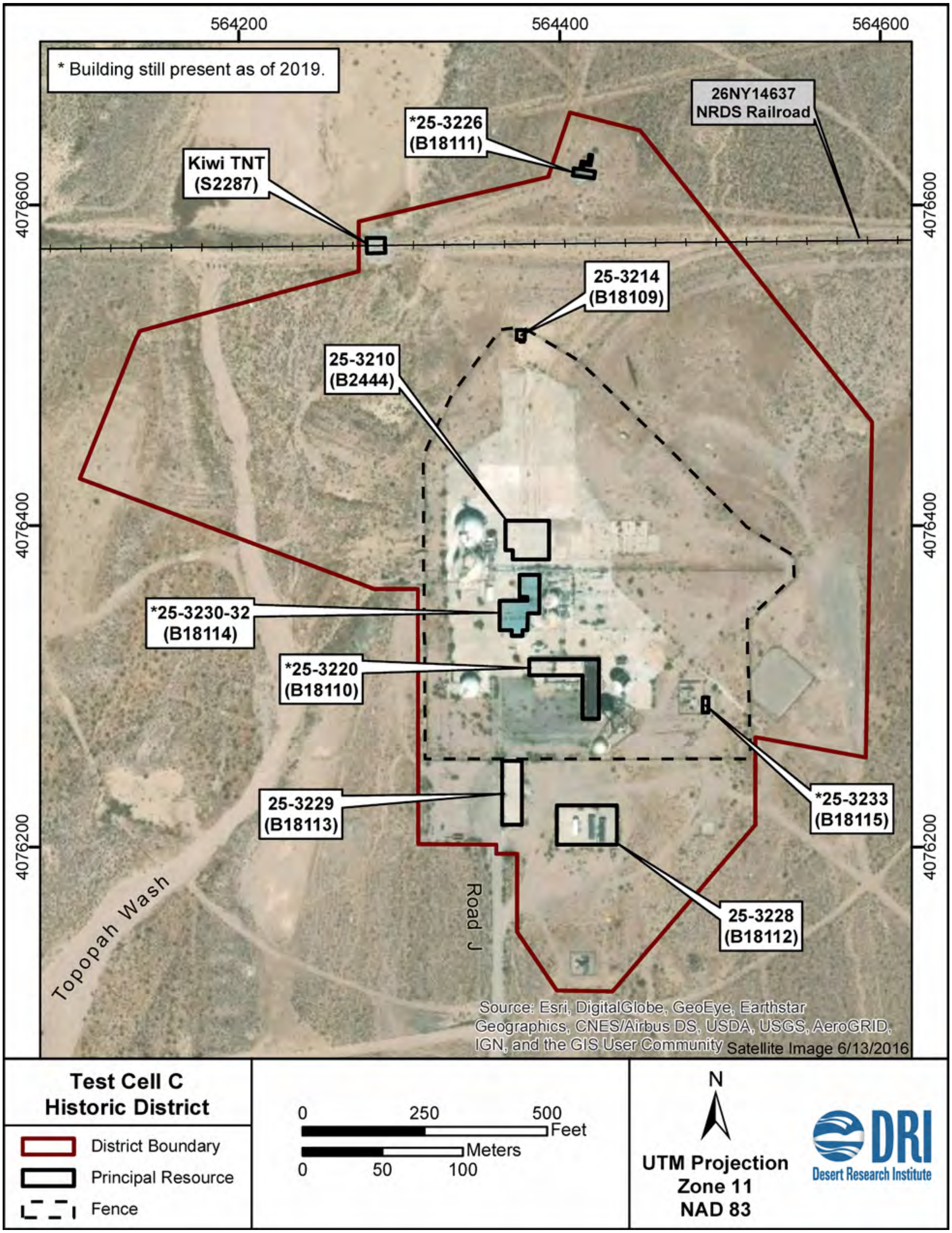
Use a USGS quadrangle map at large extent to show general area of resource.



10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
*25-3233
(B18115)
25-3229
(B18113)
25-3228
(B18112)
Road J
Topopah Wash
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
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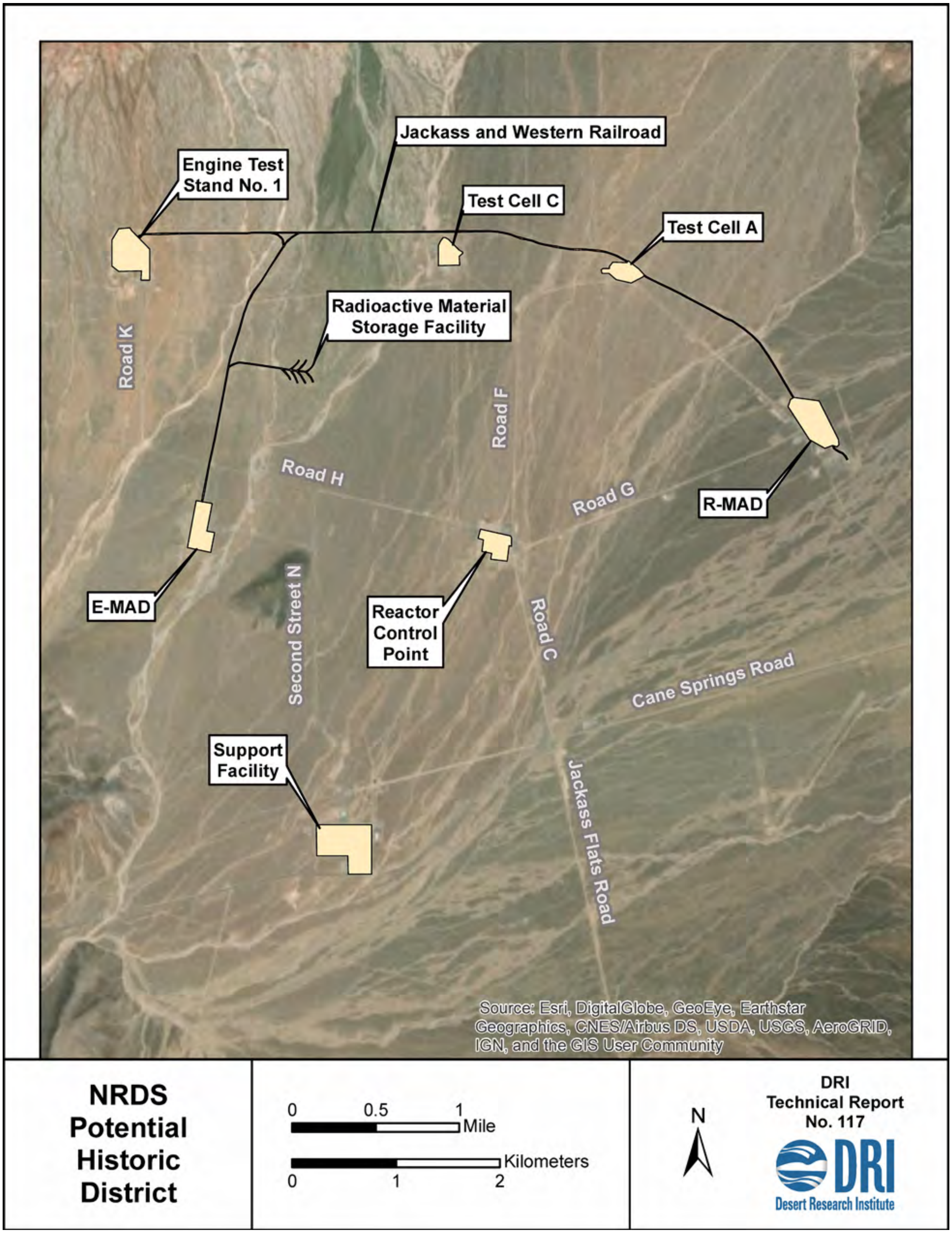
DRI
Desert Research Institute


Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Second Street N
Reactor Control Point
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
Desert Research Institute

11. Photographs

Include as many photographs as needed to accurately depict the resource.

Elevation: South/East Direction facing: Northwest Photographer: DRI, Photo 266 Date: 2019

Elevation: West/South Direction facing: Northeast Photographer: DRI, Photo 262 Date: 2019
Power House is on the right. Substation 4 (AR-3215) is in the foreground.

Power House interior, facing south (DRI, Photo 1048, 2019).

Power House interior, facing north (DRI, Photo 1050, 2019).

12. Accessory Resources

Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-3215: Substation 4**			
Construction Date	**1960**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564480		Northing: 4076290	

AR-3215, facing southwest (DRI, Photo 1056, 2019).

AR-3215, facing northwest (DRI, Photo 1056, 2019).

SHPO Resource #: S2287 2019
Other Resource #: KIWI-TNT Stand

NEVADA STATE HISTORIC PRESERVATION OFFICE

Architectural Resource Assessment (ARA) Form

For SHPO Use Only	SHPO Concurrence?: Y / N		Date:		
Survey Date	January 2019	Recorded By	Reno, Edwards, Wedding	Agency Report #	TR 117

1. Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

2. Property Overview and Location

Street Address	Area 25, Nevada National Security Site (NNSS)						
City, Zip	N/A						
County	Nye						
Assessor's Parcel #	N/A		Subdivision Name	Nuclear Rocket Development Station (NRDS)			
UTM Location (NAD 83, UTM Zone 11 North)			Easting: 564285		Northing: 4076575		
USGS Info	Township: 13S	Range: 51E	Section: Unplatted	USGS 7.5' Quad & Date: Jackass Flats, Nev. 1983			
Ownership	Private ☐	Public-Local ☐	Public-State ☐		Public-Federal ☒	Multiple ☐	
Should the property's location be kept confidential?			Yes ☐		No ☒		

3. Architectural Information

Construction Date	1964		
Architectural Style	N/A		
Architectural Type	N/A		
Roof Form	N/A		
Roof Materials	N/A		
Exterior Wall Materials	N/A		
Foundation Materials	Concrete		
Window Materials	N/A		
Window Type	N/A		
Accessory Resources?	Yes ☒	No ☐	
	Number?: 1		

Condition of Resource(s)?		
Good ☒	Fair ☐	Poor ☐
Explanation: Other than removal of portable test equipment and monitoring stations, resource is in excellent condition.		

(Insert primary photograph below.)

Test Stand, facing northeast (DRI, Photo 202, 2019).

4. NRHP Eligibility - Existing Listings, Districts, & Potential Districts

Is the property listed in the National Register?	Yes ☐	No ☒	If yes, provide:	Date Listed:	
				NRIS #:	
Contributing to a listed historic district?	Yes ☐	No ☒	If yes, provide:	Name:	NRIS #:
				Date listed:	
If no, is there a potential district?	Yes ☒	No ☐	If so, is the potential district eligible for the NRHP?	Yes ☒	No ☐
		If so, is this resource contributing?		Yes ☒	No ☐
District Name: Test Cell C Historic District				SHPO #: D346	

Note: A resource that is contributing to a National Register-eligible district is considered eligible for the National Register for the purposes of project review, even though the resource itself may not be individually eligible.

5. NRHP Eligibility - Individual

If not already listed, complete the information below:

Eligible Under:	Criterion A ☒	Criterion B ☐	Criterion C ☒	Criterion D ☒		
	Not Eligible ☐	Unevaluated ☐				
Area(s) of Significance	Engineering, Transportation, Health/Medicine					
Period(s) of Significance	1964-1965					
Integrity – Does the resource possess integrity in all or some of the 7 aspects?						
Location ☒	Design ☒	Materials ☒	Workmanship ☒	Setting ☒	Feeling ☒	Association ☒
General Integrity:	Intact ☒	Altered ☐	Moved ☐	Date(s):		
Threats to Resource:	Demolition					
Historic Name	KIWI-TNT (Transient Nuclear Test) Stand					
Current/Common Name	Same					
Historic/Original Owner	U.S. Atomic Energy Commission					
Current Owner	National Nuclear Security Administration Nevada Field Office (NNSA/NFO)					
Current Owner Address	232 Energy Way, North Las Vegas, Nevada 89030					
Historic Building Use	Nuclear reactor test stand					
Current Building Use	None					
Architect/Engineer/Designer	Unknown					
Builder/Contractor	Unknown					

6. Narrative Eligibility Justification

Provide a detailed explanation of the resource's eligibility for the National Register, including supporting historic information, methods for evaluation under the four criteria, discussion of the seven aspects of integrity, and conclusions about eligibility.

This test stand, which is little more than a concrete pad on a railroad grade, is a splendid example of how a resource can have significance far beyond anything imaginable from looking at the material remains themselves.

In addition to contributing to the Test Cell C Historic District, it is individually eligible not only under Criteria A and C, but also under Criterion D. It is not eligible under Criterion B.

It is of importance nationally under Criterion A as the only example of a test designed to explore the results of a reactor excursion or meltdown in a nuclear rocket engine. As such, it provided information needed for the safe design of launch pads and for gauging the likely impacts of an in-flight accident while still within proximity to the earth. The test literally blasted its way to international importance. To quote Dewar (2004:285):

> The test caused an international incident. The Soviet Union alleged the United States violated the LTBT [Limited Test Ban Treaty], claiming KIWI-TNT was an above-ground nuclear explosion. The U.S. denied the allegation, stating it was a reactor rather than a nuclear explosive because it lacked a nuclear yield and had no fission products detected outside the United States. Later the State Department blasted the AEC and its "TNT" designation, which implied an explosion, as it had wanted to charge the Soviets with a LTBT violation but found their effort blunted.

The Kiwi-TNT Test Stand is eligible under Criterion C as the only facility ever built to deliberately test the self-destruction of nuclear rocket reactor. It is in amazingly good condition. With re-installation of monitoring equipment, it could be used for the same purpose today. It fully retains all aspects of integrity.

Kiwi-TNT is also eligible under Criterion D for the information it has provided and its potential to continue to provide information on radioactive contamination following a nuclear reactor accident. During the test, radiation and the dispersion of contamination were thoroughly monitored. The extent of contamination was investigated during an extensive cleanup campaign. This area was subjected to follow-up monitoring of radiation levels, which continues to the present. Therefore, it provides an extensive body of data and it continues to provide data on both short- and long-term management of radioactive contamination related to reactor incidents because the place is still contaminated.

7. Narrative Architectural Description

Provide a detailed description of the resource, including all character defining features, potential construction methods, potential alterations (both historic and non-historic), and any accessory resources.

The Kiwi-TNT (Transient Nuclear Test) was the only reactor test at Test Cell C not conducted on the Reactor Pad. This was a test to determine the effects of a runaway reactor explosion in order to safely design launch facilities for nuclear-powered rockets. Although this would not create a nuclear explosion, it would still result in a fairly powerful detonation that would damage the Test Cell C complex and cover the facility with radioactive reactor debris, which would require a lengthy cleanup period. Therefore, a single-purpose test stand was built on the Jackass and Western Railroad grade 630 feet from Test Cell C. The distance was well judged because the only damage to Test Cell C was a broken window. The blast was equivalent to 200 to 300 pounds of black powder. This was enough to completely destroy the reactor on its railroad flatcar, but no damage was done to the test stand, which remains in excellent condition today. Because it did not interfere with railroad traffic, there was no need to remove the test stand.

Fairly level ground was desired for measuring fallout from the radioactive cloud. Therefore, it was necessary to locate the test to the west of Test Cell C, where there was open ground to the southwest all the way to the Amargosa Desert. A northeast wind was also required for the test, which was the opposite of the optimal wind direction for other tests. The test is described in detail by Dewar (2004:279-286).

Despite the tremendous importance of the test, the physical structure needed for it was remarkably simple because control and monitoring infrastructure were already present at the nearby Test Cell C facility. The concrete pad for this test is on the main line railroad grade near the east end of the dike crossing Topopah Wash. Large attachment points are embedded in the edges of this structure, which does not impede use of the tracks. Concrete aprons extend from the top of the grade down both sides of the dike to the wash bottom, encompassing a square culvert.

A series of radiation monitoring stations on poles was installed along the north side of the railroad tracks running westward. These poles were removed following the test.

A number of graded alignments were bladed outward from the test structure to create zones for guiding cleanup of radioactive debris following the test. No trace of these temporary cuts was found in the midst of the other extensive ground disturbance around Test Cell C or in the active erosional area of Topopah Wash.

The test structure and surrounding area have restricted access because of radioactive contamination resulting from the test, despite an extensive cleanup program. The facility was built late in 1964, and the test was conducted on January 12, 1965.

Accessory Resource

AR-1, Railroad Track Alteration: Concrete covers the portions of the ties between the rails starting at the test pad and continuing eastward nearly to the switches for the Test Cell C spurs. The purpose of this concrete fill is unknown.

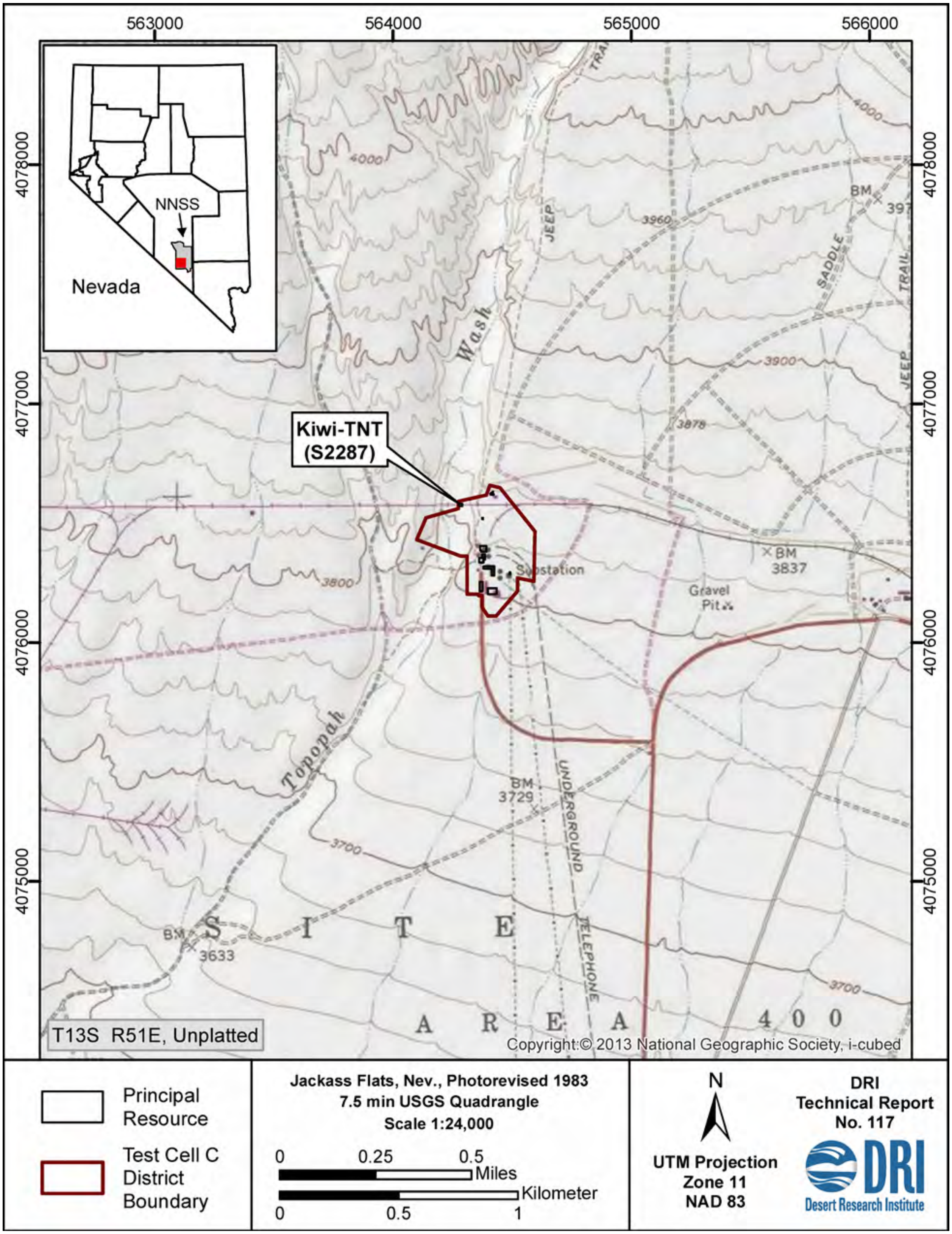
8. References

List references used to research and evaluate the individual property.

Dewar, James A.
2004 *To the End of the Solar System: The Story of the Nuclear Rocket*. University Press of Kentucky, Lexington.

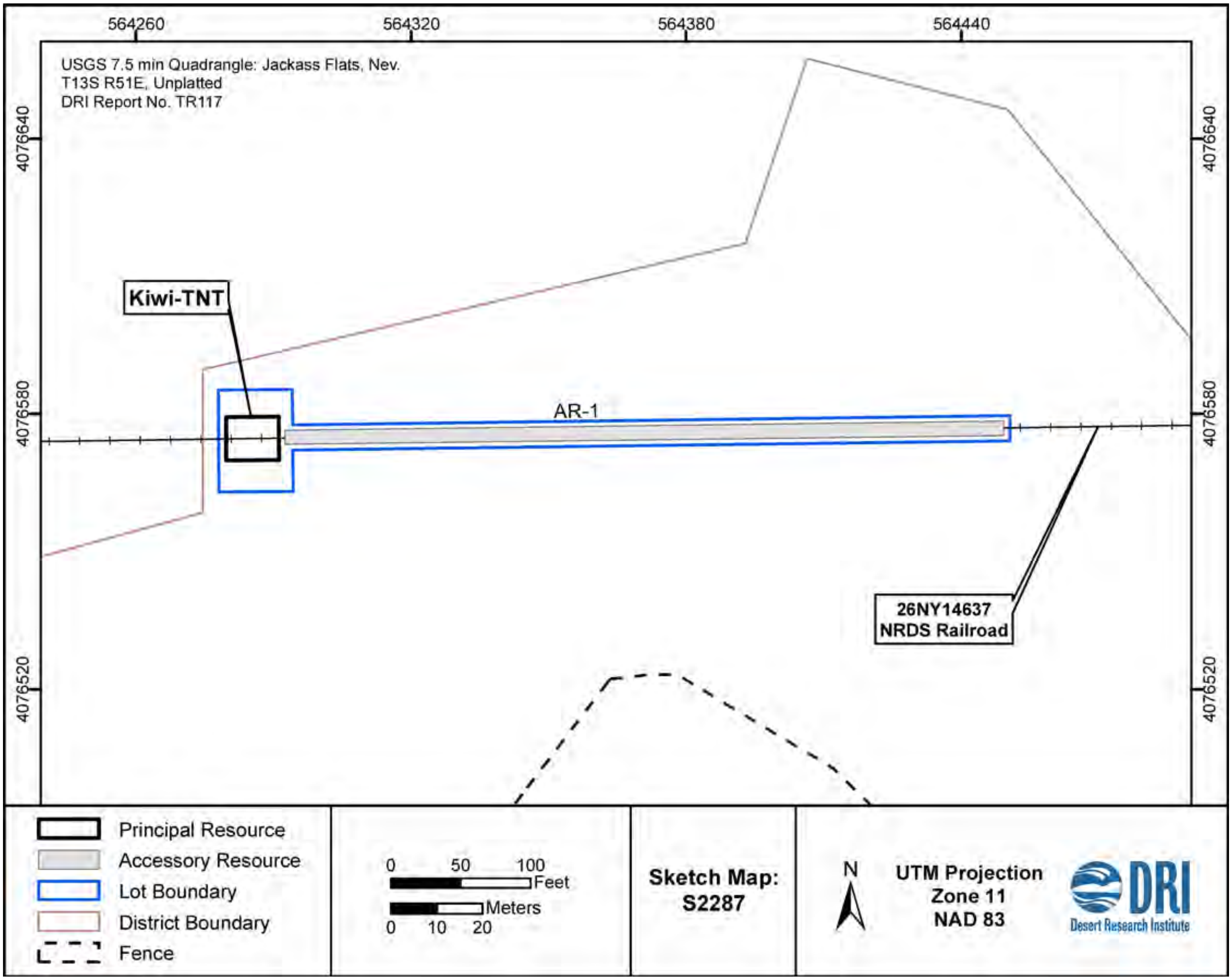
9. Area Location Map

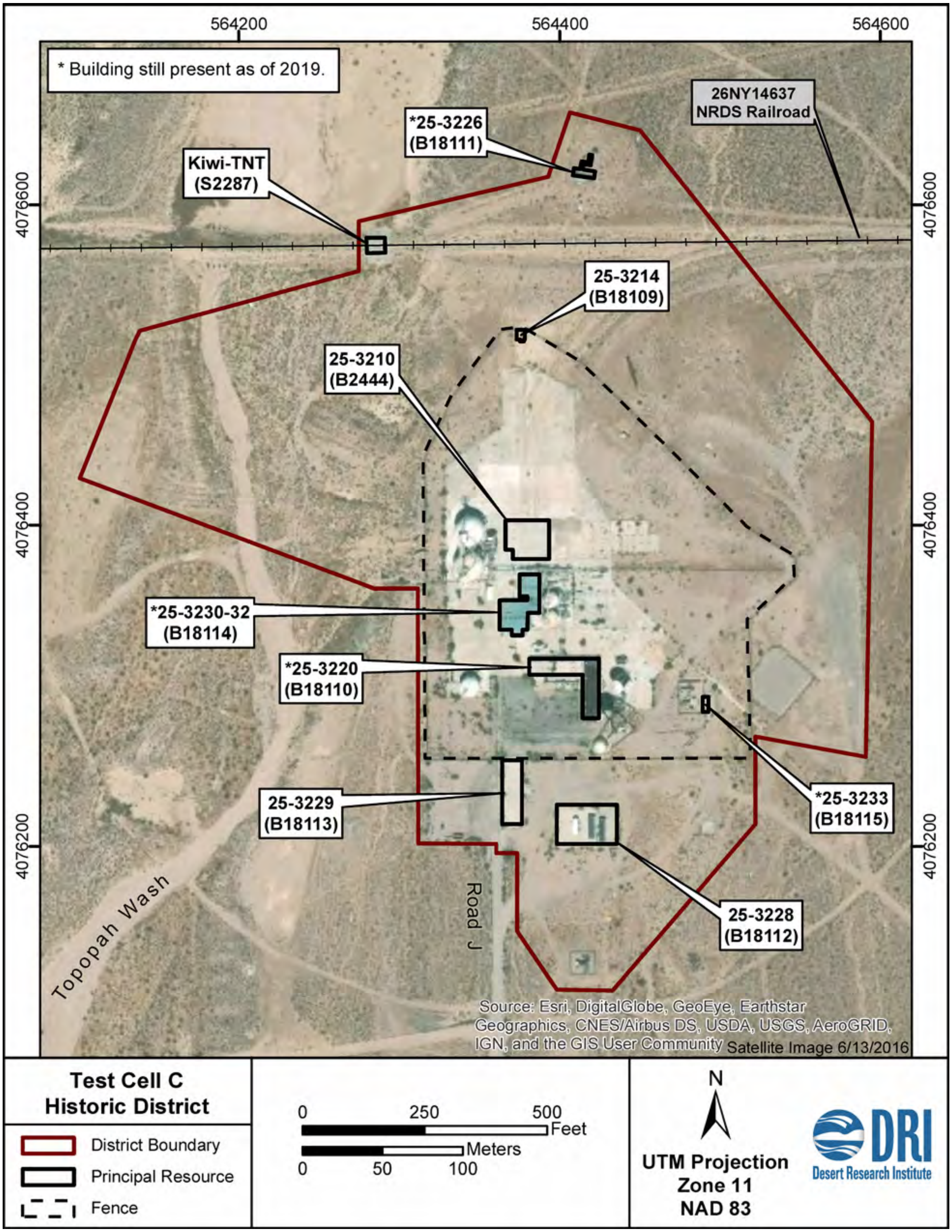
Use a USGS quadrangle map at large extent to show general area of resource.

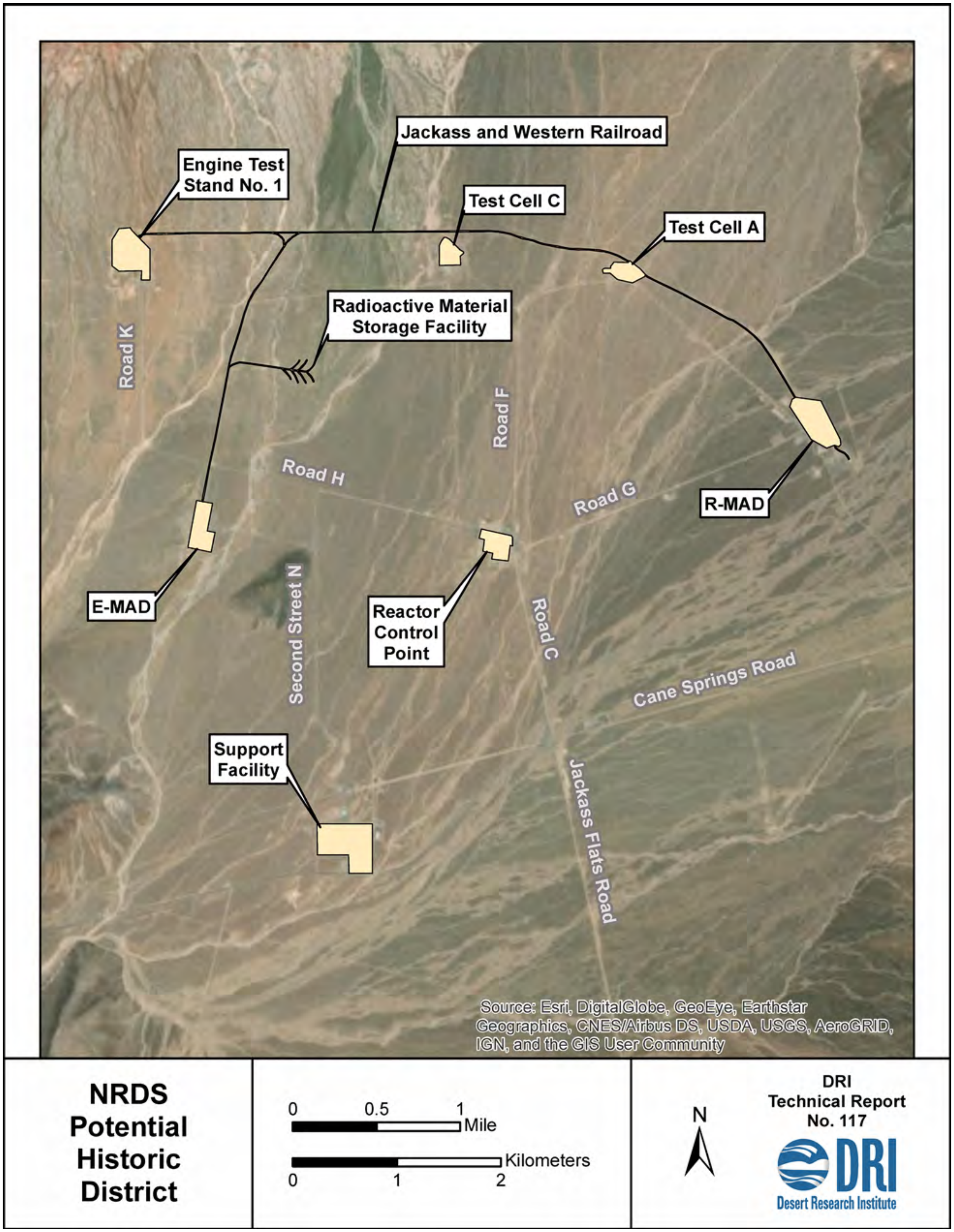


10. Site Plan Map

Use aerial imagery, drafting software, or a hand-drawn sketch (to scale) showing, at minimum, building/structure footprints and relationship to associated features. Attach extra maps if needed.




564200
564400
564600
4076600
4076400
4076200
* Building still present as of 2019.
26NY14637
NRDS Railroad
*25-3226
(B18111)
Kiwi-TNT
(S2287)
25-3214
(B18109)
25-3210
(B2444)
*25-3230-32
(B18114)
*25-3220
(B18110)
25-3229
(B18113)
*25-3233
(B18115)
25-3228
(B18112)
Road J
Topopah Wash
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Satellite Image 6/13/2016
Test Cell C
Historic District
District Boundary
Principal Resource
Fence
0
250
500
Feet
Meters
0
50
100
N
UTM Projection
Zone 11
NAD 83
DRI
Desert Research Institute

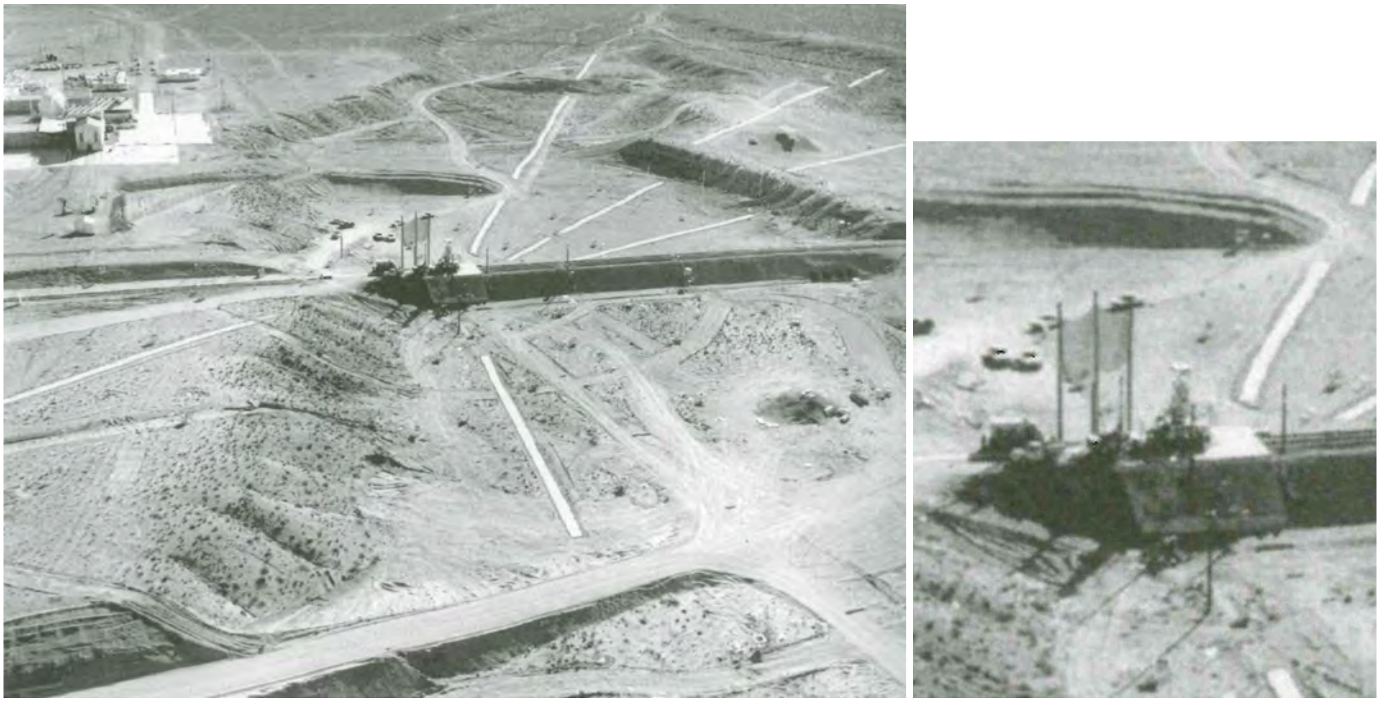

Jackass and Western Railroad
Engine Test Stand No. 1
Test Cell C
Test Cell A
Radioactive Material Storage Facility
Road K
Road F
Road H
Road G
R-MAD
E-MAD
Reactor Control Point
Second Street N
Road C
Cane Springs Road
Support Facility
Jackass Flats Road
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
NRDS Potential Historic District
0 0.5 1 Mile
0 1 2 Kilometers
N
DRI Technical Report No. 117
DRI
Desert Research Institute

11. Photographs

Overview of the KIWI-TNT Stand, above the red arrow at left, in relation to the main Test Cell C facility at right, facing northeast. The building on the ridge behind the stand is the Camera Bunker (DRI, Photo 200, 2019).

Test Stand on causeway over Topopah Wash, facing west. Concrete-filled railroad bed (AR-1) is in foreground (DRI, Photo 164, 2019).

A zoomed in view of the test stand from the image on the first page (DRI, Photo 202, 2019). The yellow sign on the left indicates that the pad is a contamination area.



KIWI-TNT overview immediately prior to the test, facing south, and a zoomed in clip of the pad at right (Photographer: Los Alamos Scientific Laboratory, reproduced from Dewar 2004:284).

KIWI-TNT on its railroad car immediately prior to the test (Photographer: Los Alamos Scientific Laboratory, reproduced from Dewar 2004:282).

12. Accessory Resources

Complete only if Accessory Resources are present. Include as many extra entries as necessary.

Accessory Property Type

Building ☐	Structure ☒	Object ☐	Landscape (non-archaeological site) ☐

Accessory Resource Overview

Accessory Resource Name	**AR-1: Railroad Track Alteration**			
Construction Date	**1964**	Contributing?	Yes ☒	No ☐
UTM (NAD 83, UTM Zone 11 North)	Easting: 564290 to 564450	Northing: 4076575		

Concrete-filled railroad bed (AR-1) east of Test Stand, facing west. Photo is taken from the eastern terminus of the altered section of track (DRI, Photo 113, 2019).