LAUGHLIN AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR
ENVIRONMENTAL ASSESSMENT

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EXECUTIVE SUMMARY

The Department of Defense (DoD) proposes to construct a Digital Airport Surveillance Radar (DASR) at Laughlin Air Force Base (AFB) in Del Rio, Texas. The proposed action is evaluated in this Environmental Assessment (EA) in accordance with the United States Air Force (USAF) instruction AFI 32-7061. The installation of the DASR is part of the DoD National Airspace System (NAS) program, which involves installation of new air traffic control equipment on DoD bases throughout the country. These radars are also being installed at commercial airports under the authority of the Federal Aviation Administration (FAA). The implementation of the NAS program at DoD bases was previously evaluated in a programmatic EA and Finding of No Significant Impact (FONSI), which fully detailed the need for the program and committed to completing site-specific NEPA documentation tiered from the programmatic EA for individual NAS sites.

The NAS program was developed to modernize military air traffic control systems in the United States and its territories. DoD NAS is a component of the aviation system capital investment plan developed by the FAA. Pursuant to the Program Management Directive, the DoD must provide services within its delegated airspace which are comparable to the services which FAA provides to civil aircraft in civilian airspace. These services include flight following, separation, expeditious handling, radar approach control, and landing. The purpose of the DASR component of the USAF NAS program is to detect and process aircraft position and weather conditions in the vicinity of USAF airfields. The DASR will serve to accurately locate aircraft, in terms of range, azimuth, and altitude; provide information regarding aircraft identification code; identify emergency conditions; and report six discrete weather precipitation levels.

The NAS program is comprehensively upgrading air traffic control systems infrastructure by systematically replacing analog systems with state-of-the-art digital technology. The ASR-11 at Laughlin AFB is needed to replace the existing AN/GPN-12 airport surveillance radar, which was installed around 1977. The ASR-11 will improve system reliability, provide additional weather

data, reduce maintenance cost, improve performance, and provide digital data input to proposed new digital automation system air traffic controller displays.

The DASR facilities at Laughlin AFB will consist of: primary and secondary radar electronics and rotating antennas, tower, interconnecting cabling, an uninterruptable power supply, an emergency generator, power conditioning, electronic equipment grounding systems, a fuel storage system, foundations for an equipment shelter and antenna tower, an unpaved access road, fencing and security systems. Facility construction at Laughlin AFB would include a 0.45 acre site (140 feet by 140 feet) and a gravel access road. Once the new DASR system is operational, the existing AN/GPN-12 will be dismantled and structures will be razed. The ground would be reclaimed by Laughlin AFB.

A site survey identified three viable alternative sites. Site 1 is located on the southern portion of the base, approximately 1,000 feet southwest of the existing AN/GPN-12 radar system; 1,200 feet south of base housing; and 1,500 feet east of the golf course. The terrain is generally a flat gravel surface surrounded with scrub brush and sparse desert vegetation, consisting primarily of low growing species. Site 1 can be reached from the unnamed road that currently serves the existing AN/GPN-12; the road originates at the southern end of Fourth Street. Alternatively, Site 1 can be accessed from an unpaved road that originates near the southwestern curve of Vandenberg Drive.

Site 4 is located on a small knoll approximately 200 feet north of the site perimeter fence on the west side of the base, approximately 1,500 feet west of the base housing complex and other support unit buildings. Site 4 is located approximately 7,000 feet northwest of the existing AN/GPN-12 radar. The site is approximately 5,000 feet south of U.S. Route 90 and the Union Pacific Railroad. The terrain is flat and has scrub brush and sparse desert vegetation. Site 4 can be reached from an unnamed, unpaved road from either Laughlin Drive or Edwards Street.

Site 7 is located on the opposite side of the airfield, on the northeastern side of the base, in the vicinity of the ground-based parachute exercise area. Site 7 is located on flat terrain,

approximately 12,000 feet northeast of the existing AN/GPN-12 radar. The site is at the edge of an open field that is surrounded with small mesquite trees, and sparse, scrubby desert vegetation. Additionally, Site 7 is approximately 1,500 feet northwest of known archaeological sites in the Sacatosa Creek floodplain, where artifacts have been recovered. Site 7 can be reached via an unnamed, unpaved road off the perimeter road.

Construction at any of the three alternative ASR-11 sites would have minimal impacts on land use. Each of the three sites is currently identified as open space, which would ultimately be lost if the radar were constructed at that location. Additionally, the existing permitted use of seasonal hunting in the vicinity of Site 1 may be restricted by the operation of a radar. However, given the limited size (140 feet by 140 feet) of disturbance, when compared to the vast acreage of surrounding open space, this impact is not considered significant.

Construction at alternative Site 1, Site 4, or Site 7 would not adversely impact the socioeconomic conditions at Laughlin AFB. There may be a slight short-term increase in revenue generated in the surrounding area due to construction employees patronizing local businesses.

Construction of the ASR-11 at any of the alternative sites or removal of the existing AN/GPN-12 would not result in adverse impacts to existing utilities or transportation. Various lengths of open trench excavation would be needed to provide utility connections for the ASR-11 operation. Sufficient electrical power is available to each of the alternative ASR-11 sites. Telephone lines would be extended from the existing locations; the distance to existing service is less than one-half mile for Site 1, approximately one mile for Site 4, and two-to-three miles for Site 7. As a system separate from the dial-up phones, fiber-optic cable would be extended to the new RAPCON in the new Base Operations Complex, scheduled to be online in early 2001. Specific routes and distances will be determined when final design plans are completed; construction of the conduits could impact the immediate land use of the open trench excavation.

Impacts on transportation within Laughlin AFB would be minimal. The small size of the project would not produce a volume of construction related traffic that would impact existing conditions.

Heavy vehicles, including cement trucks, are frequently on base roads. Therefore, the cement trucks and other construction vehicles necessary for construction are not expected to have an impact on base roads. A new gravel road will be constructed for construction and maintenance vehicle access to the selected site. Proposed access to Site 1 would be via the existing road to the AN/GPN-12 site and then via a new gravel road to Site 1. The approximate length of the new road is 1,000 feet. Proposed access to Site 4 would be constructed from the back entrance road to Laughlin AFB, following the course of an existing gravel perimeter road for approximately 2,500 feet, and then continuing straight to Site 4. The approximate length of the new gravel road is 165 feet. Proposed access to Site 7 would be from the existing gravel perimeter road that runs along the tree line at the edge of the grass field near the parachute training area. The approximate length of the new road is 70 feet. Regardless of the site selected, the road will be engineered and designed for drainage, underlain with a geotextile filter fabric, and covered with 6 inches of crushed stone.

None of the proposed three sites is located in an area populated by sensitive noise receptors. Of the three sites, Site 1 and Site 4 are closest to base residential areas, and construction noise could be audible at residences. Site 7 is more distant from occupied areas and would have minimal noise impact. Construction vehicle noise and some noise from trenching may also be audible at various locations throughout Laughlin AFB, at sound levels consistent with existing sound levels at the base. It is not anticipated that there would be any long-term noise impacts as a result of operation of the ASR-11 radar. Noise levels generated by the ASR-11 would be maintained at a level consistent with current Occupational Safety and Health Administration (OSHA) regulations.

The short-term air quality impacts of constructing an ASR-11 would be similar at all of the three alternative sites. Site clearing and construction vehicle traffic would generate fugitive dust during the construction period. No new roads would be needed with the exception of gravel access driveways. Site 1 does require the construction of a somewhat longer gravel access road. All dust would be minimized during construction by applying water as needed. Consequently, no adverse short-term dust impacts are anticipated at any of the sites.

Construction vehicles and equipment would produce emissions that could temporarily affect air quality. However, because the number of vehicles required is relatively few and the construction duration is limited, emissions are not anticipated to exceed NAAQS in the vicinity of the NAS sites. Operation of the ASR-11 at any of the three alternative sites would produce identical emissions, which are not anticipated to have any adverse impact on air quality.

It is not anticipated that construction of the ASR-11 at any of the alternative sites would have adverse impacts on surface water or ground water. There are no surface water features in the vicinity of any of the three alternative sites. Neither the excavation for the radar tower footings (approximately seven feet deep) nor the excavation for the utility conduits are expected to penetrate the water table. Contaminated soils should also not be encountered at the 3 sites.

The construction of the ASR-11 would have no impact on unique vegetation or plant communities. All 3 sites are all dominated by ubiquitous species of West Texas scrub. Approximately 0.45 acres would be cleared to facilitate construction and allow for grading and other permanent improvements at any of the three sites, and additional area would be cleared for roadways. The clearing of a small area of West Texas scrub on a base with nearly 2,000 acres of open space is not a substantial adverse impact. Similarly, the impact to vegetation associated with the installation of the utility conduits (e.g. telephone, electricity, and fiber optic cable) is considered to be minimal, although somewhat greater for Site 4 and Site 7, which are located at greater distance from the RAPCON or existing utilities, thereby requiring a greater length of conduit.

Construction is not anticipated to have an adverse impact on wildlife habitat. The state threatened Texas horned lizard (*Phrynosoma cornutum*) is the only state listed species known to occur on Laughlin AFB. The Wildlife Diversity Program at the Texas Parks and Wildlife Department anticipates that the project would have no negative impact to rare species; similarly, the U.S. Fish and Wildlife Service determined that impacts on federally listed species are not likely.

The construction of the ASR-11 would not adversely impact aesthetic resources at Laughlin AFB. The aesthetic value of the ASR-11 at any of these sites would be consistent with the aesthetic value of military structures and facilities elsewhere on the base.

Based on archaeological and historical survey reports, cultural resource sites are not likely to be present within the project area for ASR-11 Sites 1, 4, or 7. However, utility construction/trenching for communication lines between Site 7 and the new RAPCON is expected to occur along the edge of known archaeological sites along the Sacatosa Creek floodplain. Although Site 7 itself is over 1000 feet from mapped archaeological sites, there is little space between the southernmost extent of base runways and the mapped extent of Sacatosa Creek floodplain archaeological sites; as a result, the fiber optic link route for Site 7 runs right along the edge of several archaeological sites. It is possible that further archaeological investigations would be needed if Site 7 is selected.

Some hazardous materials and waste would likely be used and generated during construction, including: equipment fuel, engine oil, hydraulic oil, grease, and other equipment operation and maintenance material. Refueling of equipment may also take place at the alternative ASR-11 site selected for construction. The construction phase of the DASR system would comply with applicable Laughlin AFB policies and guidelines for pollution prevention.

Operation of the radar facility at any of the three alternative sites would include the storage of diesel fuel in a 1,000 gallon above-ground storage tank (AST). The fuel tank would comply with all federal, state, and base spill control requirements. In addition, hazardous materials and waste would likely be used and generated during operation, including: equipment fuel, engine oil, hydraulic oil, grease, and other equipment operation and maintenance material. All hazardous waste would be used and disposed of in accordance with applicable regulations and base policies.

During the dismantling of the existing AN/GPN-12 radar, solid waste would need to be removed. All solid waste would be handled in accordance with standard base procedures. Any hazardous

materials produced would be disposed of following Laughlin AFB policies and protocols and relevant state regulations.

Facility siting at any of the three alternative sites would be a sufficient distance from occupied buildings that the radar operation would not pose a RFR hazard to personnel within the general vicinity of any of the DASR sites.

Construction and operation of the ASR-11 facility would result in minimal short-term and long-term impacts, regardless of which site is selected as the preferred location. The USAF has identified Site 4 as the preferred location for the DASR facility; however, both Sites 1 and 4 would be acceptable locations for the ASR-11 facility from an environmental perspective. Site 7 is somewhat less preferable due to the greater impacts that could result from the more extensive utility construction and utility construction adjacent to sensitive archaeological area.

1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA; 42 U.S.C. Sections 4321-4347) is the basic national charter for protection of the environment (CEQ, 1978). NEPA establishes policy, sets goals, and provides the process for carrying out the policy and achieving the goals. NEPA procedures were established to ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. To implement NEPA, the U.S. Air Force (USAF) has promulgated an internal instruction that contains policies, responsibilities, and procedures dictating how NEPA should be implemented for USAF projects (USAF, 2000b).

This environmental assessment (EA) has been completed as part of the NEPA process, in compliance with USAF instruction AFI 32-7061 (USAF, 2000b). According to this instruction, the environmental assessment is a written analysis which serves to (1) provide analysis sufficient to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI); and (2) aid federal agencies in complying with NEPA when no EIS is required. If this EA were to determine that the proposed project would significantly degrade the environment, significantly threaten public health or safety, or generate significant public controversy, then an EIS would be completed. An EIS involves a comprehensive assessment of project impacts and alternatives and a high degree of public input. Alternatively, if this EA results in a FONSI, then the action would not be the subject of an EIS. The EA is not intended to be a scientific document. The level and extent of detail and analysis in the EA is commensurate with the importance of the environmental issues involved and with the information needs of both the decision makers and the general public.

The proposed action addressed in this EA is the construction of a Digital Airport Surveillance Radar (DASR; specifically, an ASR-11) at Laughlin Air Force Base (AFB) in Texas. This proposed action is part of the Department of Defense (DoD) National Airspace System (NAS)

Program, which involves installation of new air traffic control equipment on U.S. Army, U.S. Navy, and USAF bases throughout the country. These radars are also being installed at commercial airports under the authority of the Federal Aviation Administration (FAA). The implementation of the NAS program at DoD bases was previously evaluated in a programmatic EA and FONSI (USAF, 1995a), which fully detail the need for the program. Environmental review at FAA airfields is being conducted separately.

The programmatic EA for the NAS program committed to completing site-specific NEPA documentation tiered from the programmatic EA for individual NAS sites. This EA addresses the site-specific impacts of locating an ASR-11 on Laughlin AFB, and evaluates the consequences of constructing an ASR-11 on both the natural and man-made environments.

1.2 PURPOSE OF THE ACTION

The NAS program was developed to modernize military air traffic control systems in the United States and its territories. DoD NAS is a component of the aviation system capital investment plan developed by the FAA. Pursuant to the Program Management Directive (USAF, 1994), the DoD must provide services within its delegated airspace which are comparable to the services which FAA provides to civil aircraft in civilian airspace. These services include: flight following, separation, expeditious handling, radar approach control, and landing.

The purpose of the DASR component of the USAF NAS program is to detect and process aircraft position and weather conditions in the vicinity of USAF airfields. The DASR will serve to accurately locate aircraft, in terms of range, azimuth, and altitude; provide information regarding aircraft identification code; identify emergency conditions; and report six discrete weather precipitation levels.

1.3 NEED FOR THE ACTION

The NAS program is comprehensively upgrading air traffic control systems infrastructure by systematically replacing analog systems with state-of-the-art digital technology. The ASR-11 at Laughlin AFB is needed to replace the existing AN/GPN-12 airport surveillance radar, which was installed around 1977. The ASR-11 will improve system reliability, provide additional weather data, reduce maintenance cost, improve performance, and provide digital data input to proposed new digital automation system air traffic controller displays. The proposed new ASR-11 will take advantage of the significantly increased capabilities of digital technology.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The proposed action is the installation of an ASR-11 at Laughlin AFB in Texas (Figure 2-1). Three alternative sites (Figure 2-2) for the radar on Laughlin AFB have been identified, in accordance with the NAS Siting Plan (USAF, 1995a). The alternative to constructing the ASR-11 at Laughlin AFB is the No-Action Alternative, which would result in the continued use of the existing AN/GPN-12 system.

2.1 PROPOSED ACTION: DASR AT LAUGHLIN AFB

2.1.1 DASR System. The DASR system would detect and process aircraft position and weather conditions at the airfield. DASR systems would consist of two subsystems: the Primary Surveillance Radar and the Monopulse Secondary Surveillance Radar. The purpose of the subsystems would be to accurately locate aircraft, in terms of range, azimuth, and altitude.

The Primary Surveillance Radar would transmit electromagnetic waves in the form of radio frequency pulses which backscatter from the surface of aircraft. The radar would measure the time required for an echo to return and the direction of the signal in order to determine the aircraft range and azimuth, respectively. By comparing variations in returned signal parameters, such as phase differences between pulses, the radar could separate moving targets from stationary clutter, such as mountains and trees. The primary radar would also report six discrete weather

precipitation levels (from mild to hazardous) via a processing channel dedicated to weather detection and reporting.

The Monopulse Secondary Surveillance Radar (also called the beacon radar) would be a cooperative system consisting of ground-based beacon interrogator/receiver systems and existing aircraft based transponders. The secondary radar would obtain additional information, such as identification code, barometric altitude, and emergency conditions, from an aircraft transponder. Various processing techniques would be used to decipher both overlapping responses from multiple aircraft (synchronous garble) and aircraft responses to other beacon systems (asynchronous interference). The beacon radar would also provide rapid identification of aircraft in distress.

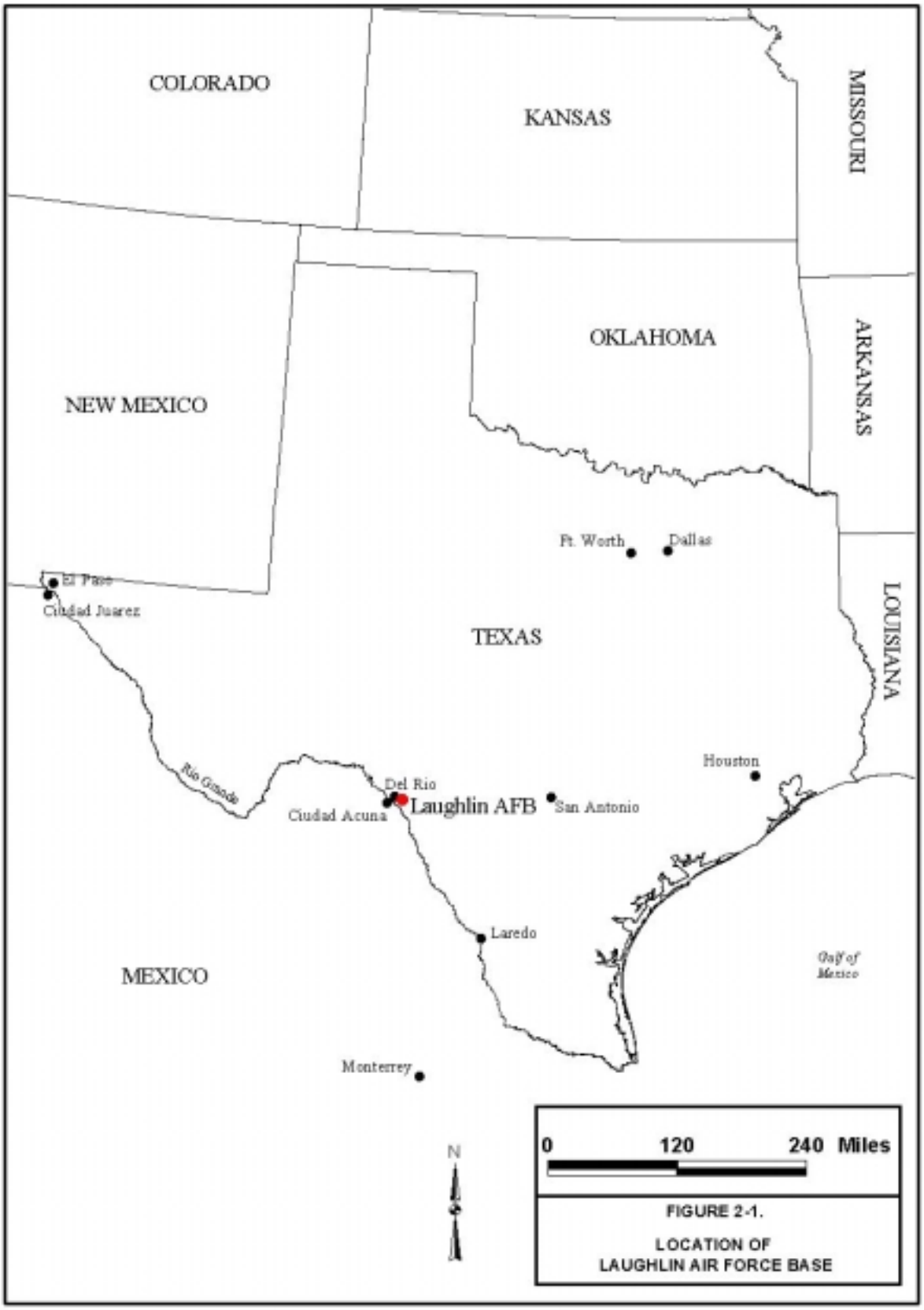
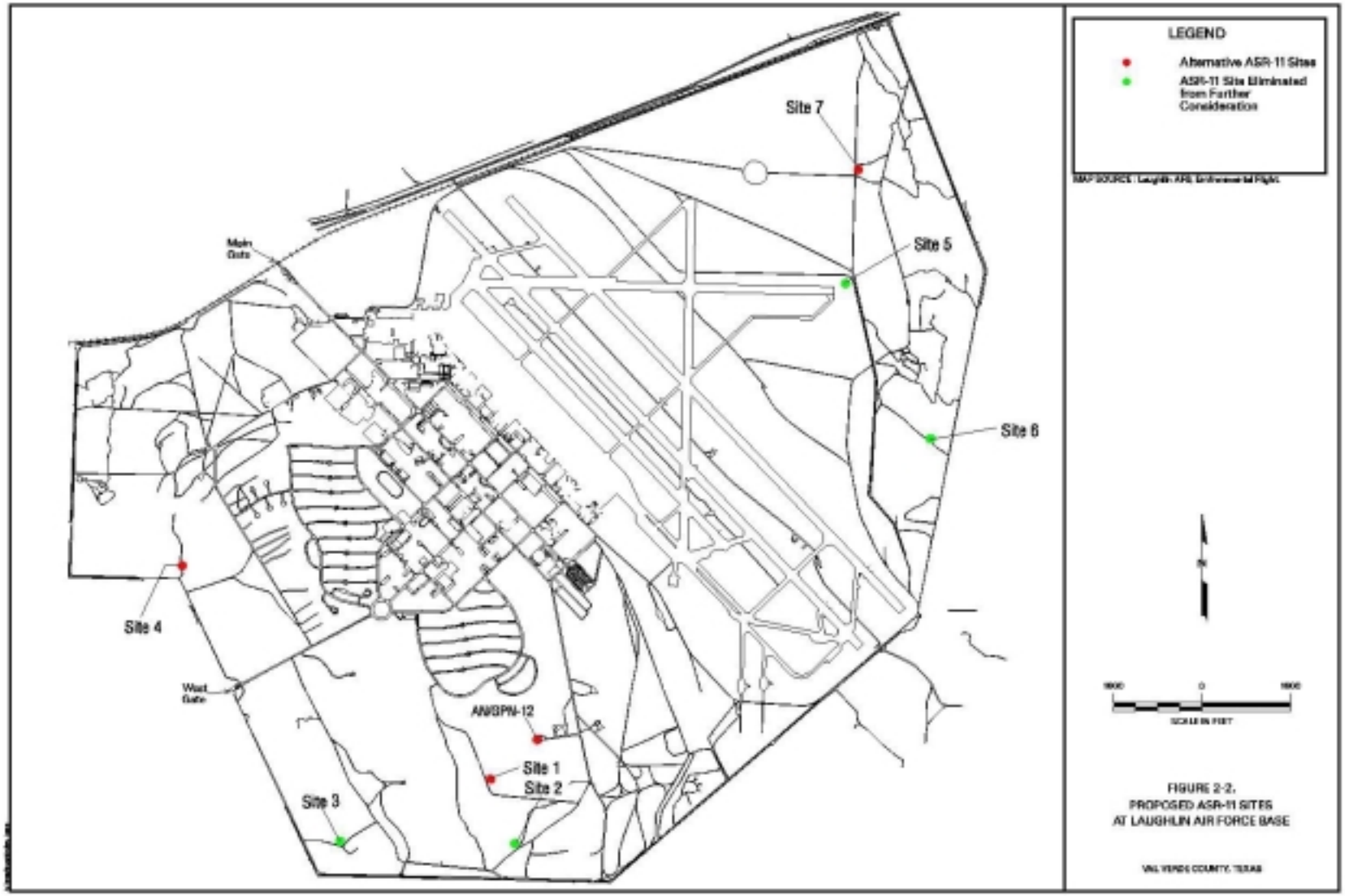


FIGURE 2-1.

LOCATION OF
LAUGHLIN AIR FORCE BASE


LEGEND
Alternative ASR-11 Sites
ASR-11 Site Eliminated from Further Consideration
Site 7
Site 5
Site 6
Site 4
Site 1
Site 2
Site 3
ANGPN-12
Main Gate
West Gate
SCALE IN FEET
FIGURE 2-2.
PROPOSED ASR-11 SITES
AT LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY, TEXAS

The DASR system would provide highly accurate target data to the Laughlin AFB Local Control Facilities and Military Control Towers. The ASR-11 would have clutter rejection, target accuracy, and probability of detection that are equal to or better than the existing GPN-12.

The DASR facilities at Laughlin AFB would consist of: primary and secondary radar electronics, rotating antennas, 47-foot tower, interconnecting cabling, an uninterruptable power supply, an emergency generator, power conditioning, electronic equipment grounding systems, a fuel storage system, foundations for an ASR-11 shelter and antenna, an unpaved access road, fences, and security systems. Facility construction primarily would be within a 0.45 acre site (140 feet by 140 feet), including a concrete pad foundation for an equipment shelter and antenna (USAF, 1999a), a 1,000 gallon above ground fuel storage tank for the emergency generator, and miscellaneous site improvements (minor regrading and installation of geotextile fabric beneath six inches of crushed stone).

Depending on the site chosen, approximately 1,450 to 2,500 feet of utility trenching between the edge of the site and existing duct banks/manholes would be required to connect the ASR-11 to existing electric lines (USAF, 1999a). The telephone connections and fiber optic connections may be made in the same utility conduit; however, the new telephone cable may connect to an existing cable at a different location within the utility conduit than the fiber optic connection. Between 5,400 and 17,500 feet of fiber optic cable, depending on the site chosen, would be required to connect the ASR-11 to the new Radar Approach Control (RAPCON), which Laughlin AFB anticipates will be completed as part of the new Base Operations Complex (under a separate project) by early 2001 (USAF, 1999a). No new roads would be constructed with the exception of a short driveway to access the radar tower. Once the new DASR system is operational, the existing AN/GPN-12 would be dismantled and structures would be razed. The ground would be reclaimed by Laughlin AFB.

2.1.2 Alternative ASR-11 Sites. Three alternative sites on Laughlin AFB have been identified as potential locations for the ASR-11, based on the siting criteria contained in the *National Airspace System Digital Airport Surveillance Radar Siting Plan* (USAF, 1995a). The three sites evaluated

in this EA were identified based on operational, construction, and environmental criteria. The operational criteria included the following (FAA, 1992):

- **The site should not be located closer than 0.5 mile from the end of any existing or planned runway.**
- **The site should not be located closer than 0.5 mile from any point of required detection coverage.**
- **The site should not be located closer than 2,500 feet from any existing or planned electronic equipment installation or facility.**
- **The site should not be located less than 0.5 mile from National Weather Bureau radars and radiosonde equipment.**
- **The site should not be located closer than 1,500 feet to any above-ground object which would interfere or cause degradation in the ASR-11 operation.**

Operational characteristics of the new ASR-11 as compared to the existing AN/GPN-12 are shown in Table 2-1.

Table 2-1. Comparison of Characteristics of Existing AN/GPN-12 and Proposed ASR-11

	AN/GPN-12	ASR-11
Frequency	2700-2900 MHZ	2700-2900 MHZ; 2 frequencies separated by at least 30 MHZ
Power Peak	355 kW	19.5 kW (1 microsec) 18.0 kW (89 microsec)
Average	--	1600 Watts (Solid state)
Pulse Repetition Frequency	1002-1006 pulses/second	720-1050 pulses/second

Sources: USAF, 1991a; USAF, 1995a

Construction criteria included siting the ASR-11 in an area with a slope of less than 20 percent and away from occupied existing structures, railroads, highways, runways and taxiways, or power lines. The environmental criteria for siting included avoiding a number of sensitive resources,

including: ecological/wildlife refuges, preserves, conservation areas and sanctuaries; wild and scenic rivers; prime and unique farmlands; historical, archaeological, and cultural sensitive sites; wetlands; threatened and endangered species habitat; designated hazardous waste sites; and floodplains. The details of the siting process are described in the Integrated Site Survey Report prepared by Raytheon Systems Company (USAF, 1999a).

Initial site selection screening criteria applied in June 1998 identified seven sites (Sites 1 through 7, Figure 2-2) for consideration at the in-briefing, held July 21, 1998. Sites 2, 3, 5, and 6 were eliminated from further consideration. Site 2 is located approximately 1,800 feet south of the existing AN/GPN-12 (and approximately 1,400 feet from Site 1). Site 2 was rejected from in-depth survey because the site offered the same predicted coverage as Site 1, which is closer to the RAPCON (the nearest source for electrical power and the destination point for the fiber optic cable). Site 3, approximately 3,500 feet west of the existing AN/GPN-12, was considered disadvantageous due to its location near terrain which seasonally floods; it appeared that an access road would have to cross this depression, as would the conduits for electrical and communication lines. Site 3 was also considered disadvantageous due to its distance from existing power and communication lines. Sites 5 and 6 are located on the opposite (northern) side of the airfield from the existing RAPCON, making the sites less desirable due to the distance required to provide communications lines. Site 5, approximately 2 miles northeast of the existing AN/GPN-12, is located near the end of an abandoned runway that is used for "hot cargo parking." The site would violate a safe distance requirement for occupied structures and/or important navigational facilities; for this reason Laughlin AFB personnel requested the site be eliminated from further consideration. Site 6, approximately 2 miles east-northeast of the existing AN/GPN-12, was considered less desirable, not only because of its distance from existing power and communication conduits, but also because the comparatively lower elevation of this site would require access across a seasonal wet depression.

Sites 1, 4 and 7 were selected for further investigation (Figures 2-3 through 2-5). Site 1 is located on the southern portion of the base, approximately 1,000 feet southwest of the existing AN/GPN-12 radar system and 1,200 feet south of base housing. Site 4 is located on a small knoll on the

western portion of the base, approximately 1,500 feet west of the base housing complex and other support unit buildings. Site 7 is located on the opposite side of the airfield, on the northeastern side of the base, in the vicinity of the ground-based parachute exercise area.

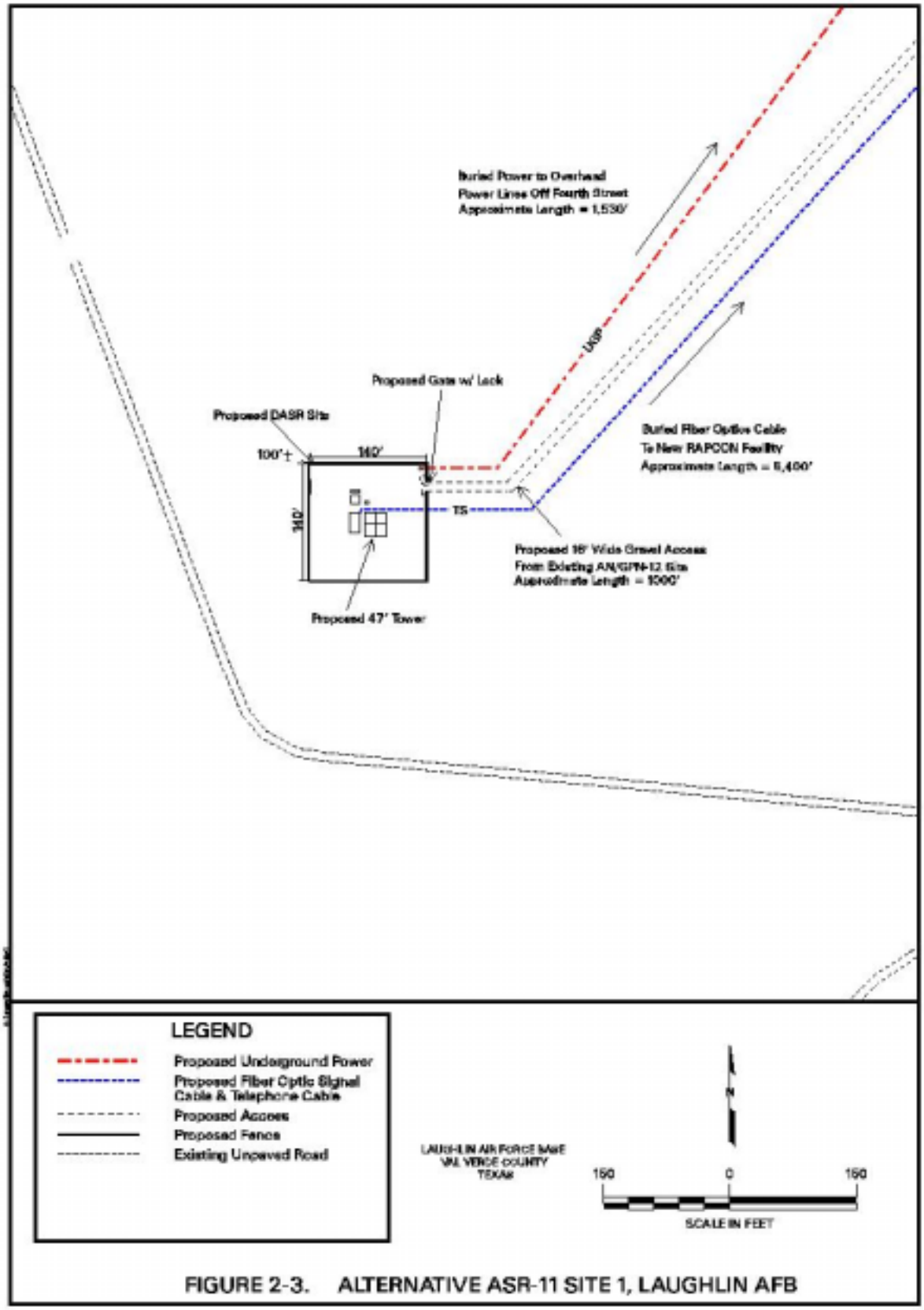


FIGURE 2-3. ALTERNATIVE ASR-11 SITE 1, LAUGHLIN AFB

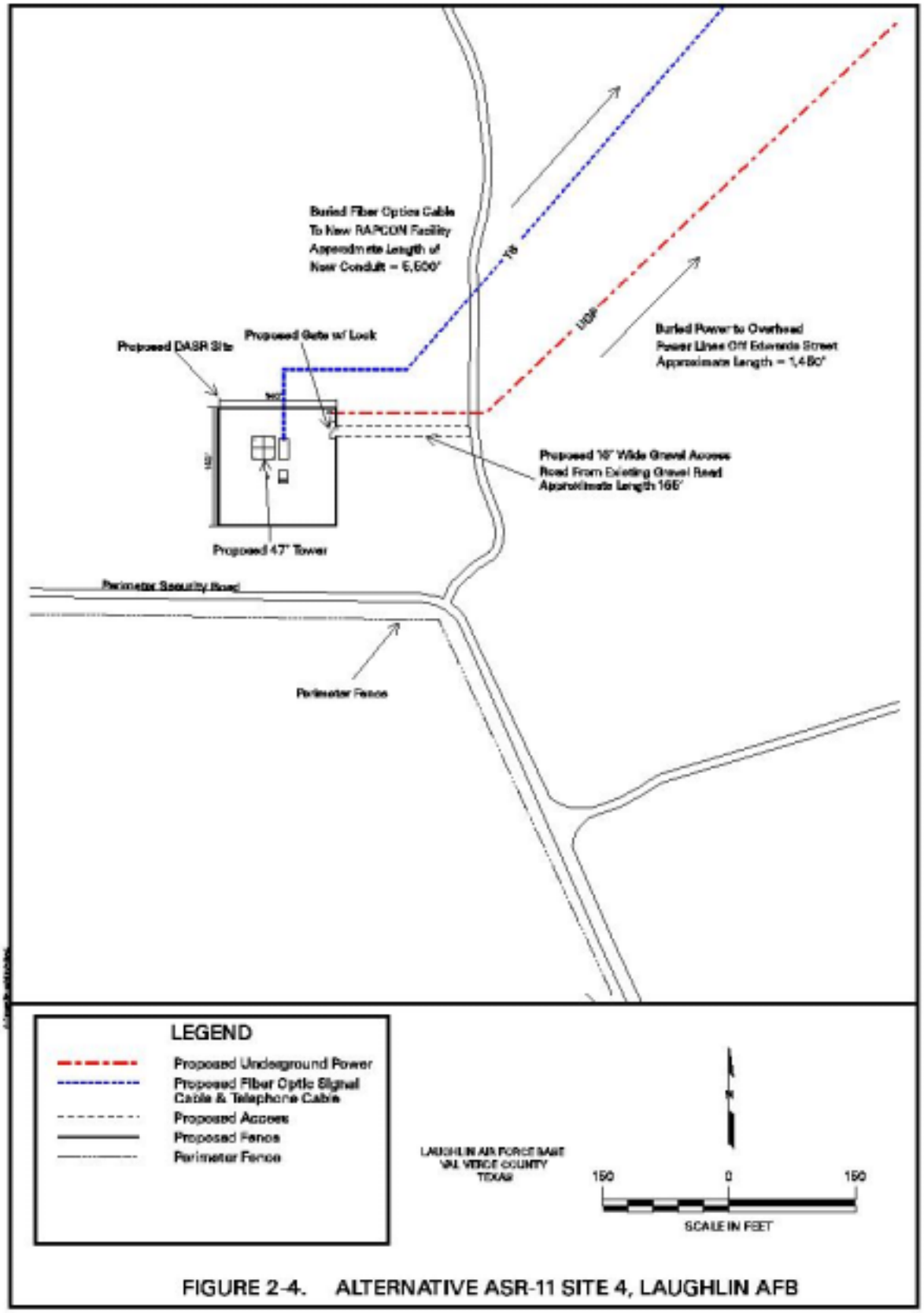


FIGURE 2-4. ALTERNATIVE ASR-11 SITE 4, LAUGHLIN AFB

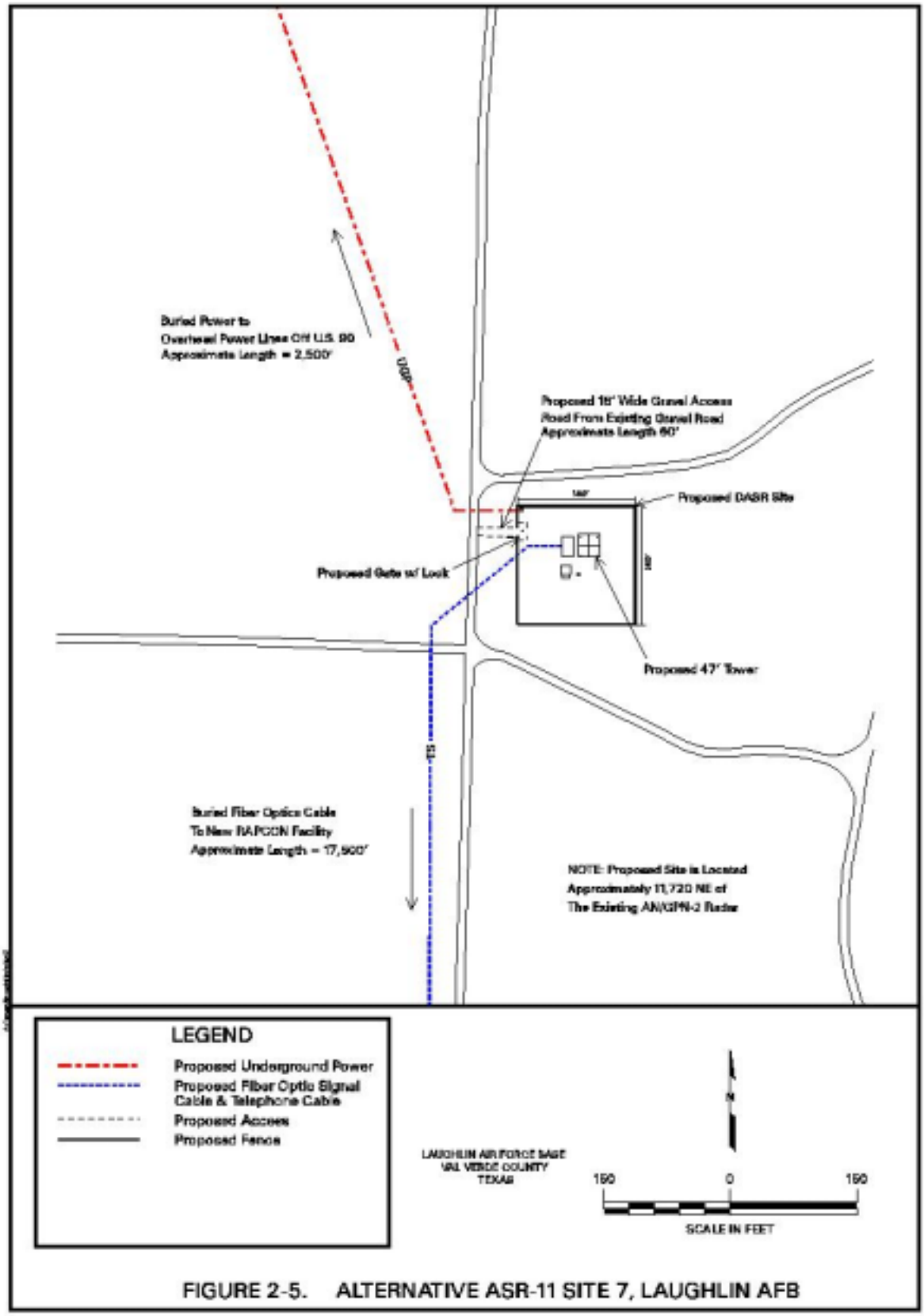


FIGURE 2-5. ALTERNATIVE ASR-11 SITE 7, LAUGHLIN AFB

3.0 AFFECTED ENVIRONMENT

The existing environmental conditions and future conditions without the project are described for each site in order to provide a baseline against which potential impacts related to construction or operation of the ASR-11 can be determined. General conditions at Laughlin AFB are presented for each of the parameters, and site specific detail is included, as available. Environmental conditions at the existing AN/GPN-12 are also described in order to assess any potential issues associated with its removal. The following information was obtained from several documents/reports obtained from Laughlin Environmental staff and supplemented with data collected during a site visit in July 1998.

3.1 LAND USE

3.1.1 Existing Conditions

Laughlin AFB is located in Val Verde County, Texas, seven miles east of the city of Del Rio, Texas, and less than ten miles northeast of the Rio Grande, which forms the boundary between the United States and Mexico. Approximately 97 percent of the land in Val Verde County is in agricultural use as rangeland for grazing sheep, goats, cattle, and horses. Laughlin AFB coordinates with Val Verde County and the City of Del Rio through the Middle Rio Grande Development Council in accordance with Executive Order 12372 (USAF, 1997a). The Middle Rio Grande Development Council is an agency created with state approval to manage regional development, and to foster coordination between Val Verde County, the City of Del Rio, and private, civic, institutional, and community organizations.

Laughlin has a large land area. The airfield itself, including the Clear Zones, occupies less than half the main installation's 4,500 acres. Facilities cover another 750 acres, concentrated in a single cantonment. This leaves more than 2,000 acres of recreational land and open space. There is sufficient open land that during deer season, hunting with rifles is permitted in open areas (USAF, 1998a). Additionally, ninety-seven acres of the main base are leased for grazing (USAF,

1998a). The area to the east of the runways is identified as the last open space available for future growth (USAF, 1991b).

Land use at the main base is classified into thirteen categories: airfield (primary surface/clear zones), airfield pavement (runway/taxiway/apron), aircraft operations and maintenance, technical training, industrial, administrative support, community commercial, community service, medical, housing (accompanied), housing (unaccompanied), outdoor recreation, and open space (see Figure 3-1) (USAF, 1998a).

Aircraft operations and maintenance activities are located near the flightline, with the exception of the Radar Approach Control (RAPCON) facility, which is located in an outlying area to the south of the field. Industrial land uses are concentrated on the northern end of the cantonment, convenient to the flightline but separated from residential and community areas. The fire training area, munition storage facilities, compost yard and sewage treatment plant are at the southern end of the base, well separated from other uses (USAF, 1998a).

Site 1. Site 1 is located approximately 1,000 feet west-southwest of the existing AN/GPN-12 radar. It is approximately 1,200 feet southwest of the existing RAPCON, 1,200 feet south of base residential areas, and 1,500 feet east of the golf course, on the south side of the base. The terrain is generally a flat gravel surface surrounded with scrub brush and sparse desert vegetation. Site 1 is mapped as open space on Laughlin AFB's general plan and is within an area currently used seasonally for hunting (USAF, 1998a).

Site 4. Site 4 is located approximately 7,000 feet northwest of the existing AN/GPN-12 radar, on a ridge near the highest point of the airbase. The site is approximately 1,500 feet southwest of base residential areas and 200 feet north of the site perimeter fence on the west side of the base. The site is approximately 5,000 feet south of U.S. Route 90 and the Union Pacific Railroad. The terrain is flat and has scrub brush and sparse desert vegetation. Site 4 is mapped as open space on Laughlin AFB's draft General Plan (USAF, 1998a).

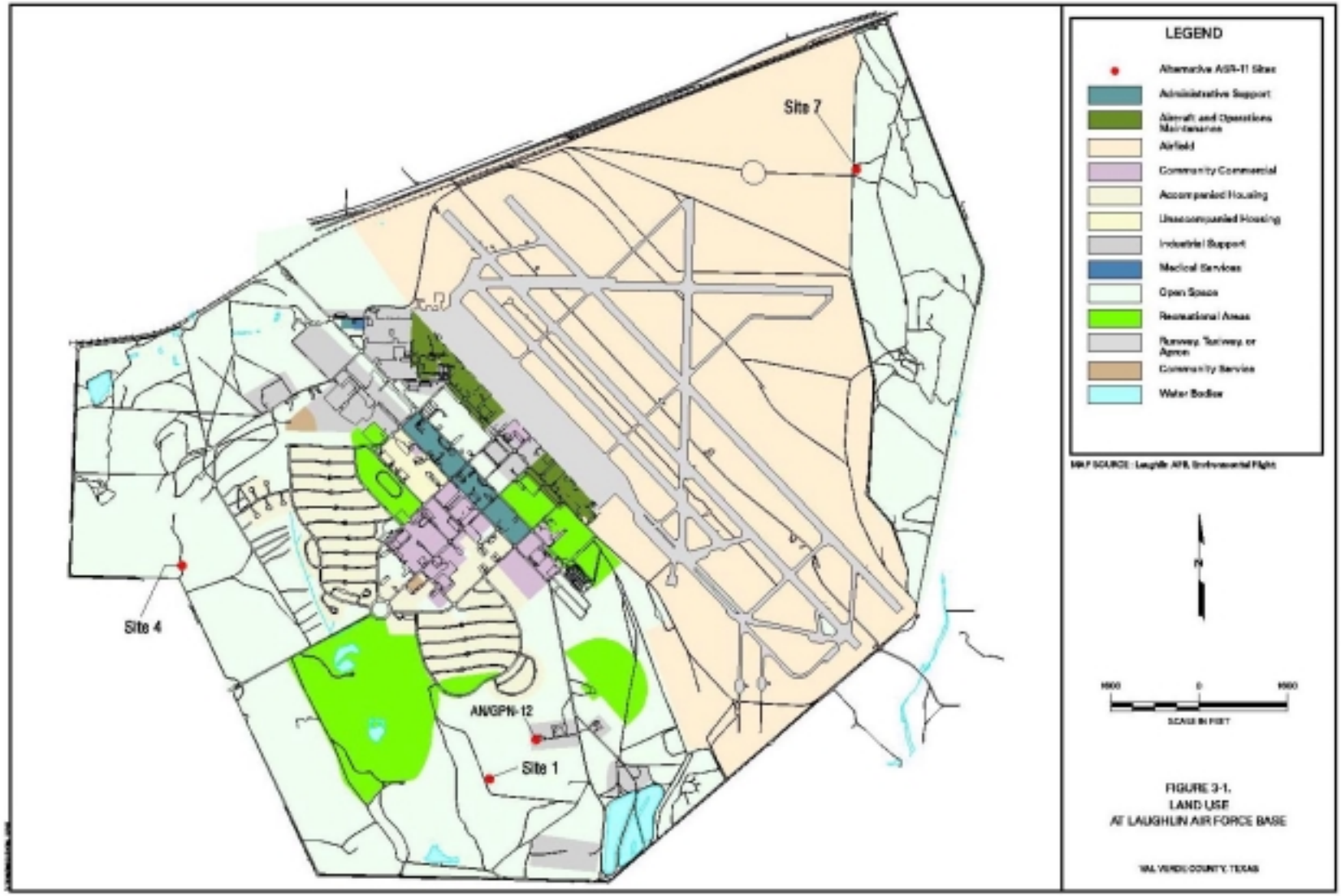


FIGURE 3-1.
LAND USE
AT LAUGHLIN AIR FORCE BASE

Site 7. Site 7 is located approximately 12,000 feet northeast of the existing AN/GPN-12 radar, east of the runways, near the ground-based parachute practice area on the far northeast corner of the base. The terrain is flat. The site is at the edge of an open field that is surrounded with scrub brush, small trees, and sparse desert vegetation. Site 7 is mapped as open space on Laughlin AFB's draft General Plan (USAF, 1998a).

AN/GPN-12. The existing AN/GPN-12 radar is located approximately 300 feet south-southwest of the RAPCON, 800 feet southeast of base housing, and 1,200 feet north of the base sewage disposal ponds. The existing radar site (and adjoining RAPCON facility) is indicated as aircraft operations and maintenance land use, surrounded by open space in the draft General Plan for Laughlin AFB (USAF, 1998a).

3.1.2 Future Baseline Without the Project

The 1995 Laughlin AFB General Plan (USAF, 1998a) indicates that the base intends to construct a new control tower and new RAPCON facility, and plans to redevelop the Operations Building (Building 306). This will create a new Base Operations Complex, allowing all flight operations to be concentrated in the same area near the flightline. The new Base Operations Complex is tentatively scheduled for construction in the year 2000. A new RAPCON facility will be constructed within the new Base Operations Complex, tentatively scheduled to be on-line in 2001, before completion of ASR-11 installation (USAF, 1999d; USAF, 1999f).

Current mission plans do not include expansion of the airfield or cantonment, but should the need arise, there is sufficient space on Laughlin AFB for expansion (USAF, 1998a). In the future without the project, no land use changes are anticipated at either Site 1, Site 4, Site 7, or at the existing AN/GPN-12.

3.2 SOCIOECONOMICS

3.2.1 Existing Conditions

This section addresses the population, employment, general economic condition, and housing of the study areas. Socioeconomic data specific to the alternative ASR-11 site locations and the existing AN/GPN-12 radar system do not exist. However, there are data for the general area of Laughlin AFB, the nearby city of Del Rio, and the surrounding county of Val Verde, Texas.

3.2.1.1 Population. The population of Del Rio is 30,750, as measured by the 1990 U.S. Census. This represents nearly 80 percent of the population of Val Verde county and over 57 percent of the surrounding six-county area (USAF, 1998a). The population of Val Verde County was estimated at 42,736 persons in 1994, 10.4 percent higher than the estimated population in 1990. From 1980 to 1990, the county population grew approximately 7.8 percent; this is substantially less than the population growth of Texas, which was approximately 19.4 percent during the same time period (USAF, 1997a).

Population associated directly with Laughlin AFB in 1994 totaled 3,761 people, including 1,146 permanent military personnel, 1,527 dependents, 184 students, and 904 civilians. Approximately 891 military retirees reside in the county (USAF, 1997a).

3.2.1.2 Employment. Del Rio has a small manufacturing base and a thriving retail sector. Tourism and outdoor recreation have become increasingly important since the opening of Lake Amistad National Recreation Area in 1969. Import and export trade has grown steadily in recent years due to the increasing number of "Maquilladora" facilities (cross-border industries) in Ciudad Acuńa, Del Rio's sister city in Coahuila, Mexico (USAF, 1998a).

The Federal Government is the largest single employer in the middle Rio Grande region, accounting for nearly 4,500 jobs, or 23 percent of Val Verde's total workforce. Laughlin AFB is the largest local employer, but the U.S. Border Patrol, the Customs Service, and the

National Park Service also have a substantial number of employees in the area. Laughlin AFB alone employs more than 3,100 civilian and Air Force personnel. The base's civilian payroll, including Civil Service, contract and Non-appropriated Fund employees, was $58.8 million in 1997, while the military payroll was $37 million. In 1997, the base generated an estimated 1,082 indirect jobs in the local community, with an annual payroll of $30.4 million (USAF, 1998a).

3.2.1.3 Expenditures of Laughlin AFB. Expenditures associated with the operation of Laughlin AFB include: contracts and procurements of services; materials; equipment; and supplies. These expenses provide jobs for contractors, and other secondary employment opportunities. Laughlin AFB receives services such as: range operations and maintenance, engineering support, and management support.

Laughlin AFB paid $20.5 million into the local economy in direct purchases, construction contracts, and other expenditures (USAF, 1998a). Altogether, including payroll, indirect jobs, and expenditures, the total economic impact of Laughlin on the local economy is estimated to be approximately $147 million per year (USAF, 1998a).

3.2.1.4 Housing. Within Laughlin AFB, two housing areas - East and West Capehart - contain a total of 600 units in 330 buildings. The housing units were constructed in 1959 and 1969. Most officers are assigned units in East Capehart, while enlisted personnel are assigned to West Capehart. In 1994, Laughlin AFB began a program to repair, renovate, and modernize housing units. The fifth of five phases of that program was scheduled to begin in 1999. In 1996, a housing market analysis concluded that the availability of suitable off-base housing in the Del Rio area was only "fair" (USAF, 1998a).

3.2.2 Future Baseline Without the Project.

The population and economy of the Del Rio area are expected to continue to grow at least through the year 2030 (State of Texas, 1997). It is not expected that there would be any substantial change in socioeconomic trends due to changes at Laughlin AFB unless there is a major change (expansion or reduction) in base operation. Presently there is no indication of any planned changes on base that would substantially affect population, housing, or employment.

3.3 UTILITIES AND TRANSPORTATION

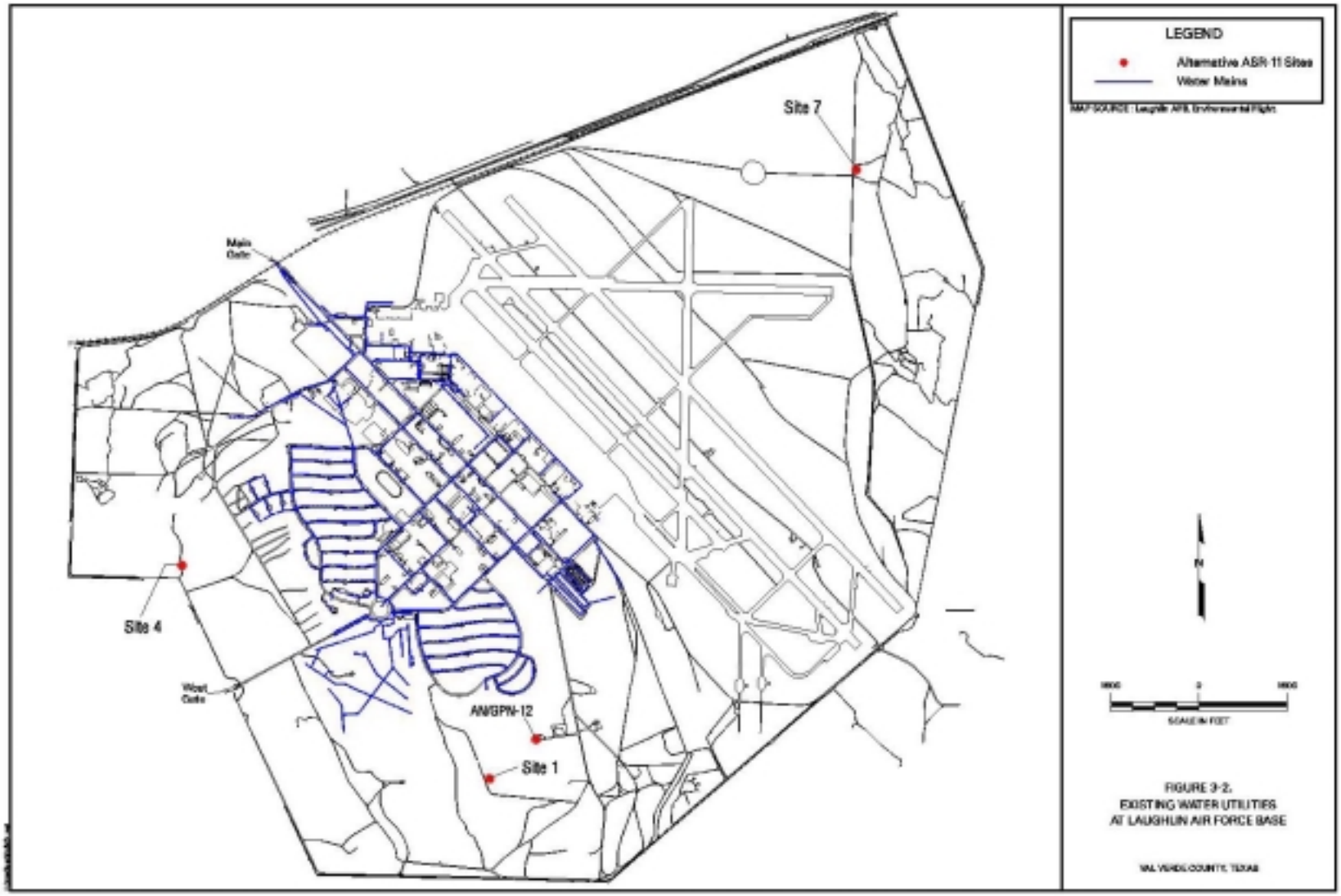
3.3.1 Existing Conditions

The utilities supplied to Laughlin AFB, including the area of the alternative ASR-11 sites and the existing AN/GPN-12 are discussed in this section. The utilities include water, wastewater, solid waste, electricity, telephone, and natural gas. Transportation, mainly roadway management and usage, is described in 3.3.1.7.

3.3.1.1 Water Supply. Laughlin AFB obtains chlorinated potable water from the City of Del Rio (USAF, 1998b). The source of this water is the San Felipe Springs near Del Rio. The Air Force has auxiliary pumps at the springs and a 16-inch diameter water main, approximately 6 miles long, to transport water to the base (USAF, 1997a; USAF, 1998a). The springs have a flow rate of 40 million to 90 million gallons per day (mgd), which is well above the demand of Del Rio and Laughlin AFB, combined (USAF, 1988; USAF, 1998a; USAF, 1998b). The water is pumped to a one-million gallon water storage tank at the base. Three pumps are used to transfer water from the ground storage tank to the base distribution system and elevated storage tanks (USAF, 1997a). The elevated storage tanks provide a pressure of 53 pounds per square inch to the distribution mains (USAF, 1998a). A half-million gallon deluge tank near the flight line provides emergency fire-fighting capability. There are no active wells at Laughlin AFB (USAF, 1995b). The base layout of water lines is depicted on Figure 3-2.

Water is not supplied to the immediate vicinity of any of the alternative ASR-11 sites or to the existing AN/GPN-12.

3.3.1.2 Wastewater Treatment. The sanitary sewage collection system conveys wastewater to the sanitary sewage treatment plant, which consists of a three-pond facultative lagoon system (USAF, 1998a). The wastewater treatment system is permitted by the Texas Natural Resource Conservation Commission (TNRCC) to handle up to 1,000,000 gallons per day (USAF, 1998a). The entire system has excess capacity and is in compliance with applicable TNRCC requirements (USAF, 1998a). Recently, annual average inflow was approximately 166,000 gallons per day, with a maximum of 519,000 gallons per day (USAF, 1999b). Heavy storm events have a large impact on flow rates (USAF, 1999b). It is estimated that outflow may be as little as 50 percent of inflow, due to evaporation (USAF, 1999b).


LEGEND
Alternative ASR 11 Sites
Water Mains
Site 7
Main Gate
Site 4
West Gate
AN/GPN-12
Site 1
N
SCALE IN FEET
FIGURE 3-2.
EXISTING WATER UTILITIES
AT LAUGHLIN AIR FORCE BASE

Discharge from the wastewater treatment system is into a un-named creek which flows 3.5 miles to Sacatosa Creek and thence to Sycamore Creek a few hundred yards above the point at which the latter stream enters the Rio Grande (USAF, 1998a). The treatment plant is in good condition but the collection system is in need of repairs (USAF, 1998a). The sanitary sewage system consists of clay, concrete and cast iron mains. Many of the mains are 40 years old and in poor condition. The larger collector lines are in particularly bad shape (USAF, 1998a). Wastewater utility lines are depicted on Figure 3-3.

There is a wastewater line approximately 200 feet from Site 1. Site 4, Site 7, and the AN/GPN-12 are not near wastewater lines.

3.3.1.3 Solid Waste. Nonhazardous solid waste is collected by contract and disposed of off-base (USAF, 1998a). The solid waste is disposed of by the contractor in a landfill facility owned by the City of Del Rio. The landfill has a remaining capacity of 2.5 million cubic yards and a remaining life expectancy of approximately 15-18 years (USAF, 1997a). The base recycling center accepts aluminum and steel cans, paper, cardboard, plastic, and glass. Grass clippings and brush are composted to the maximum extent possible (USAF, 1998a).

In 1995, Laughlin AFB disposed of 2,660 tons (3,547 cubic yards) of solid waste. Of this total, 947 tons were generated from the base housing and 1,713 tons from the base operations (USAF, 1997a).

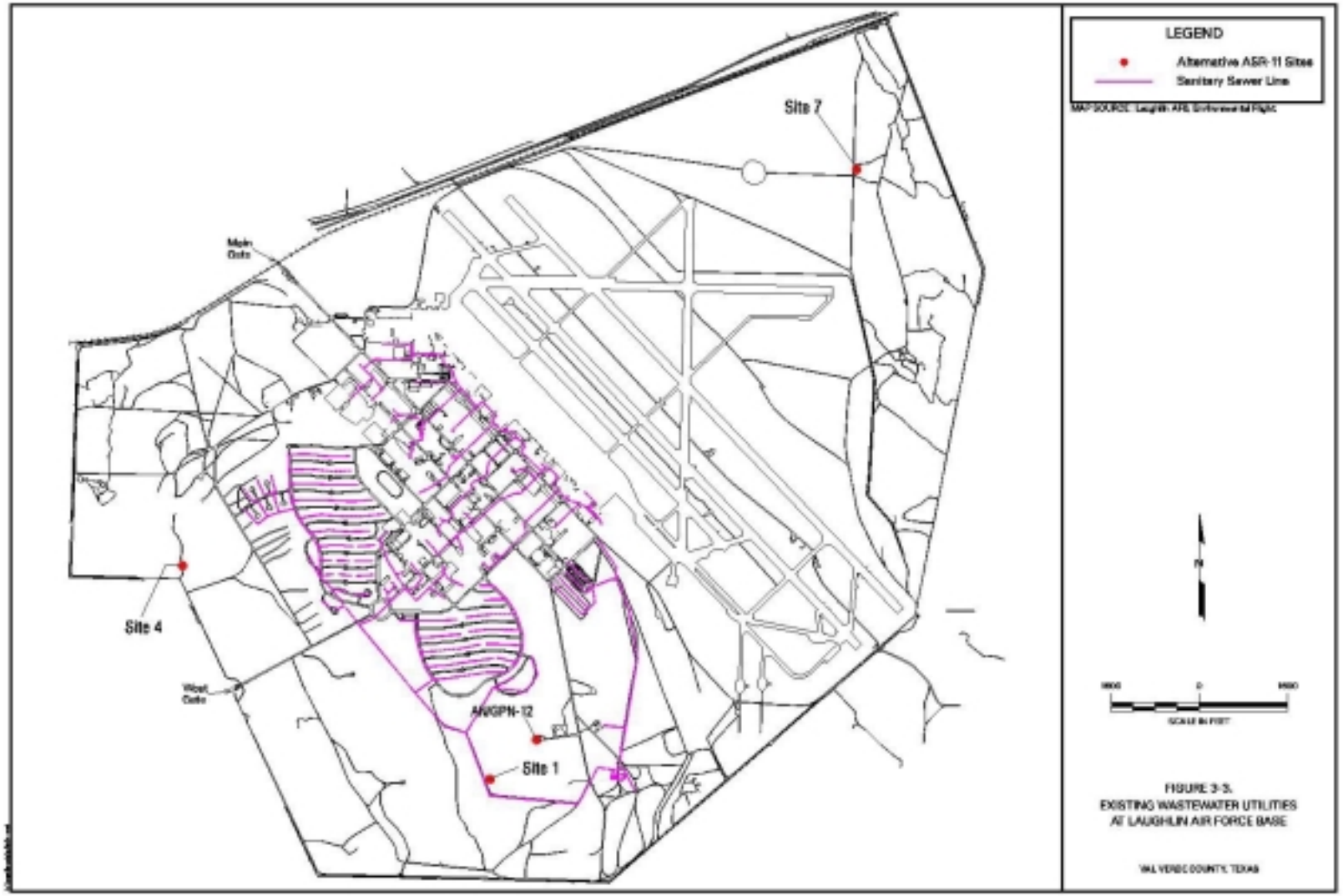


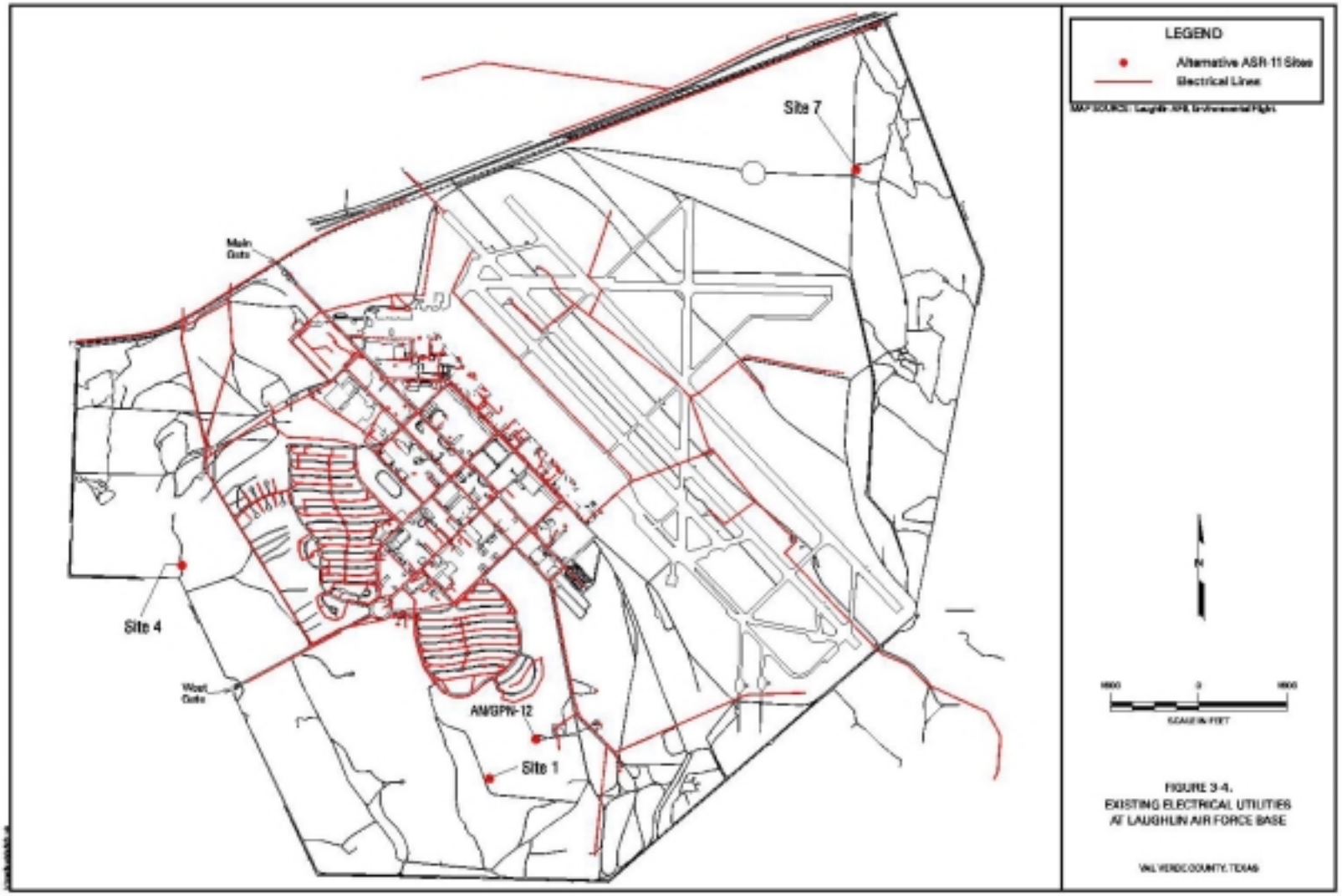
FIGURE 3-3.
EXISTING WASTEWATER UTILITIES
AT LAUGHLIN AIR FORCE BASE

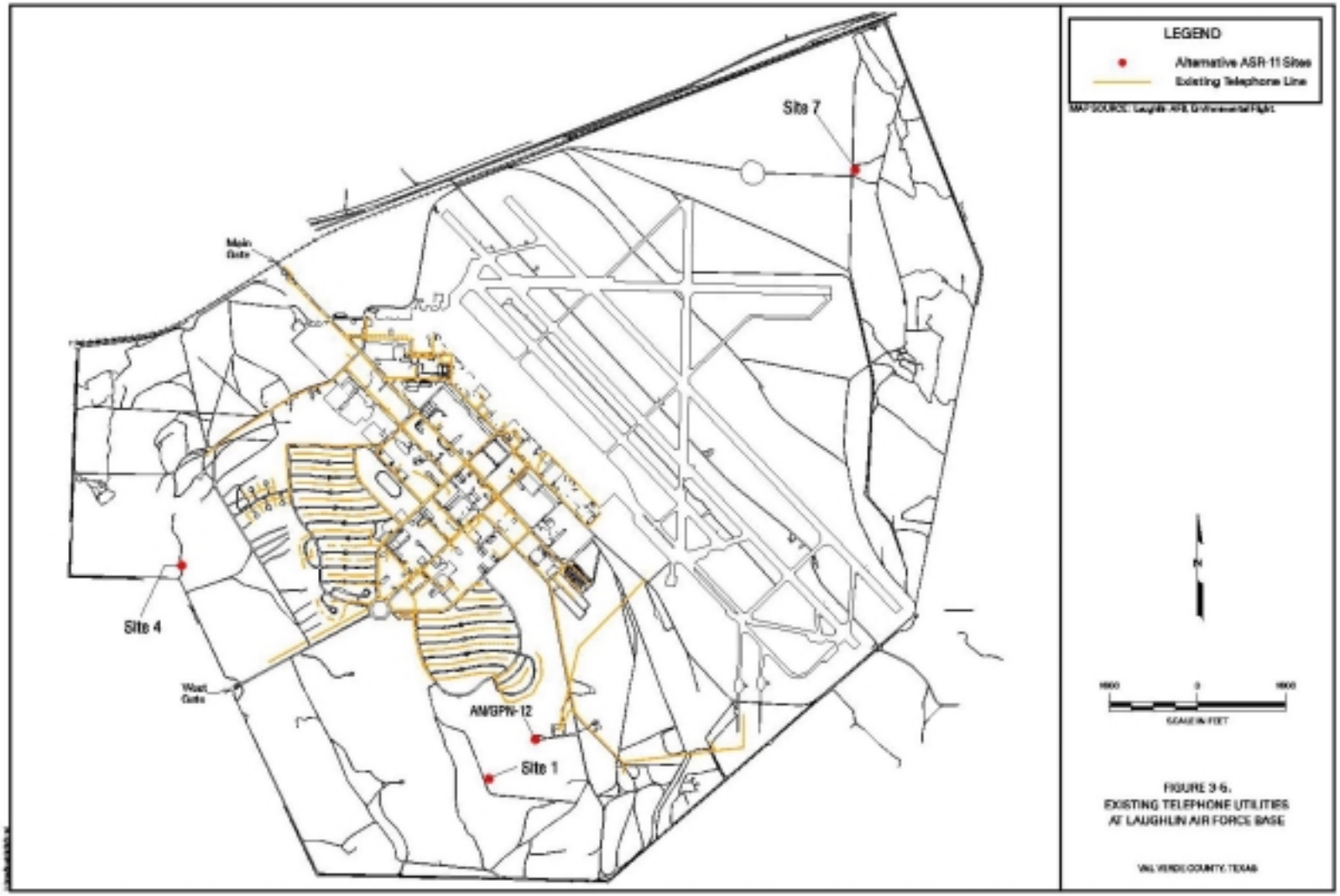
3.3.1.4 Electricity. Electrical power is supplied to Laughlin AFB by the Central Power and Light Company from the Hamilton Road substation located two miles west of the base (USAF, 1997a). Two 12-megawatt (MW) feeder lines enter the base from the northwest (USAF, 1998a). The power is then distributed within the base through 16.6 miles of primary overhead power lines, 6.7 miles of primary underground power lines, 14.6 miles of secondary (stepped-down) overhead power lines, and 25 miles of secondary underground power lines (USAF, 1998a). The maximum power demand is 8,000 kilovolt-amperes (KVA), with an available maximum of 20,000 KVA (USAF, 1998a).

Electrical utility lines within the base are depicted on Figure 3-4. Electrical power currently exists within 1/4 to 1/2 mile of the alternative ASR-11 sites. Site 1 is approximately 1,530 feet west of an existing underground line along the extension of Fourth Street; Site 4 is approximately 1,450 feet west of an existing distribution substation at the west end of Edwards Street; and Site 7 is approximately 2,500 feet south of an existing distribution power line located along U.S. Route 90 (USAF, 1999a). Electrical power is available at the existing AN/GPN-12 site.

3.3.1.5 Telephone. Telephone equipment provides for internal communication at Laughlin AFB and connects the base to the regional system. Much of the telephone system within the base is overhead copper wires (USAF, 1998a), which is adequate for voice communication but does not have sufficient capacity for high-speed data communication.

Telephone utility lines within the base are depicted on Figure 3-5. For Site 1, the closest existing telephone service is the existing AN/GPN-12 site; Site 1 is approximately 900 feet from service at the existing AN/GPN-12 site and 1,400 feet from service at RAPCON (USAF, 1999a). Site 4 is approximately 1,500 feet west of existing standard telephone service in the base housing area; near the end of Edwards Street. Dial-up telephone lines are currently available at the end of Arizona Avenue, approximately 10,000 feet from Site 7 around the north end of the airfield, and at existing telephone service at RAPCON, approximately 17,000 feet from Site 7 around the south end of the airfield. Telephone service is available at the existing AN/GPN-12 site.


LEGEND
Alternative ASR-11 Sites
Electrical Lines
Site 7
Main Gate
Site 4
West Gate
AN/GPN-12
Site 1
N
FIGURE 3-4.
EXISTING ELECTRICAL UTILITIES
AT LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY, TEXAS


LEGEND
Alternative ASR-11 Sites
Existing Telephone Line
Site 7
Main Gate
Site 4
West Gate
AN/GPN-12
Site 1
N
SCALE IN FEET
FIGURE 3-6.
EXISTING TELEPHONE UTILITIES
AT LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY, TEXAS

3.3.1.6 Natural Gas. Laughlin AFB receives natural gas service from Pacific Gas and Electric Texas Gas Partnership, L.P. (USAF, 1999b). Within the base, the old steel gas pipe system was recently replaced with polyethylene pipes (USAF, 1997a). Natural gas consumption varies according to season, with peak usage occurring from November to March (USAF, 1999b).

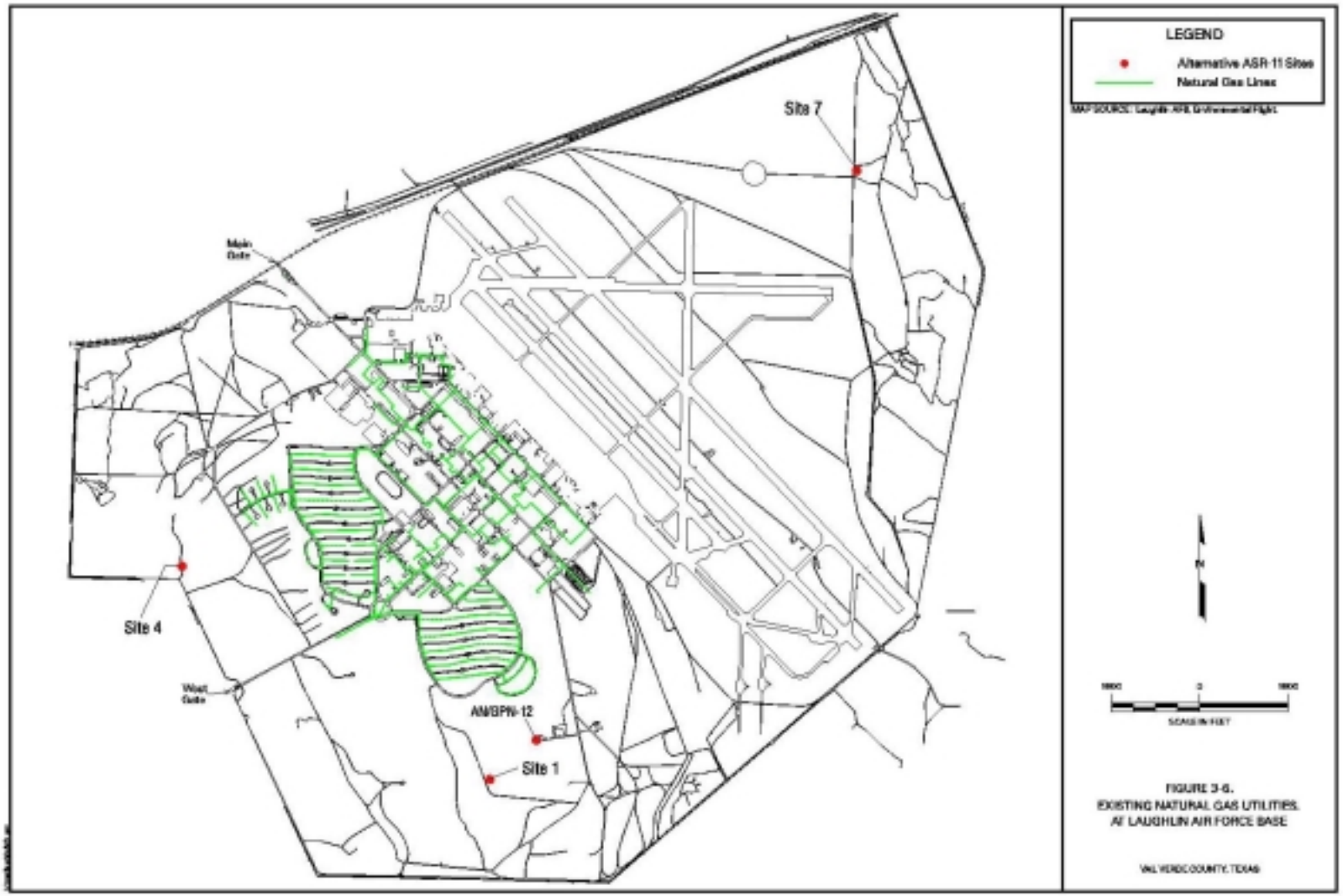
Natural gas utility lines within the base are depicted on Figure 3-6. There are no natural gas lines in the immediate vicinity of any of the alternative ASR-11 sites or the existing AN/GPN-12.

3.3.1.7 Transportation. Most transportation to and from Laughlin AFB is via U.S. Route 90, which connects Del Rio to the west with San Antonio to the east. U.S. Route 277 serves as an alternate commuting route from Del Rio.

While the

Union Pacific Railroad has trackage along the north edge of Laughlin AFB, Del Rio is the closest train station to Laughlin AFB. Both freight and passenger service are available to Los Angeles and El Paso in the west and to San Antonio and other cities to the east. Bus service is available from Del Rio to San Antonio, Laredo, El Paso, and other destinations.

The road layout at Laughlin AFB is shown in Figure 3-7. U.S. Route 90 serves the main gate. The west gate, served by U.S. Route 277, is open during weekday rush hours only (USAF, 1998a). There are three distinct street patterns at Laughlin AFB. The primary street grid was laid out in 1942; its main axis was Third Street, now called Liberty Drive, which parallels the flightline and runway 13/31. Liberty Drive is Laughlin AFB's "main street." The numbered streets (First through Seventh) run parallel to Liberty. A secondary grid pattern is formed by Alabama, Arizona, Arkansas, and California Avenues and their associated cross-streets at the north corner of the cantonment. The secondary grid was laid out at the same time as the primary grid, but at a 45 degree angle to it, to accommodate railroad tracks that were once located in this area. A third street pattern is the Military Family Housing areas. These streets were laid out in 1959 on a curvilinear plan that follows the natural contours of the land (USAF, 1998a).


LEGEND
Alternative ASR-11 Sites
Natural Gas Lines
Site 7
Main Gate
Site 4
West Gate
AN/GPN-12
Site 1
N
SCALE IN FEET
FIGURE 3-6.
EXISTING NATURAL GAS UTILITIES
AT LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY, TEXAS

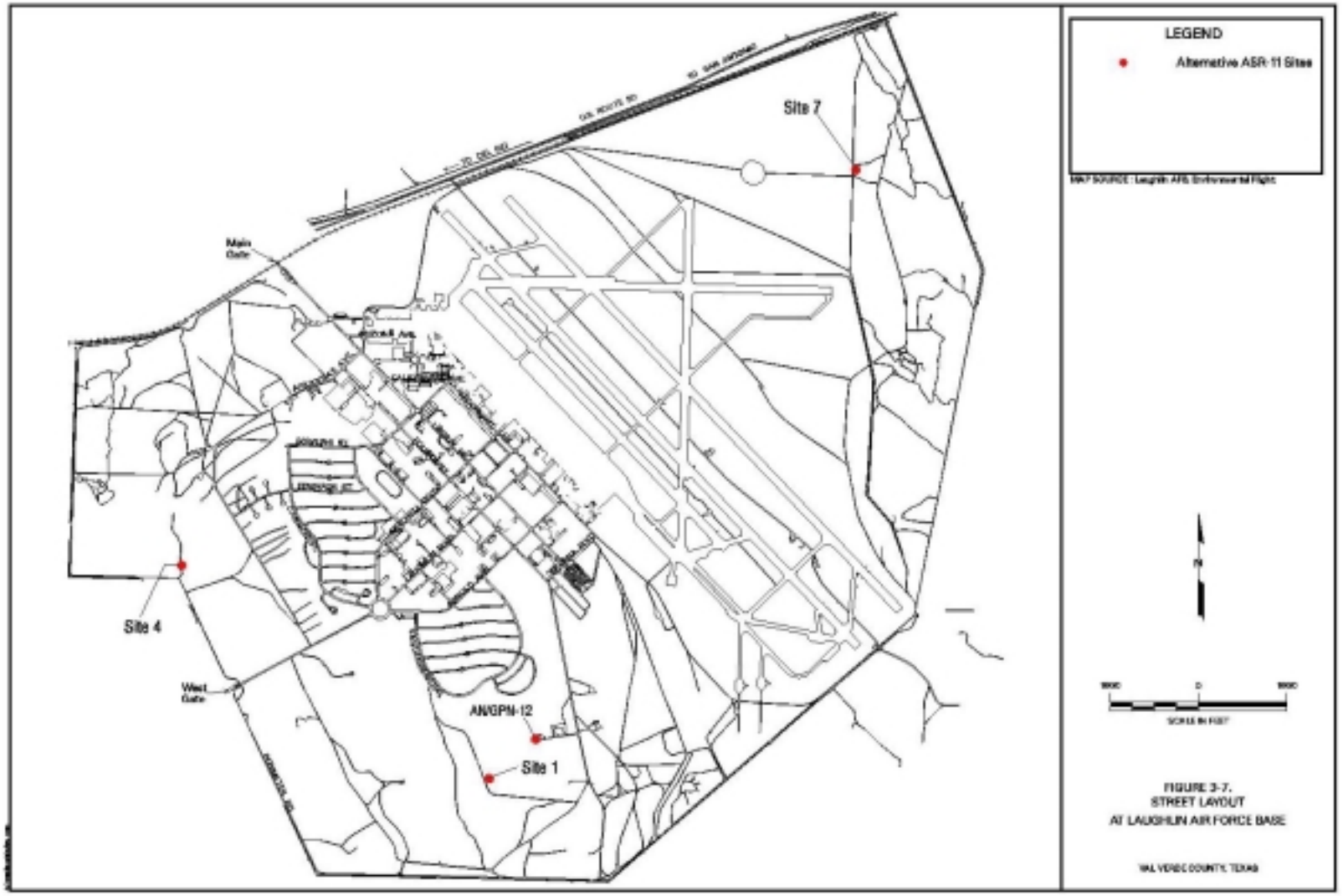


FIGURE 3-7.
STREET LAYOUT
AT LAUGHLIN AIR FORCE BASE

All streets within the cantonment and Military Family Housing Areas are asphalt-paved, but there are at least 32 miles of unpaved roads at Laughlin AFB. These include the perimeter (fence) road and several other dirt roads in unimproved areas that have been created over the years for various purposes (USAF, 1998a).

Traffic congestion is rarely a problem at Laughlin AFB. Rush hour traffic backups at the main gate seldom result in more than a few minutes delay, unless a train is in the crossing. Paved streets, sidewalks, and unimproved tracks facilitate transportation by automobile, bicycle, or on foot, within the limits of Laughlin AFB. No formal vehicle count has been performed since 1982, when the Military Traffic Management Command counted approximately 640 vehicles entering the main gate and 100 vehicles entering the west gate during the morning rush hour (USAF, 1998a).

None of the alternative ASR-11 sites, nor the existing AN/GPN-12, is located next to a paved street. Heavy-duty road vehicles do not need roads to traverse most of the open land at the base, and each of the alternative ASR-11 sites can be reached by off-road travel. Site 1 can be reached from the unnamed road that currently serves the existing AN/GPN-12; the road originates at the southern end of Fourth Street. Alternatively, Site 1 can be accessed from an unpaved road that originates near the southwestern curve of Vandenberg Drive. Site 4 can be reached from an unnamed, unpaved road from either Laughlin Drive or Edwards Street. Site 7 can be reached via an unnamed, unpaved road off the perimeter road.

3.3.2 Future Baseline Without The Project

The quantity and quality of the potable water supplied to the base are considered adequate to support current and future mission needs (USAF, 1998a). The base is in the process of installing new water mains in the Military Family Housing Area and replacing all 199 fire hydrants and the laterals and shutoff valves leading to them (USAF, 1998a).

The sanitary sewer collection system is in need of major repairs; Laughlin AFB is awaiting funding for the reconstruction of the collection system (USAF, 1998a).

Laughlin AFB has a $2 million per year program to replace the airfield electrical distribution system, upgrade facility lighting and wiring, and replace service entrances and the primary electrical distribution system. Eventually, all power lines will be placed underground through the base's "pole-away" program (USAF, 1998a).

No substantial change in solid waste and natural gas utility conditions are anticipated at Laughlin AFB in the near future. Improvements of telephone and general communication capacity are anticipated. Increased commercial traffic associated with Mexican trade is anticipated in the future and there are long-term plans for road construction in the Del Rio area (USAF, 1998a). No substantial change in traffic conditions within the base is expected, other than the elimination of on-street parking and improving pedestrian access (sidewalks) (USAF, 1998a).

3.4 NOISE

Existing noise environments at the three alternative ASR-11 sites and existing AN/GPN-12 are discussed in this section. Environmental noise levels from aircraft are described in terms of the day-night average sound level, in units of A-weighted decibels (dBA). The day-night average sound level parameter is used by many federal agencies to describe noise exposure and to predict the community effects of long-term exposure to environmental noise. The day-night average sound level parameter is also used by federal agencies to determine the appropriateness of a given use of specific land (land use compatibility) relative to the average level of environmental noise experienced at that location. Air Force land use compatibility guidelines are documented in the *Air Installation Compatible Use Zone (AICUZ) Program Handbook* (USAF, 1991c). Noise levels below 65 decibels are considered to be compatible with residential land use. Residential land use is discouraged for areas with noise levels in the range of 65-70 decibels, strongly discouraged for areas in the range of 70-75 decibels, and considered generally unacceptable for areas that exceed

75 decibels. For comparison, noise levels from familiar sounds, expressed in decibels, are tabulated in the Programmatic EA (USAF, 1995a).

3.4.1 Existing Conditions

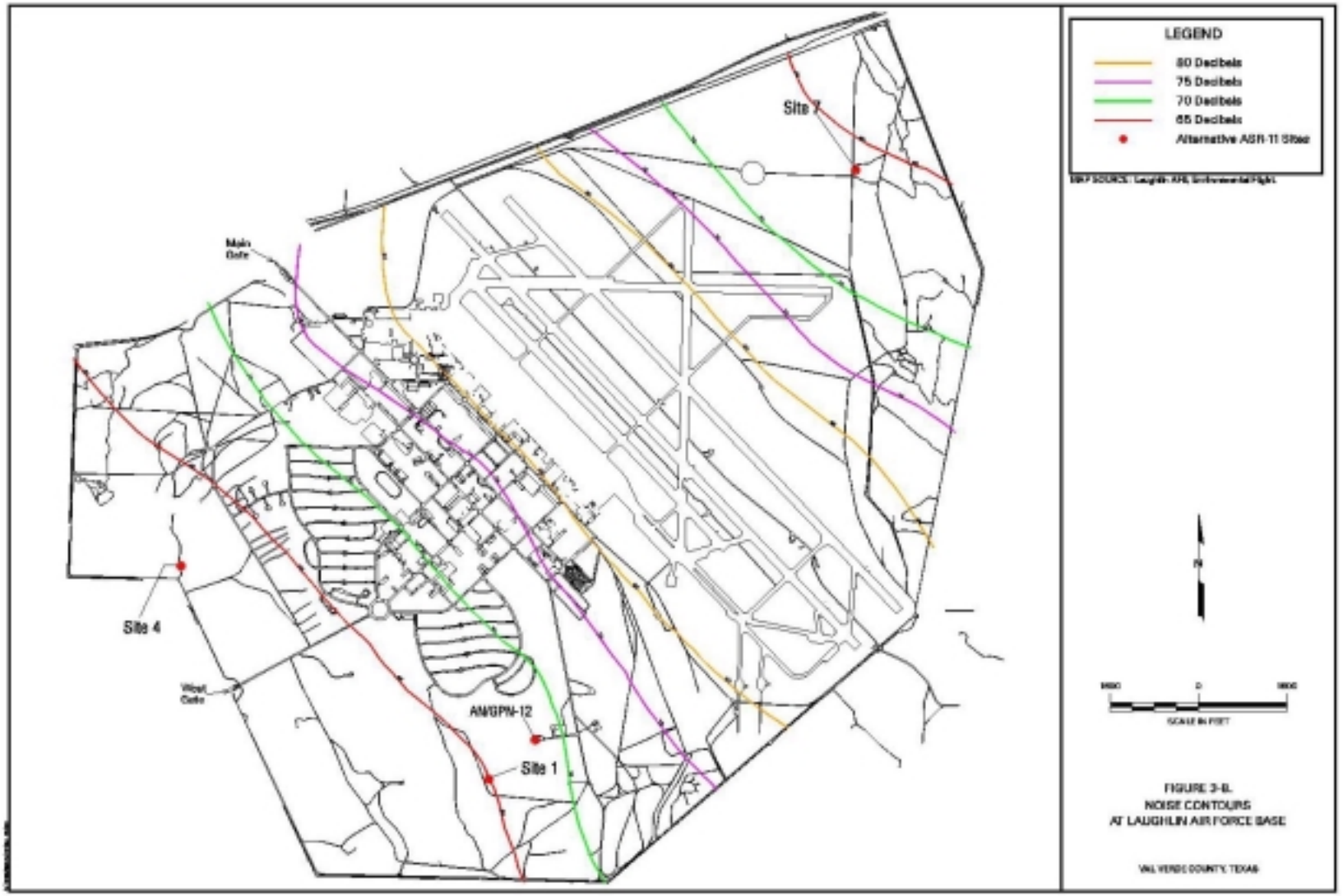
The primary source of noise in the vicinity of Laughlin AFB is military aircraft operations and aircraft maintenance. Figure 3-8 depicts noise contours on Laughlin AFB. These contours were obtained from the 1992 T-1 Beddown EA (as referenced in USAF, 1997a). The illustrated noise levels reflect only the contribution of aircraft noise to ambient environmental noise levels. The noise generated by surface vehicles is not included in the contours; the contribution from such sources to the total noise levels is minimal, except in the immediate vicinity of roadways (USAF, 1997a). The noise associated with activities at Laughlin AFB is characteristic of noise associated with flying operations at most Air Force installations and civilian airports. During periods of no aircraft activity at Laughlin AFB, noise associated with base activities results primarily from maintenance and shop operations, ground traffic movement, occasional construction, and similar sources. Analysis of noise contours for Laughlin AFB indicates that T-37 ("Tweets"), T-1 ("Jayhawks"), and T-38 ("Talons") operations are the dominant noise sources at Laughlin AFB.

AICUZ is an Air-Force wide program established to provide guidelines for compatible development in the vicinity of the base. Compatibility is determined by a number of factors, including noise impacts from aircraft operations. An AICUZ study, associated with the JPATS (T-6) Beddown EA, is scheduled to be completed in March 2000. The updated study will supplement a previous AICUZ study completed in 1991 and will address the change from the existing T-37 to T-6 aircrafts. This change will be phased over an 8 year period beginning with the first shipment in January 2002. The new AICUZ study will take into account new noise contours for the T-6 aircraft. Since the new contours will only be slightly different than the existing baseline contours, noise contour information was collected from the 1992 T-1 Beddown study for this EA (USAF, 2000a).

The proposed sites of the new ASR-11 radar at Laughlin AFB are all located in areas that are fairly remote from other activities on the main base, and are at least 1/4 mile from residential receptors (see Section 3.1.1) and other noise sensitive receptors such as schools and medical facilities. Based on conditions observed during the July 1998 field visit, ambient sound levels at each of the alternative ASR-11 sites are fairly quiet, with the exception of times when jet aircraft fly overhead. Figure 3-8 shows sound level contours for the base. Based on these contour levels, the ambient sound level at Site 1 is 65 dBA, the ambient sound level at Site 4 is less than 65 dBA, and the ambient sound level at Site 7 is between 65 and 70 dBA. Based on the figure, the ambient sound level at the existing AN/GPN-12 is also between 65 and 70 dBA.

3.4.2 Future Baseline Without the Project

It is not anticipated that there would be any substantial change in ambient noise conditions at any of the sites or at the AN/GPN-12 in the future without the project. No major changes in land use activities are expected to occur, and thus it is anticipated that there would be no major changes in noise levels.


LEGEND
80 Decibels
75 Decibels
70 Decibels
65 Decibels
Alternative ASR-11 Sites
Site 7
Main Gate
Site 4
West Gate
AN/GPN-12
Site 1
N
FIGURE 3-8.
NOISE CONTOURS
AT LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY, TEXAS

3.5 AIR QUALITY

Existing air quality characteristics in the vicinity of the three alternative ASR-11 sites and existing AN/GPN-12 are discussed in this section. Regional data expected to characterize the specific sites are described.

The U.S. Environmental Protection Agency (USEPA) defines ambient air in 40 CFR Part 50, as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, USEPA has promulgated ambient air quality standards and regulations. The National Ambient Air Quality Standards (NAAQS) were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, USEPA has issued NAAQS for six criteria pollutants (Table 3-1): carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), and particulates (e.g., PM_{10}, particles with a diameter less than or equal to a nominal 10 micrometers (μm). National primary standards are set to protect human health with an adequate margin of safety for even the most sensitive portion of the human population. Secondary standards are set for some pollutants to protect against damage to plants, animals, and materials. The Texas Administrative Code (§30 TAC 101.21), amended to be effective May 7, 1979, states that the NAAQS (primary and secondary), as amended, will be enforced throughout all parts of Texas (ELR, 1998).

3.5.1 Existing Conditions

Ambient air at Laughlin AFB is similar to ambient air encountered generally in southwestern Texas. The climate is semiarid, with warm, dry weather. The average daily high temperature ranges from 62°F in January to 96°F in July; average daily low temperatures range from 41°F in January to 75°F in July (USAF, 1997b). Average annual precipitation is 18.6 inches, most of which falls from April to October (NOAA, 1999). Prevailing winds are from the southeast in the summer months and from the northeast in the winter (USAF, 1995b).

Table 3-1. National Ambient Air Quality Standards

Pollutant	Federal Standards (USEPA, 1988)	
	Primary Standard	Secondary Standard
Sulfur dioxide (SO_2)		
annual arithmetic mean[1]	0.03 ppm[a] (80 μg/m³)[b]	No secondary standard
24-hour average[2]	0.14 ppm (365 μg/m³)	No secondary standard
3-hour average[2]	No primary standard	0.50 ppm (1300 μg/m³)
Particulates (PM-10)[3, 4]		
annual arithmetic mean[1]	50 μg/m³	Same as primary standard
24-hour average[5]	150 μg/m³	Same as primary standard
Particulates (PM-2.5)[6]		
annual arithmetic mean[1]	15 μg/m³	Same as primary standard
24-hour average[7]	65 μg/m³	Same as primary standard
Carbon Monoxide (CO)		
8-hour average[2]	9 ppm (10 mg/m³)	No secondary standard
1-hour average[2]	35 ppm (40 mg/m³)	No secondary standard
Ozone (O_3)		
8-hour average[8]	0.08 ppm (157 μg/m³)	Same as primary standard
1-hour average[9, 10]	0.12 ppm (235 μg/m³)	Same as primary standard
Nitrogen Dioxide (NO_2)		
annual arithmetic mean[1]	0.053 ppm (100 μg/m³)	Same as primary standard

Table 3-1. National Ambient Air Quality Standards (continued)

Pollutant	Federal Standards (USEPA, 1988)	
	Primary Standard	Secondary Standard
Lead (Pb) calendar quarterly avg[1]	1.5 μg/m^3	Same as primary standard

1. Not to be exceeded
2. Not to be exceeded more than once a year
3. Particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers
4. The PM-10 standards are being phased out over time
5. 99th percentile 24-hour concentration
6. Particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
7. 98th percentile 24-hour concentration
8. Average of three consecutive annual fourth-highest daily maximum rolling 8-hour average concentrations
9. Not to be exceeded more than one day per year
10. Applies only to areas designated nonattainment when the ozone 8-hour standard was adopted in July 1997

a. ppm=parts per million by volume
b. Parenthetical value is an approximately equivalent concentration
Source: USEPA, 1998a (40 CFR 50)

The combination of sparse vegetative cover, intermittent winds, and low soil moisture leads to entrainment of dust into the air, both in the Del Rio area and in more distant locations (e.g., Texas panhandle and Mexico), especially when dry air moves in from the north and west. Other than airborne dust and pollen, sources of air pollution in the region are relatively minor due to the low population density and low level of industrialization. General sources beyond the immediate Del Rio region include: (1) petroleum production near Midland, Texas (200 miles northwest), (2) industrial facilities in Monterrey, Nuevo Leon, Mexico (250 miles south), and (3) urbanized areas of San Antonio, Texas (120 miles east), and El Paso, Texas / Ciudad Juarez, Chihuahua, Mexico (400 miles northwest).

Laughlin AFB is in the Metropolitan San Antonio Interstate Air Quality Control Region (AQCR), AQCR 217 (USEPA, 1998b). The Del Rio area has no air monitoring stations within the federal network of air quality monitoring stations. There are monitoring stations in San Antonio (4), in Laredo (1), in the lower Rio Grande Valley (3), and in the El Paso/Ciudad Juarez area (15) (TNRCC, 1999a). Among these, only El Paso constitutes a nonattainment area (for particulate

matter and ozone) as defined by the USEPA. Monitoring stations for "air toxics" are located in the same four areas (San Antonio, Laredo, lower Rio Grande valley, El Paso/Ciudad Juarez), although the number of stations is smaller (TNRCC, 1999b). There are no monitoring stations closer to give a more representative indication of conditions in the Del Rio area.

Within Texas, there are four nonattainment areas for ozone: Houston-Galveston-Brazoria, Beaumont-Port Arthur, Dallas-Fort Worth, and El Paso (USEPA, 1998c). The Houston area is listed as severe, Dallas-Fort Worth and El Paso are serious, and Beaumont-Port Arthur (which is contiguous to the Houston area) is moderate. El Paso is also a nonattainment area for PM_{10} (particulate matter below 10 μm), and Dallas is also a nonattainment area for lead. These four areas have considerably higher populations and more industry than Del Rio. Since there are no air monitoring stations in the area, a direct comparison to the NAAQS cannot be made. Nevertheless, Val Verde County and surrounding counties are outside of nonattainment areas for criteria pollutants as last determined by the USEPA (USEPA, 1998b,c). Based on the attainment status for criteria pollutants at Laredo, and the lower Rio Grande valley, it can be concluded that air quality in the Del Rio region likely meets NAAQS. This is consistent with its status of being outside of USEPA designated nonattainment areas.

All but one of Laughlin AFB air-pollution facilities (except Building 51, Corrosion Control) are operated under exemptions from the TNRCC, according to the draft General Plan (USAF, 1998a). The top two Laughlin AFB sources of annual air emissions, as estimated in total pounds of emissions, are jet engine testing and internal combustion (USAF, 1998a).

Activities at Laughlin AFB that could potentially affect the air quality in the vicinity of the three alternative ASR-11 sites and the existing AN/GPN-12 site include managed and inadvertent fires on the base. Other potential emission sources in the vicinity of the ASR-11 and AN/GPN-12 sites include automobile and truck engines, aircraft maintenance, jet engine testing, and jet engine operation. A minimal source of emissions is the emergency generator for the AN/GPN-12.

3.5.2 Future Baseline without the Project

Without the project, air quality in the vicinity of the three ASR-11 sites and the existing AN/GPN-12 site is expected to be stable. Incremental improvement in automotive emissions and continuing pollution prevention efforts at the base aimed at reducing the use of volatile organic compounds will tend to improve air quality, while the increasing population of Del Rio will contribute to emissions due to increasing traffic and use of small engines. These two tendencies will tend to counteract each other so that no appreciable overall change is expected.

3.6 GEOLOGY AND SOILS

3.6.1 Existing Conditions

Soils and geology (including physiography, mineral resources, and geologic hazards) are discussed in this section, as related to the three alternative ASR-11 sites and the site of the AN/GPN-12, including site-specific data as available.

3.6.1.1 Soil Resources. Soil at Laughlin AFB is mostly a variety of sandy clays, sometimes containing limestone gravel, commonly called "caliche." Secondary cementation has produced localized zones of hard deposits, which may make excavation difficult. A lean clay of low to medium plasticity is present below the caliche in some areas of the base (USAF, 1998a).

The dominant soil type for Laughlin AFB is Zapata-Vinegarroon complex. The soil complex is characterized as having 60 percent Zapata, 30 percent Vinegarroon, and 10 percent other. Zapata soil, located on uplands, has a surface layer about 8 inches thick with slopes ranging from 1 percent to 5 percent. Vinegarroon soils are loamy, well drained, and moderately permeable (USAF, 1997a). These soils formed in old outwash sediment over thick beds of caliche. As much as 20 percent of the surface is covered by limestone and caliche fragments. The Zapata soil is generally on the more sloping broad plains, and the Vinegarroon soil is mostly in the less sloping areas. The rooting zone is shallow in the Vinegarroon soil and very shallow in the Zapata soil (USAF, 1995b).

The soils at Site 1 and Site 4, as well as in the vicinity of the existing AN/GPN-12, are mapped as Olmos very gravelly loam, which is a well-drained shallow soil on old outwash deposits, partly covered with limestone gravel, with hardened caliche below about 18 inches (USAF, 1995b). Within the Olmos soils, approximately 45 percent of the surface may covered by limestone gravel. Typically, the surface layer is moderately alkaline, brown very gravelly loam about 18 inches thick. The soil is well drained, and the rooting zone is very shallow to shallow (USAF, 1995b).

The soil at Site 7 is mapped as Acuna silty clay. Acuna silty clay typically has five recognizable layers of clay and silty clay in various colors, with masses of calcium carbonate in the third and bottom layers. Typically, the surface layer is dark grayish brown silty clay about 18" thick. Surface runoff is medium, permeability is moderate, the rooting zone is deep, and the water erosion hazard is slight to moderate (USAF, 1995b).

The soils at all three ASR-11 sites generally had the appearance of a hardpan, with gravel comprising approximately 20 percent of the compacted substrate's surface.

3.6.1.2 Geology. Laughlin AFB lies in the Lower Pecos Canyonlands physiographic region, at the junction between the Edwards Plateau and the Rio Grande Plain. The boundary between these two regions is approximately matched by U.S. 90, with the Edwards Plateau to the north of the highway and the Rio Grande Plain to the south (USAF, 1998a). Also, the base is within the Devil's River Uplift geologic province (USAF, 1997c). The base is located on the Georgetown formation, consisting of soft to moderately hard argillaceous limestone with scattered thin beds of marl or shale (USAF, 1998a).

The geology of Val Verde County consists of sedimentary rock from three geologic periods. The dominant bedrock material is limestone from the Cretaceous Period (75 to 135 million years old) and was deposited under marine conditions. Tertiary and Quaternary Period (less than 3 million years) materials were deposited under fresh water conditions (USAF, 1997a).

Minerals with significant deposits in Val Verde County include oil, natural gas, and manganese. The oil in the area is asphaltic and is generally not economical to drill. There are some small natural gas deposits being tapped in the northwest part of the county. Manganese was mined near Shumla during World War I, but the quality of the ore was not sufficient to allow economical operation of the mines after the war ended (USAF,1995b).

Laughlin AFB lies near the edge of the Balcones Fault Zone, but there are no known active faults or seismic activity in the immediate area (USAF, 1998a).

3.6.2 Future Baseline Without the Project

The geology and soil conditions are not expected to change in the future without the project, although it is possible that areas that have not previously been disturbed could be affected by expansion of any base activity. It is expected that the above stated existing conditions will continue to represent the area of the alternative ASR-11 sites and the existing AN/GPN-12.

3.7 SURFACE WATER AND GROUNDWATER

3.7.1 Existing Conditions

The surface water and groundwater at the three alternative radar sites and the site of the AN/GPN-12 are discussed in this section. Site specific data are not available at this stage of the analysis. The data for the surrounding area are expected to generally characterize and describe the alternative ASR-11 sites and the area of the AN/GPN-12.

3.7.1.1 Surface Water. Permanent (year-round) bodies of water at the base are limited to sewage treatment lagoons and water hazards on the golf course. There are three intermittent streams on the base. Sacatosa Creek is located along the eastern perimeter of Laughlin AFB. Zorro Creek is in the northwest corner. An unnamed creek is located in the southwest part of the base. The main drainage from improved areas of the base runs down a ditch along Second Street, past the sewage ponds, and into an channel which flows into Sacatosa Creek. The golf course and the

family housing area are drained by the unnamed creek. Sacatosa Creek, Zorro Creek, and the unnamed creek are directly tributary to the Rio Grande.

Laughlin AFB holds a permit for discharge of storm water from USEPA under the National Pollutant Discharge Elimination System (NPDES).

3.7.1.2 Groundwater. The Georgetown aquifer is the principal aquifer in the Del Rio area. The aquifer releases 40 million to 90 million gallons of water per day at San Felipe Springs. The city of Del Rio and Laughlin AFB each draw their water supplies from San Felipe Springs.

Groundwater samples from four wells from presumed uncontaminated locations around the base have been analyzed for general water quality parameters, metals, and various organic compounds in order to establish background concentrations of these analytes (USAF, 1997c). Nineteen metals, eight organic compounds, fluoride, chloride, bromide, and nitrate were detected in these samples. The study did not compare detected concentrations to drinking water standards.

3.7.2 Future Baseline Without the Project. No changes in surface and groundwater conditions are anticipated. Normal operations of the base have the potential to contribute fertilizers, petroleum products, and various solvents to groundwater due to landscaping activities and the potential for spillage associated with flight operations and maintenance. Impacts on groundwater quality in the absence of the project should be minimized, basewide, by adherence to Base Plan 705, Oil and Hazardous Materials Spill Prevention, Control, and Countermeasures; the base Hazardous Waste Management Plan; and the base Permanent Pollution Prevention Program (USAF, 1998a).

3.8 BIOLOGICAL RESOURCES

Biological resources present at and around Laughlin AFB generally, and at the alternative ASR-11 sites and existing AN/GPN-12 site in particular, are discussed below.

3.8.1 Existing Conditions

3.8.1.1 Vegetation. Untended uplands at Laughlin AFB are predominantly West Texas grassland and scrub-shrub. Vegetation consists mostly of thorny and woody scrub brush and grasses. Native vegetation is considered to be mainly grasses (*Poaceae*); heavy grazing pressure has led to domination by woody shrubs and prickly pear cactus (*Opuntia engelmannii*) (USAF, 1995b). Other shrubs present include cenizo (*Leucophyllum frutescens*), Crucifixion thorn (*Koeberlinia spinosa*) (UTSA-CAR, 1995), Texas paloverde (*Parkinsonia texana*), sotol (*Dasylirion* sp.), and occasional agaves (*Agave* spp.) (USAF, 1998a). Along the creeks there are mesquite trees (*Prosopis glandulosa*), various shrubs, and grasses. A more extensive list of area plant species is provided in Appendix B.

Cultivated areas at Laughlin AFB have commercial exotic grasses and various shade and flowering trees. Mowed but not otherwise tended areas are generally planted with introduced species such as Bermudagrass (*Cynodon dactylon*), Johnsongrass (*Sorghum halepense*), King Ranch bluestem (*Botriochloa ischaemum* var. *songarica*), and Lehmann lovegrass (*Eragrostis lehmanniana*) (USAF, 1988). A wide variety of ornamental trees and shrubs are cultivated at the base. Current landscaping policy at the base favors the use of plants better adapted to dry conditions than trees and lawn grasses (USAF, 1998a).

Site 1. Vegetation at Site 1 consists primarily of scrubby, low growing species including prickly pear cactus, sagebrush (*Artemisia sp.*), creosote bush (*Larrea tridentata*), guajillo (*Acacia berlandieri*), and a few yucca (*Yucca sp.*). The vegetation provides approximately 50 percent cover, over a dry, hard-packed gravelly substrate.

Site 4. Vegetation at Site 4 consists of scrubby, low growing species similar to those observed at Site 1. Prickly pear cactus, sagebrush, creosote bush, guajillo, and javelina bush (*Condalia ericoides*) were noted. The vegetation is more sparse than Site 1, with 15 percent cover.

Site 7. Vegetation at Site 7 includes mesquite trees, with larger specimens at the edge of the site. Other vegetation includes sagebrush, creosote bush, guajillo, and yucca.

AN/GPN-12. The existing AN/GPN-12 site has been cleared of vegetation to facilitate operation and maintenance.

3.8.1.2 Wetlands. Laughlin AFB contains a total of 19 acres of surface water, which includes sewage treatment ponds and golf course water hazards. There are no permanent streams occurring on base. However, Sacatosa and Zorro Creeks flow intermittently along the eastern boundary and through the northwestern corner of the base, respectively (USAF, 1997a). There are several small areas of periodically wet ground, and two larger areas of semi-permanent wetlands within the base. One of the larger wetland areas is in the Sacatosa Creek floodplain, at the southeastern corner of the base. The other larger wetland is an area along Zorro Creek near the Nature Trail, in the northwestern corner of the base. Both areas dry out during prolonged droughts (USAF, 1998a).

Three small areas on Laughlin AFB are designated as floodplains. The largest is the floodplain of Sacatosa Creek, which extends into the Clear Zone at the southeast end of the runways. A small part of the wetlands near the Nature Trail lies within the floodplain of Zorro Creek, which is an intermittent stream with a poorly defined channel at this point, but after heavy rains this area is subject to minor flooding. A holding pond in the southwestern corner of the base, on the unnamed creek which drains the golf course, periodically fills with water (USAF, 1998a).

None of the floodplains or wetlands is located at or adjacent to any of the alternative ASR-11 sites (Site 1, Site 4, or Site 7) or the existing AN/GPN-12 site.

3.8.1.3 Wildlife. Wildlife present at Laughlin AFB has been documented through several studies and projects (UTSA-CAR, 1995; USAF, 1988; USAF, 1997a; USAF, 1998a). Representative wildlife species are identified below. A more extensive list of indigenous wildlife species is provided in Appendix B.

Mammals occurring on Laughlin AFB include whitetailed deer (*Odocoileus virginianus*), javelina (*Tayassu tajacu*), opossum (*Didelphis virginiana*), big brown bat (*Eptesicus fuscus*), armadillo (*Dasypus novemcinctus*), ringtail (*Bassariscus astutus*), spotted skunk (*Spilogale gracilis*), badger (*Taxidea taxus*), coyote (*Canis latrans*), bobcat (*Felis rufus*), raccoon (*Procyon lotor*), blacktailed jackrabbit (*Lepus californicus*), and ground squirrel (*Citellus* sp.).

Game birds occurring at the base include wild turkey (*Meleagris gallopavo*), scaled (blue) quail (*Callipepla squamata*), bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and white-winged dove (*Zenaida asiatica*). Raptors include turkey vulture (*Catharus aura*), black vulture (*Coragyps atratus*), and red-tailed hawk (*Buteo jamaicensis*). During migration, waterfowl (Anseriformes) may be found in the area of the golf course or sewage treatment ponds. Cattle egret (*Bubulcus ibis*) and killdeer (*Charadrius vociferus*) are also recorded as present. Songbirds occurring at the base include scissor-tailed flycatcher (*Muscivora forficata*), horned lark (*Eremophila alpestris*), common crow (*Corvus brachyrhynchos*), and American robin (*Turdus migratorius*).

Other vertebrates present at Laughlin AFB include rattlesnakes (*Crotalus sp.*), kingsnakes (*Lampropeltis sp.*), bullsnakes (*Pituophis melanoleucus*), indigo snakes (*Drymarchon corais*), turtles (Anapsida), and horned lizards (horned toad; *Phrynosoma cornutum*). It has also been reported that ponds at the golf course supported catfish (*Ictalurus* sp.), largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieui*), and bluegill (*Lepmomis macrochirus*).

Deer and birds represent critical safety hazards to aircraft. There are an average of 35 bird strikes per year (USAF, 1997a), Therefore, efforts to control bird attractants and to diminish habitat value for deer and birds are considered beneficial. For example, removing dead animals from the base is beneficial because it reduces the number of turkey vultures in the flight lines.

Over 1300 acres of land on Laughlin AFB (33 percent of the base) are managed for wildlife (USAF, 1997a). In March 1991, the base entered into Cooperative Agreement No. 14-160002-

91-207 with the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department in which the base agreed to maintain favorable habitat for featured species of fish and wildlife, and to protect threatened and endangered species and their habitats (USAF, 1997a).

At the alternative ASR-11 sites, small diameter burrows and unidentified animal scat were observed during the site survey, indicating that small mammals are present. However, no individuals were observed during the site survey at Site 1, Site 4, or Site 7. Wildlife habitat value at the alternative radar sites appeared to be typical of the area. Numerous land snails were observed at Site 7. Due to the lack of vegetation at the existing AN/GPN-12, the radar site is less likely to support mammals, although reptiles and birds may utilize the site.

3.8.1.4 Threatened and Endangered Species. Several federal and state listed species exist in Texas (TPWD, 1996). A recent (1995) biological survey of Laughlin AFB was conducted by Texas Parks and Wildlife Department to determine if any federal or state listed endangered or threatened species were present. The state threatened Texas horned lizard was the only state listed species identified on the base. However, base documents indicate that indigo snakes, another state threatened species, are present at the base as well (USAF, 1998a). The state survey concluded that no federally listed bird species nest on base, and none was likely except as an occasional visitor (USAF, 1997a).

The following threatened wildlife species have been verified within 50 miles of Laughlin AFB (USAF, 1995b):

- **Birds: osprey (*Pandion haliaetus*), golden-cheeked warbler (*Dendroica chrysoparia*)**
- **Reptiles: Texas tortoise (*Gopherus berlandieri*), gray-banded kingsnake (*Lampropeltis alterna*), rock rattlesnake (*Crotalus lepidus*), Texas indigo snake (*Drymarchon corais*), Mexican milk snake (*Lampropeltis triangulum annulata*), Baird's ratsnake (*Elaphe bairdi*), and Trans-Pecos ratsnake (*Bogertophis subocularis*)**
- **Fish: Rio Grande darter (*Etheostoma grahami*), blotched gambusia (*Gambusia senilis*), Devil's River minnow (*Dionda diaboli*), Conchos pupfish (*Cyprinodon eximius*), Proserpine shiner (*Cyprinella proserpina*), and blue sucker (*Cycleptus elongatus*)**

Additional threatened species considered likely in the area include common black hawk (*Buteogallus anthracinus*), zone-tailed hawk (*Buteo albonotatus*), and ferruginous owl (*Glaucidium brasilianum*) (USAF, 1995b).

3.8.2 Future Baseline Without the Project. Without the project, the status of vegetation, wetlands, wildlife, and threatened and endangered species in the vicinity of the three ASR-11 sites and the existing AN/GPN-12 site is expected to remain similar to existing conditions. There is no planned change in land use that would alter the current characteristics of biological resources at the sites under consideration for the ASR-11.

3.9 AESTHETIC RESOURCES

The purpose of this section is to characterize the aesthetic resources of the project area in order to provide a framework for determining the potential changes that could occur as a result of the construction and operation of the ASR-11 at the alternative sites. Figure 3-9 shows the location from which photographs were taken during the site survey in July 1998.

3.9.1 Existing Conditions. The overall landscape at Laughlin AFB is generally flat and free of geographical features. The vegetational landscape is very open and fairly uniform. This combination of features is common in south and west Texas, so the natural aesthetic features at Laughlin AFB lack distinction.

Laughlin AFB has developed design standards for the various functional districts on the base. For example, the design of base housing constructed in 1959 reflects both the postwar suburban aesthetic and the realities of the south Texas climate. Landscaping goals have been somewhat formalized, and include items as diverse as improving energy conservation, screening unsightly areas, and using shrubbery to define building entries (USAF, 1998a). However, there is also what may be described as a functional aesthetic, with features like runways, aircraft hangars, lights, antennae, and towers considered an integral part of the Laughlin AFB landscape. Architectural

compatibility has been identified as a goal for long range development planning at the base (USAF, 1991b).

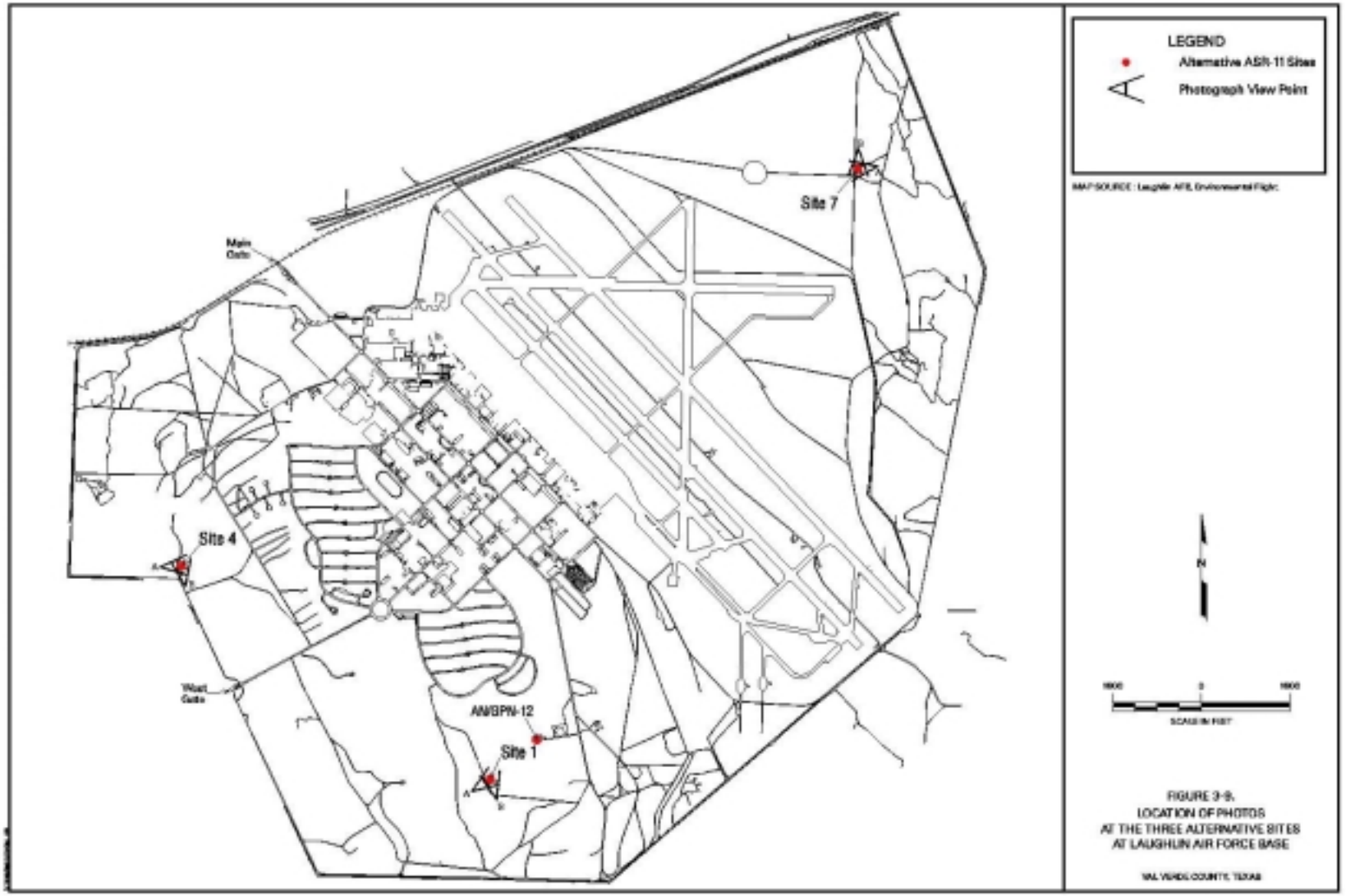


FIGURE 3-9.
LOCATION OF PHOTOS
AT THE THREE ALTERNATIVE SITES
AT LAUGHLIN AIR FORCE BASE

Site 1. The terrain at Site 1 is generally a flat gravel surface surrounded with scrub brush and sparse desert vegetation. The site is visible at relatively close range from the existing RAPCON, from the golf course, and from the base residential housing area (approximately 1,200 feet to the north). Based on information in the site survey report (USAF, 1999a), Site 1 is expected to be visible from points east and south to a distance of several miles. Views of Site 1, extending to the northeast and to the north, are depicted in Figure 3-10; the photographs show that the cantonment is clearly visible.

Site 4. The terrain at Site 4 is flat and surrounded with scrub brush and sparse desert vegetation. Site 4 is located on a ridge near the highest point of the airbase, which makes it visible from much of the base. From the site perimeter fence on the west side of the base, Site 4 is visible and relatively close, approximately 200 feet to the north. Based on information in the site survey report (USAF, 1999a), Site 4 is expected to be visible from points north, west, and south to a distance of several miles. Site 4 may be visible from U.S. Route 90 and the parallel Union Pacific Railway, which are both located approximately 5,000 feet to the north. Views of Site 4, extending to the east and to the north, are depicted in Figure 3-11; the photographs show that the cantonment is visible in the distance.

Photograph A. View of alternative Site 1, extending northeast toward existing GPN-12.

Photograph B. View of alternative Site 1, extending north toward base housing.

Figure 3-10. Photographs of Alternative ASR-11 Site 1

Photograph A. View of alternative Site 4, extending east toward base housing and water towers.

Photograph B. View of alternative Site 4, extending to the north.

Figure 3-11. Photographs of Alternative ASR-11 Site 4

Site 7. The terrain at Site 7 is flat and at the edge of an open field that is surrounded with scrub brush, small trees, and sparse desert vegetation. From the cantonment, Site 7 is visible approximately 6,000 feet to the northeast. Site 7 is visible from U.S. Route 90 and the parallel Union Pacific Railway, which are located approximately 2,500 feet to the northwest. Based on information in the site survey report (USAF, 1999a), Site 7 is likely to be visible from miles in every direction. However, the terrain at the ground surface may currently be obscured from observers to the west by small trees bordering on the airfield. Views of Site 7 extending to the west and southwest are depicted in Figure 3-12; the photographs show that views from the site towards the airfield are presently obscured by taller vegetation (mesquite).

3.9.2 Future Baseline Without the Project

The aesthetic values for the areas of all the alternative ASR-11 sites and the existing AN/GPN-12 site are not expected to substantially change in the future without the project. There are no proposed projects that would alter the aesthetic resources that currently exist at the sites.

Photograph A. View of alternative Site 7, extending west toward airfield.

Photograph B. View of alternative Site 7, extending southwest toward airfield.

Figure 3-12. Photographs of Alternative ASR-11 Site 7

3.10 CULTURAL RESOURCES

3.10.1 Existing Conditions

The following section identifies the prehistoric and historic resources that are present on Laughlin AFB.

3.10.1.1 Archaeological Sites. A team from the University of Texas at San Antonio Center for Archaeological Research (UTSA-CAR) surveyed the base in 1994, under the direction of the National Park Service. The team found that the main area of archeological interest on the base is the flood plain of Sacatosa Creek along the southeastern edge of the base, where ten sites containing lithic artifacts (arrowheads and other stone tools) were identified (USAF, 1998a). The survey team indicated that these ten sites plus one site on Zorro Creek were eligible for inclusion on the National Register of Historic Places, but did not recommend nomination of the sites to the register (USAF, 1998a). Subsequent formal evaluations determined that only four of these sites were actually eligible (TAMU, 1998).

In 1996, a follow-on detailed archaeological survey identified 26 archaeological sites on Laughlin AFB; two sites were deemed potentially significant (USAF, 1997a). These sites are located at the south end of the runway in the south clear zone, and in the buffer zone between the fence and base boundary on the far eastern edge of the base.

The base is also the former location of the headquarters of the Zacatosa Ranch, located east of Sacatosa Creek in a safety zone northeast of the airfield (TAMU, 1998). Some artifacts from before 1942 have been found at the ranch (TAMU, 1998).

Neither Site 1 nor Site 4 nor the existing AN/GPN-12 is in the vicinity of known archaeological resources. Site 7 is approximately 1,500 feet northwest of the closest archaeological sites mapped from the 1994 survey (UTSA-CAR, 1995) in the Sacatosa Creek floodplain, where artifacts were recovered.

3.10.1.2 Historic Structures. The city of Del Rio has a number of historic structures, dating to the 1870s; none of these structures is proximate to Laughlin AFB (USAF, 1997a). A survey of Laughlin AFB was conducted in 1982 and revealed no known sites or structures that could be considered candidates for historic preservation (USAF, 1997a). In 1996, the National Park Service conducted a comprehensive survey to inventory potential historic structures at Laughlin AFB; again, no historic structures were identified (USAF, 1997a). All but one of the original World War II era buildings were demolished or removed shortly after the end of the war in 1945. Buildings built following reactivation of the base in 1952 are considered to have little architectural or historic importance (USAF, 1998a). Thus, there are no historic resources in the vicinity of any of the three alternative sites (Site 1, Site 4, or Site 7) or the existing AN/GPN-12.

3.10.2 Future Baseline Without the Project

It is not anticipated that there would be any substantial change in cultural resource conditions at the alternative radar sites, or the AN/GPN-12, if the project were not completed.

3.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

3.11.1 Existing Conditions

3.11.1.1 Pollution Prevention

No specific pollution prevention measures have been identified at the three alternative radar sites or the AN/GPN-12. On Laughlin AFB overall, a number of pollution prevention policies and procedures have been implemented, including: development and implementation of a hazardous waste management plan; a base permanent pollution prevention program; a plan for spill prevention, control, and countermeasures; replacement of underground storage tanks (USTs) with above-ground storage tanks (ASTs) and vaulted underground tanks; and closure of the old base landfill (USAF, 1998a). Laughlin AFB has a goal to reduce hazardous waste each year, and is required to collect and segregate all hazardous waste for recycling, reuse, or disposal in accordance with regulations (USAF, 1998a). The implementation of these policies and procedures on the base overall is expected to reduce existing and potential pollution. Laughlin Air Force Base Plan 705, Oil and Hazardous Materials Spill Prevention, Control, and Countermeasures, establishes procedures to deal with hazardous waste emergencies.

The base Permanent Pollution Prevention Program encourages the use of environmentally friendly substances in place of hazardous chemicals whenever possible. The use of "smart washers" containing grease eating enzymes, for instance, has lessened the need for petrochemical based cleaning substances in the aircraft and ground vehicle maintenance shops. Oil-water separators are used to prevent hydrocarbons such as oil and grease from entering the sewage system (USAF, 1998a).

3.11.1.2 Hazardous Waste

The Installation Restoration Program (IRP) is a program to identify, quantify, and mitigate past hazardous waste sites on all DoD installations. Permit conditions under the Resource Conservation and Recovery Act (RCRA) require Laughlin AFB to conduct RCRA Facility

Investigations at various sites on base where hazardous materials may have been used. There are sixteen IRP sites at the base (USAF, 1999g). Locations of the sixteen IRP sites are shown on Figure 3-13. The sixteen IRP sites at the base are as follows (USAF, 1998a; USAF, 1999g):

- **LF-01 Old base landfill (closed)**
- **WP-02 Old industrial waste pit**
- **ST-03 Defuel tank**
- **SS-04 DRMO storage area**
- **FT-05 Fire training area**
- **WP-06 New industrial waste pit**
- **DP-07 Sludge disposal pit**
- **DP-08 South boundary dike**
- **SS-09 Supply storage area**
- **ST-10 Emergency generator tank, Bldg 120**
- **ST-11 Emergency generator tank, Bldg 126**
- **ST-12 Emergency generator tank, Bldg 660**
- **ST-13 Emergency generator tank, Bldg 640**
- **SS-14 Fuels receiving and storage area**
- **SD-04 Storm drain (Second Street)**
- **SD-05 Storm drain (south from Second Street)**

FIGURE 3-13.
IRP SITES AT
LAUGHLIN AIR FORCE BASE

VAL VERDE COUNTY, TEXAS

Field investigations have been performed at all or most of these IRP sites. None of the alternative radar sites (Site 1, Site 4, or Site 7) or the existing AN/GPN-12, is at or adjacent to any of these IRP sites.

Hazardous waste from Laughlin AFB must be handled, stored, transported, disposed, or recycled in accordance with both federal and TNRCC regulations. Laughlin AFB is registered as a municipal large quantity generator of hazardous wastes (USAF, 1997a). Hazardous wastes generated at Laughlin AFB include spent solvents, thinners, strippers, paint waste, laboratory chemicals, and unused materials considered as waste or products containing hazardous materials having exceeded their shelf-life. Used motor oil, turbine oil, and hydraulic fluid are also generated on-base and transported to an off-base recycling facility (USAF, 1997a). There are two hazardous waste initial accumulation points, 10 hazardous waste collection points, and 13 waste oil collection points on Laughlin AFB. Hazardous wastes are transported to the Defense Reutilization and Marketing Office (DRMO) interim storage facility at Building 2026, while used oil and hydraulic fluid are transported separately for recycling (USAF, 1997a).

Waste antifreeze and refrigerants are recovered, recycled, and reused in on-base maintenance facilities. Following implementation of a waste minimization program at Laughlin AFB, on-base hazardous waste generation in 1995 totaled 17,651 pounds, representing a 90 percent reduction from 1992, when over 180,000 pounds of hazardous waste were transported off base for disposal (USAF, 1997a).

3.11.2 Future Baseline Without the Project

It is expected that remediation of past hazardous waste sites will continue, as well as management of hazardous materials and newly generated wastes. Continuing pollution prevention measures on the base may reduce the potential for new sources of contamination to arise at any of the sites.

3.12 ELECTROMAGNETIC ENERGY

3.12.1 Existing Conditions

Electrical currents and components generate electrical fields and magnetic fields. These may be stationary or dynamic. Depending on the equipment, electromagnetic radiation that propagates outward may be created. Electromagnetic radiation may be created in a very wide range of frequencies. Absent the propagation of electromagnetic radiation, electrical fields and magnetic fields are localized effects. The electromagnetic environment at a particular location and time is the sum of all the localized electric and magnetic fields plus electromagnetic radiation arriving from both natural and manmade sources. Electric fields, magnetic fields, and electromagnetic radiation are of interest here because of the potential for health effects from some frequency ranges and the potential for electromagnetic interference on other electronic equipment. Electromagnetic radiation is discussed first in this introduction.

Electromagnetic radiation travels at a uniform speed (3×10^8 m/sec in a vacuum; the speed of light). It is often useful to consider electromagnetic radiation as a wave, and to describe it in terms of frequency (where 1 Hz means 1 cycle per second and 1 kHz means 1000 cycles per second). Some parts of the electromagnetic spectrum are more commonly described in terms of wavelength, which is inversely related to frequency.

The spectrum of electromagnetic radiation includes visible light, which has frequencies on the order of 5×10^{14} Hz (specifically, wavelengths from 400 nanometers (nm) to 760 nm). Electromagnetic radiation with frequencies higher than that of visible light include ultraviolet light, X-rays, and gamma-rays. These types of electromagnetic radiation are described as "high energy" and have the potential to "excite" electrons, to thereby ionize molecules, and to thus affect body chemistry. Especially in high absorbed doses, high frequency electromagnetic radiation can adversely affect health (NSC, 1979).

Electromagnetic radiation with frequencies lower than that of visible light include infrared light and radio waves. Frequencies below 10^{12} Hz (10^6 MHZ) are categorized as radio waves. These

include frequencies used for AM radio; shortwave, television, and FM broadcast bands; pagers; cellular telephones; mobile radios; radar; and microwave technologies. These frequencies are non-ionizing, and have the following known health effects: (1) effects caused by directly heating body tissues, and (2) electromagnetic interference with electronic medical devices such as pacemakers.

The heating of tissues caused by exposure to radio frequency radiation (RFR) at relatively low incident power densities can normally be accommodated. However, in some tissues, heat produced at higher radiation intensities may exceed temperature regulating mechanisms so compensation for heat gain may be inadequate. Thus, exposure at high intensities can cause thermal distress or irreversible thermal damage. Eye tissues are particularly vulnerable (NSC, 1979).

Electromagnetic interference with medical devices has become an issue because medical devices increasingly use sensitive electronics at the same time that RFR and other electromagnetic sources are proliferating (FDA, 1996). Medical equipment which may be susceptible to interference from RFR includes cardiac pacemakers, defibrillators, ventilators, apnea monitors, and electric wheelchairs (VTDPS, 1996; IEEE, 1998). Medical device manufacturers are expected to design and test their products to ensure conformance with standards for protection against radio frequency interference (IEEE, 1998). Nevertheless, users of medical devices are generally advised to keep RFR emitters as far away from their devices as is practical (IEEE, 1998).

There is currently considerable interest on the part of some researchers, the news media, and the public regarding the possibility of other health effects from non-ionizing radiation (and/or other electrical or magnetic fields). However, there is no scientific consensus that non-ionizing radiation presents any other health risks (USAF, 1995a) and no consensus about a mechanism by which non-ionizing radiation could have any such effects (i.e., effects other than those associated with heating of tissue and interference with medical devices).

Existing equipment at the AN/GPN-12 radar emits electromagnetic radiation in the radio frequency range. Locations close to and directly in front of the antenna (whether rotating or stationary) are considered unsafe when the radar is operating, on the basis of the potential for heating of body tissues. Similarly, the tower immediately below the antenna is considered unsafe. RFR levels in the immediate vicinity of the existing AN/GPN-12 may be hazardous to humans at close distances, when the radar is in operation; the estimated hazard distance for the GPN-12 is 79.7 feet (USAF, 1991a). The intensity of the radar energy diminishes with distance, so there would be less tissue heating at greater distances.

Within electronic systems for radar, any high-voltage tubes capable of emitting X-rays are typically shielded with lead, and shielding on other equipment is typically adequate to limit transmitted radiation to acceptable levels. While there are unshielded components present at the AN/GPN-12 site such as incandescent light bulbs, there is no indication or expectation that significant levels of electromagnetic radiation other than RFR is emitted into the environment by the AN/GPN-12 system.

Magnetic fields and electric fields other than electromagnetic radiation are also created by electrical equipment. In everyday situations, high-voltage power lines, televisions, computer monitors, fluorescent lights, light dimmer controls, improperly grounded equipment, and appliances used with non-polarized extension cords create measurable electric fields. Transformers, alternating current (A/C) adapters, motors (e.g., analog clocks and kitchen appliances), power lines, vehicles, and old electric blankets create measurable magnetic fields.

The presence of various electrical components in the AN/GPN-12 radar system inevitably means that there are a variety of magnetic and electrical fields in the vicinity of the AN/GPN-12 equipment. As noted above, there is currently considerable interest on the part of some researchers, the news media, and the public regarding the possibility of health effects from electrical or magnetic fields. However, no scientific consensus exists that electrical or magnetic fields present health risks other than those associated with medical devices. A 1996 National

Academy of Science report, *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields*, concluded that:

> ***The current body of evidence does not show exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.*** **(National Academy of Science, 1996).**

3.12.2 Future Baseline Without the Project

Without the project, the future electromagnetic field conditions in the vicinity of the three alternative radar sites and the existing AN/GPN-12 are expected to remain similar to those currently present. There is no planned change in land use in the site locations which would substantially alter the electromagnetic field characteristics in the area.

4.0 ENVIRONMENTAL CONSEQUENCES - NO ACTION ALTERNATIVE

The alternative of No Action would leave existing AN/GPN-12 and air traffic control equipment in place. In addition, no new construction, renovation, or operations would be required. Since the no action alternative would involve no alteration to any of the three proposed ASR-11 sites at Laughlin AFB, this alternative would result in no impact to environmental resources. Thus, the environmental consequences of the No Action alternative would be identical to those identified in Section 3.0, Future Baseline Without The Project. However, selecting the No Action alternative, and thereby having to maintain the existing AN/GPN-12, would require relying on existing radar equipment that is not capable of meeting future user requirements for transmitting digital signal data to new digital automation system air traffic controller displays. The existing radar also does not meet user requirements for increased target detection, weather reporting and improved reliability.

5.0 ENVIRONMENTAL CONSEQUENCES - DASR ALTERNATIVE

Potential impacts resulting from construction (short-term) and operation (long-term) of the ASR-11 facility are described in this section. Impacts are presented by environmental parameter. Mitigation measures that may be required to reduce impacts are described in Section 7.0.

5.1 LAND USE

5.1.1 Short-term Impacts

Short-term impacts associated with the construction of the ASR-11 and removal of the AN/GPN-12 would include temporary disruption of land uses due to elevated noise levels, increased dust, interference with roadway access, and visual effects. The installation of utilities, such as power, telephone, and fiber optic cable to each of the sites could temporarily affect land uses along the proposed alignment routes. While specific alignments will not be defined until final design, it is anticipated that land uses along the alignments will also be affected by elevated noise levels and increased dust associated with open trench excavation.

Construction at any of the three alternative ASR-11 sites would have minimal impacts on land use. Each of the three sites is currently identified as open space, which would ultimately be lost if the radar were constructed at that location. However, given the limited size (140 feet by 140 feet) of disturbance, when compared to the vast acreage of surrounding open space, this impact is not considered significant.

While electricity and telephone are expected to be connected from nearby sources, fiber optic cable must be laid between the preferred site and the RAPCON. A final alignment for the cable has not been selected; however, minor disruptions to land uses along the route could occur during construction. At each site, excavation for the cable would be across open space. Use of open space at the base is fairly uniform (except that use for hunting may vary), so the impact on land use is roughly proportional to the area of land used for conduit construction. Conduit construction for Site 1 would have minimal short-term impact because a relatively small area

would be disturbed to excavate trenches for buried power and fiber optic communication lines. Conduit construction for Site 4 and Site 7 would have a somewhat greater short-term impact because a longer trench would be needed for the fiber optic communication lines. At all sites, the temporary use of open space for construction should not be considered a significant impact on land use.

Upon the successful completion of the construction of the ASR-11, the existing AN/GPN-12 radar would be dismantled. Impacts to surrounding land uses related to removal of the AN/GPN-12 would be minimal. This land could be reclaimed by Laughlin AFB.

5.1.2 Long-term Impacts

Land use at Site 1 would not be substantially affected by the operation of the ASR-11; however, the use of Site 1 for seasonal hunting may be restricted by the operation of a radar. Land use would not be substantially affected by the operation of the ASR-11 at Site 4 or Site 7. Once the construction period is over, the ASR-11 site would not be staffed. The site would consist only of the radar. Whichever site is selected, the site can either be described as a nonconforming use within the open space land use area or accounted for by reclassifying a small area as aircraft operations and maintenance. The amount of acreage required for the facility is small (0.45 acres). The loss of this area as open space would represent a negligible percentage of available land.

5.2 SOCIOECONOMICS

5.2.1 Short-term Impacts

Construction of the ASR-11 at any of the three alternative sites would require nearly identical work efforts, and would therefore have similar effects on the socioeconomic conditions. Construction at alternative Site 1, Site 4, or Site 7 would not adversely impact the socioeconomic conditions at Laughlin AFB. There may be a slight short-term increase in revenue generated in the surrounding area due to construction employees patronizing local businesses. During the construction period, the work crew would consist of approximately 10 persons.

Upon the successful completion of the construction of the ASR-11 the existing AN/GPN-12 radar would be dismantled and packed for shipment and possible reuse at another location. No effect on socioeconomic conditions is anticipated as a result of this activity.

5.2.2 Long-term Impacts

In the absence of other independent activities at Laughlin AFB, socioeconomic conditions would return to the existing conditions once the ASR-11 construction was completed. The new radar facility would not be staffed, and would therefore have no long-term effects on socioeconomic conditions.

5.2.3 Environmental Justice

Under its instructions for the Environmental Impact Analysis Process (32 CFR Part 989), the Air Force must demonstrate compliance Executive Order 12898, entitled Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, to determine the effects of Federal programs, policies, and activities on minority and low income populations. Thus, the Air Force must identify and address disproportionately high and adverse human health and environmental effects of a proposed project.

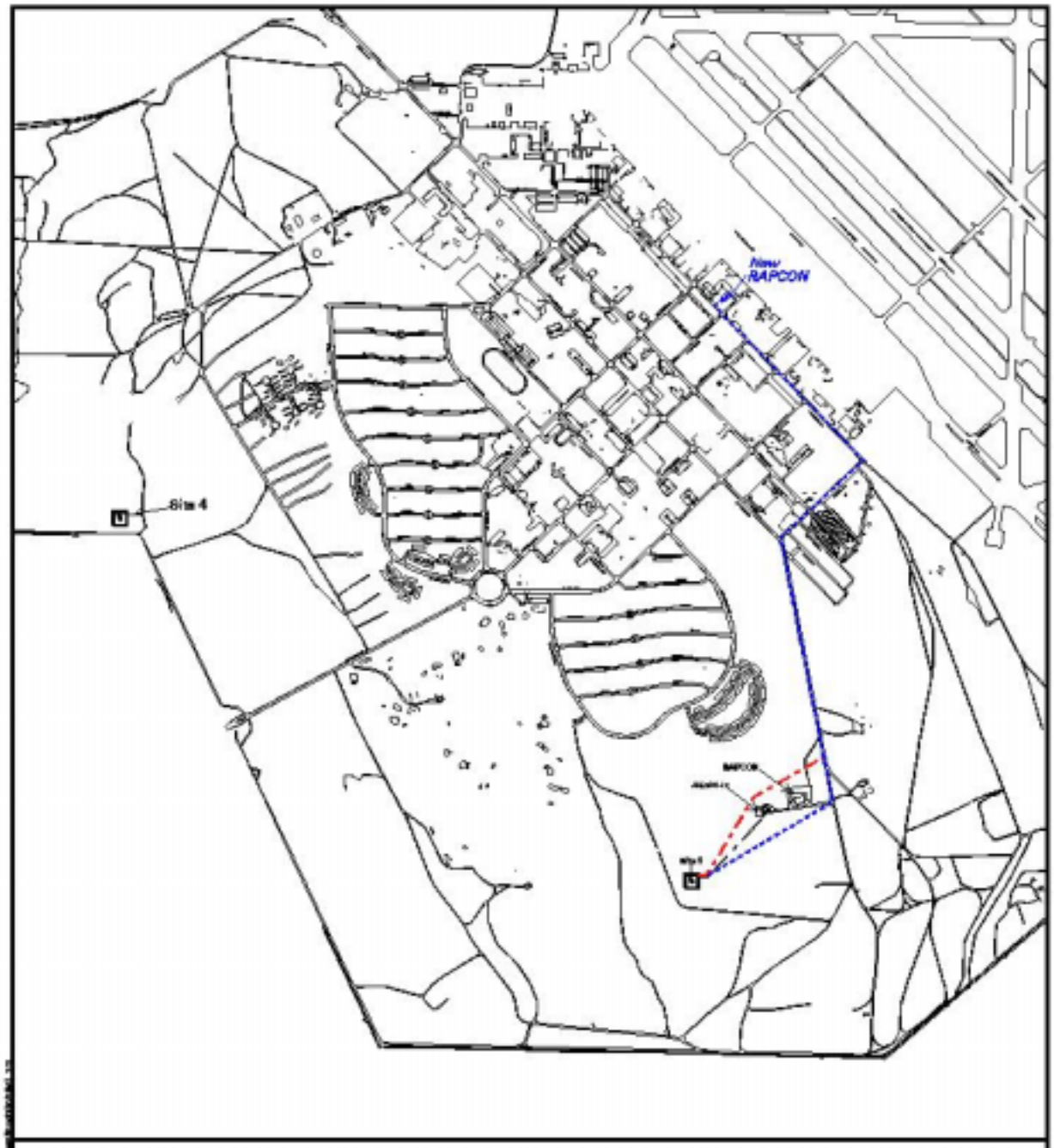
As demonstrated other parts of Section 5.0, the proposed DASR installation is not expected to have significant human health or environmental impacts. The proposed project is expected to have no adverse impact on either Laughlin AFB personnel or on residents of adjacent communities, regardless of income or ethnicity. The sites are each at least one mile from the nearest residences. The nearest residences to Site 1 and Site 4 are associated with the mobile home park northwest of the base; the closest residence to Site 1 is approximately 11,000 feet away, and the nearest residence to Site 4 is approximately 5,750 feet away. The nearest residence to Site 7, located to the northeast of Laughlin AFB, is approximately 5,000 feet away (USAF, 1999h). As a result, there appear to be no associated issues of environmental justice.

5.3 UTILITIES AND TRANSPORTATION

Utility connections required for Site 1, Site 4, and Site 7 are depicted in Figures 5-1, 5-2, and 5-3, respectively.

5.3.1 Short-term Impacts

As described below, it is not anticipated that construction of the ASR-11 at any of the alternative sites or removal of the existing AN/GPN-12 would result in adverse impacts to existing utilities or transportation. Various lengths of open trench excavation would be needed to provide utility connections for the ASR-11 operation (Table 5-1).



LEGEND

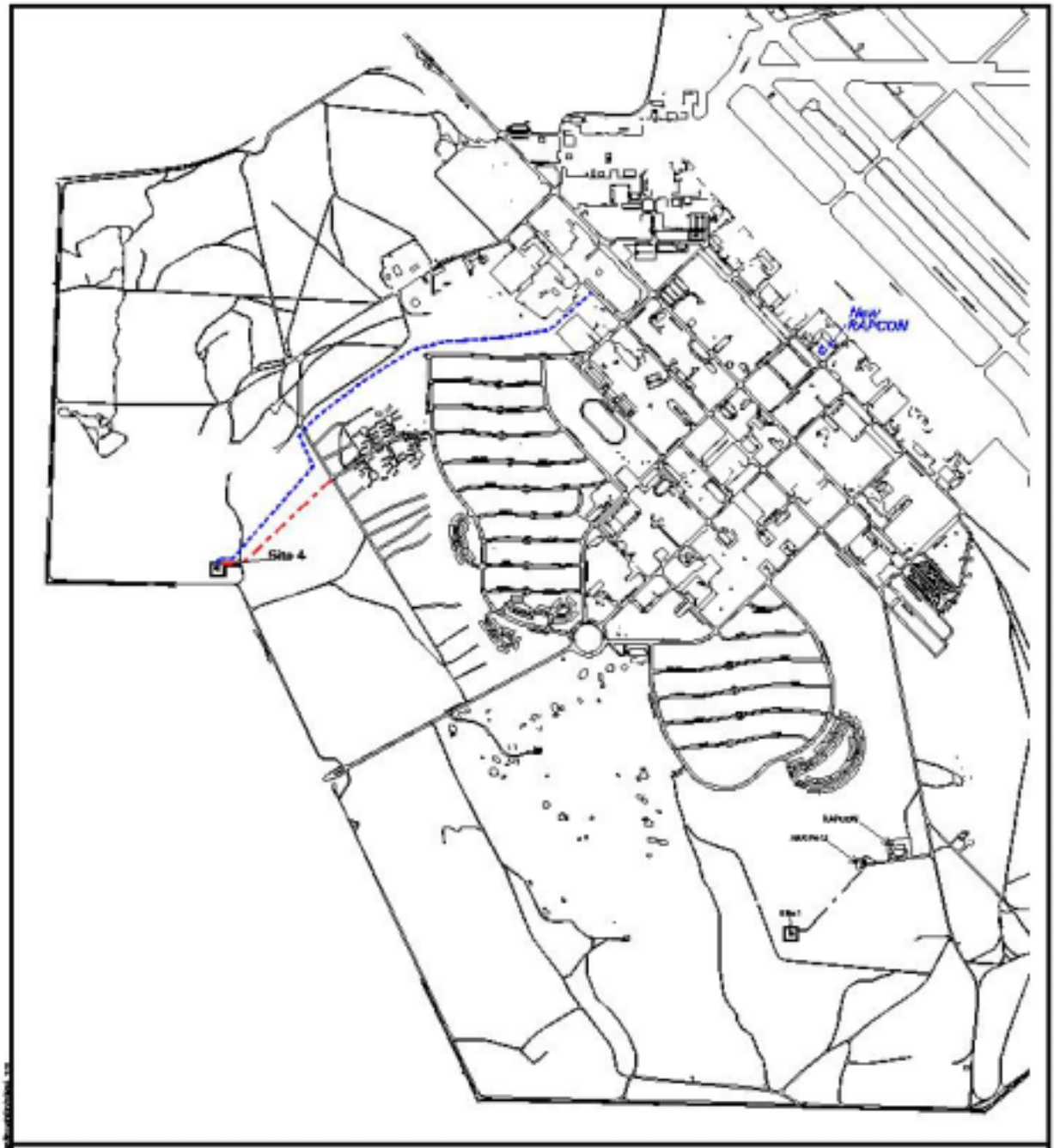
- Proposed Underground Power
- Proposed Fiber Optic Signal Cable
- Proposed Access
- Proposed Fence

LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY
TEXAS

1500 0 1500

SCALE IN FEET

FIGURE 5-1. UTILITIES DETAIL, SITE 1



LEGEND

Proposed Underground Power

Proposed Fiber Optic Signal Cable

LAUGHLIN AIR FORCE BASE
VAL VERDE COUNTY
TEXAS

1600 0 1600

SCALE IN FEET

FIGURE 5-2. UTILITIES DETAIL, SITE 4

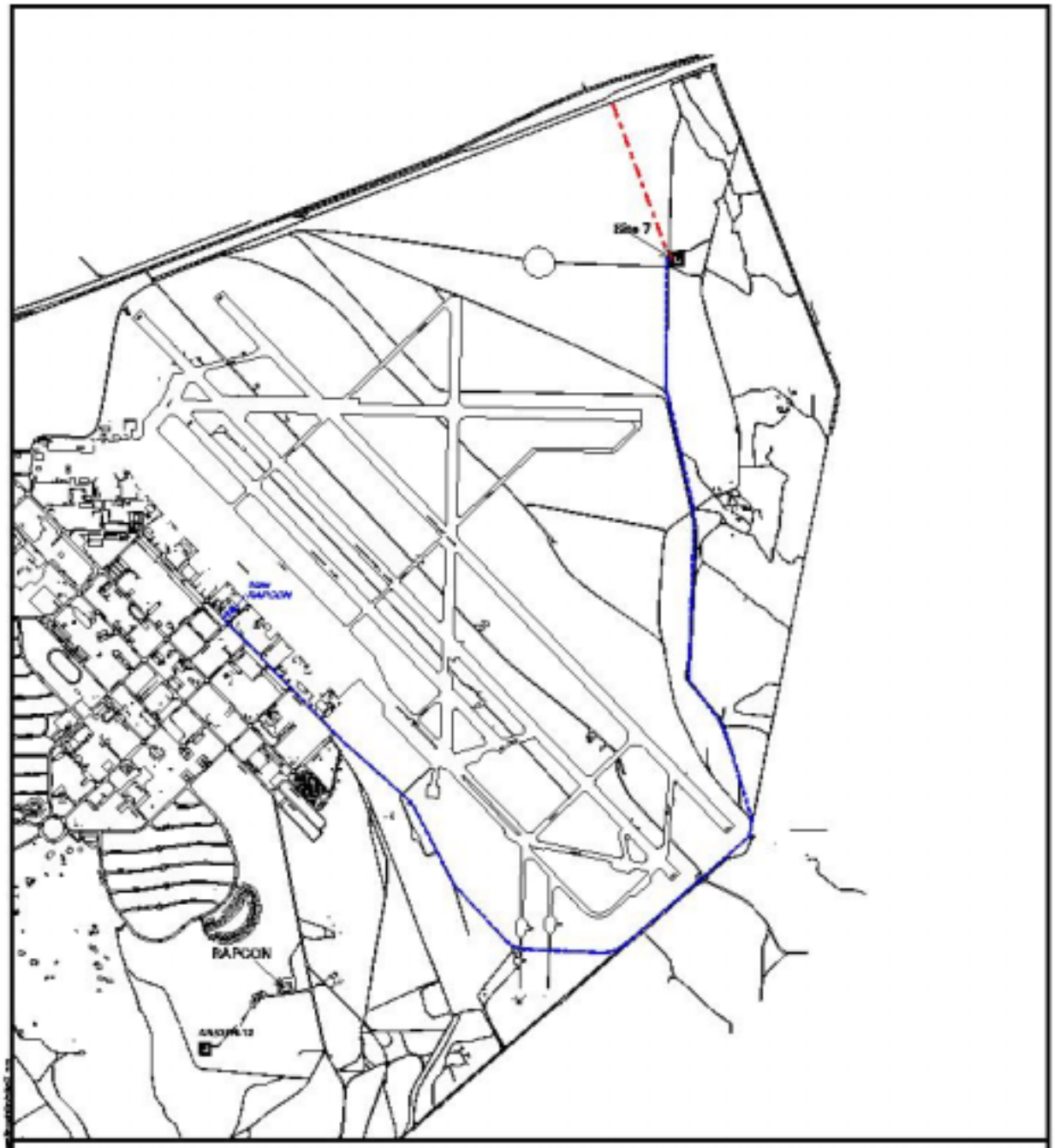


FIGURE 5-3. UTILITIES DETAIL, SITE 7

Table 5-1. Required Lengths of New Utility Connections

ASR-11 Alternative Site	Length of Electric Power Conduit Required	Estimated* Length of Telephone Cable Required	Length of Fiber Optic Cable Required
Site 1	1,530 feet	1,400 feet	5,400 feet
Site 4	1,450 feet	1,500 feet	5,500 feet[2]
Site 7	2,500 feet	17,000 feet[1]	17,500 feet

Source: USAF, 1999a
***Estimated from Figure 3-5 and USAF, 1999a**
[1] The new telephone cable would be connected to an existing telephone cable located 500 feet from the existing RAPCON.
[2] The indicated length is of the new utility conduit. The fiber optic cable would continue to the new RAPCON. The final route has not been confirmed.

5.3.1.1 Water Supply. A temporary increase in water demand would occur during construction. A water source would be supplied on site by mobile water tanks. It is not anticipated that the water demand for the construction of the ASR-11 would adversely impact the water supply at Laughlin AFB due to the small number of construction workers, short construction period, and the adequate capacity of San Felipe Springs.

5.3.1.2 Wastewater Treatment. There would be an insignificant short-term increase in demand for sewage treatment during construction. Portable wastewater units would be on site and the septage would be transported to the nearby treatment facility.

5.3.1.3 Solid Waste. During the dismantling of the existing AN/GPN-12 radar, there would be a need to remove solid waste material that may not be able to be re-used in the future. All solid waste would be handled in accordance with standard base procedures. Any hazardous materials produced would be disposed of following Laughlin AFB policies and protocols and relevant state regulations (see also Section 5.11 on hazardous materials).

5.3.1.4 Electricity. Sufficient electrical power is available to each of the alternative ASR-11 sites. Specific routes will be determined when a site is selected and final design plans are completed. Power lines could be routed from Fourth Street extension to Site 1. Site 4 would receive electricity from the west end of Edwards Street. Site 7 would be supplied with electricity from

a powerline along U.S. Route 90. The construction of the conduits could impact the immediate land use of the open trench excavation; however, electrical power in the area of the alternative ASR-11 sites would not be impacted.

5.3.1.5 Telephone. Telephone lines would be extended from the existing locations identified in Section 3.3.1.5. Specific routes and distances will be determined when final design plans are completed. The distance to existing service is less than one-half mile for Site 1, approximately one mile for Site 4, and two to three miles for Site 7. As a system separate from the dial-up phones, fiber-optic cable would be extended to the RAPCON building for data transmission. Specific routes and distances will be determined when final design plans are completed. However, Site 1 would require the shortest cable, Site 4 would require a slightly longer cable, and Site 7 would require the longest fiber-optic cable. Installation of additional transmission capacity is not expected to affect existing telephone service. Disconnection of telephone service to the existing AN/GPN-12 is not expected to affect existing telephone service.

5.3.1.6 Natural Gas. Natural gas is not required for the installation of the proposed ASR-11; therefore, there would be no impact to existing natural gas conditions on Laughlin AFB.

5.3.1.7 Transportation. Impacts on transportation within Laughlin AFB would be minimal. The small size of the project would not produce a volume of construction related traffic that would impact existing conditions. Personal vehicles and small trucks of the contractor and subcontractors would be on site or at an area designated by the Air Force. There would be a period of approximately 10 hours where cement trucks would enter the base for the foundation placement. The foundation concrete must be placed continuously, thus necessitating the 10-hour period. Heavy vehicles, including cement trucks, are frequently on base roads. Therefore, the cement trucks and other construction vehicles necessary for construction are not expected to have an impact on base roads. Construction related activities would not adversely impact existing traffic conditions.

A new gravel road will be constructed for construction and maintenance vehicle access to the selected site.

Site 1. Proposed access to Site 1 would be via the existing road to the AN/GPN-12 site and then via a new gravel road to Site 1. The approximate length of the new road is 1,000 feet. The road will be engineered and designed for drainage, underlain with a geotextile filter fabric, and covered with 6 inches of crushed stone, unless a design upgrade is warranted (USAF, 1999a).

Site 4. Proposed access to Site 4 would be constructed from the back entrance road to Laughlin AFB, following the course of an existing gravel perimeter road for approximately 2,500 feet, and then continuing straight to Site 4. The approximate length of the new gravel road is 165 feet. The road will be engineered and designed for drainage, underlain with a geotextile filter fabric, and covered with 6 inches of crushed stone, unless a design upgrade is warranted (USAF, 1999a).

Site 7. Proposed access to Site 7 would be from the existing gravel perimeter road that runs along the tree line at the edge of the grass field near the parachute training area. The approximate length of the new road is 70 feet. The road will be engineered and designed for drainage, underlain with a geotextile filter fabric, and covered with 6 inches of crushed stone, unless a design upgrade is warranted (USAF, 1999a).

5.3.2 Long-term Impacts

It is not anticipated that future utility and transportation conditions at Laughlin AFB would be affected as a result of operation of the DASR system. The addition of electrical power, telephone lines, and fiber optic cable at any of the alternative radar sites would not have an effect on the utilities in the area. The operation of the DASR system would not require water resources, wastewater treatment, collection of solid waste, or natural gas resources; therefore, no impacts to those utilities would occur. No long-term impacts on traffic are anticipated. There would be additional unpaved road surface as a long-term effect of ASR-11 construction. Approximate lengths of new access road are 1,000 feet at Site 1; 165 feet at Site 4; and 70 feet at Site 7 (USAF, 1999a). These new roads are not expected to affect transportation on the existing transportation network at the base. Discontinuing operation of the existing AN/GPN-12 is not expected to affect area utilities or transportation.

5.4 NOISE

5.4.1 Short-term Impacts

Noise impacts during construction are expected to be similar at all three sites. Construction of the radar tower and supporting infrastructure, including connections to power and telephone, would result in elevated noise levels as grading and minor excavation occur, and as construction of the tower proceeds. Typical construction equipment noise levels may be reduced by using well-maintained equipment and by installing mufflers and engine jackets (Table 5-2). Construction of the tower and supporting infrastructure is anticipated to take approximately three weeks, and therefore, any elevated noise levels would be very short-term in duration.

As indicated in the Section 3.4.1 of this EA, none of the proposed three sites is located in an area populated by sensitive receptors. Of the three sites, Site 1 and Site 4 are closest to base residential areas, and construction noise could be audible at residences. Site 7 is more distant from occupied areas and would have minimal noise impact. Construction vehicle noise and some noise from

trenching may also be audible at various locations throughout Laughlin AFB, at sound levels consistent with existing sound levels at the base.

Dismantling and removal of the existing AN/GPN-12 would result in temporary elevated noise levels; however, these are anticipated to be of short duration, and at a distance from any sensitive noise receptors.

5.4.2 Long-term Impacts

It is not anticipated that there would be any long-term noise impacts as a result of operation of the ASR-11 radar. Noise levels generated by the ASR-11 would be maintained at a level consistent with current Occupational Safety and Health Administration (OSHA) regulations as specified in CFR Title 29, Part 1910. Noise from the ASR-11 equipment located in operational areas would be designed not to exceed 55 dBA at any time. Noise from DASR system equipment located in general work areas should not exceed 65 dBA, including periods when the cabinet doors are open. The antenna pedestal with its drives, mounted on its tower, will be designed not to produce noise levels in excess of 55 dBA outdoors on the ground at a distance of 100 feet from the tower.

Table 5-2. Construction Equipment Noise Levels in dBA (L_{eq}) at 50 Feet

Equipment	Field Measurements	Well-Maintained Equipment with Mufflers and Engine Jackets	Best Technology (Specialized Mufflers and Shields)
Air Compressor	81	71	65
Back Hoe	85	80	76
Concrete Mixer	85	83	75
Concrete Pump	82	80	75
Concrete Vibrator	76	70	- -
Crane, Derrick	88	80	66
Crane, Mobile	83	80	76

Equipment	Field Measurements	Well-Maintained Equipment with Mufflers and Engine Jackets	Best Technology (Specialized Mufflers and Shields)
Dozer	87	83	76
Generator	78	71	78
Grader	85	80	65
Jack Hammer	88	80	76
Loader	84	80	75
Paver	89	80	76
Pile Driver	101	90	76
Pneumatic Tool	85	75	80
Pump	76	71	65
Rock Drill	98	90	65
Roller	80	75	80
Saw	78	70	70
Scraper	88	83	65
Shovel	82	80	78
Truck	88	83	76
Truck Alarms	94	89	75

Source: Bolt, Beranek and Newman, 1974

5.5 AIR QUALITY

5.5.1 Short-term Impacts

The short-term air quality impacts of constructing an ASR-11 would be similar at all of the three alternative sites. Site clearing and construction vehicle traffic would generate fugitive dust during the construction period. Construction of an ASR-11 at any of the sites would require disturbing approximately 0.45 acres. Since the area that would be disturbed at each of the three sites is similar, the amount of dust generated during construction is not expected to vary substantially among the sites. No new roads would be needed with the exception of gravel access driveways. Site 1 does require the construction of a somewhat longer gravel access road (1,000 feet) than either Site 4 (165 feet) or Site 7 (70 feet).

Distances for electrical connections between the alternative sites and existing utility manholes is relatively similar, ranging from 1,450 to 2,500 feet. Installation of fiber optic communication would require the installation of approximately up to 5,400 feet of cable between Site 1 and the new RAPCON (within the proposed remodeled Base Operations Complex); approximately 5,500 feet for Site 4 and; and approximately 17,500 feet of cable for Site 7. The amount of dust generated during construction is expected to vary in proportion to the length of new conduit required. It should be noted that the length of the new utility lines proposed at Laughlin AFB as part of the DASR development would exceed the 2,640-foot maximum length of new utility lines estimated in the Programmatic EA (1995a). All dust would be minimized by applying water as needed during construction. Consequently, no adverse short-term dust impacts are anticipated at any of the sites.

As described in the Programmatic EA for the NAS program (USAF, 1995a), construction vehicles and equipment would produce emissions that could temporarily affect air quality. However, because the number of vehicles required is relatively few and the construction duration is limited, emissions are not anticipated to cause an exceedence of NAAQS in the vicinity of the NAS sites.

Similar to the installation of the new ASR-11, dismantling of the existing AN/GPN-12 radar would generate some fugitive dust and some vehicle and equipment emissions. The nominal emissions

and dust generated during the AN/GPN-12 dismantling are not anticipated to cause an exceedence of NAAQS.

5.5.2 Long-term Impacts

Operation of the ASR-11 at any of the three alternative sites would produce identical emissions, which are not anticipated to have any adverse impact on air quality. Sources of emission during the operation of the ASR-11 would include the operation of the emergency diesel generator at the ASR-11 site, and evaporative loss of fuel from the aboveground storage tank on the radar site. As described in the Programmatic EA for the NAS program (USAF, 1995a), the emergency generator is anticipated to be operated approximately once a week for testing and during occasional power outages. The emissions anticipated to be produced by the emergency generator would be far below the 100 tons per year, which require review under the Prevention of Significant Deterioration regulations. Emissions are therefore expected to have no adverse impact on air quality (USAF, 1995a). The evaporative loss from the associated aboveground storage tank (AST) is also expected to be minimal, and to have no adverse impact on air quality. Maintenance traffic on unpaved access roads would generate fugitive dust during operation of the ASR-11 system. The travel distance on unpaved roads would be greatest for Site 7.

5.6 GEOLOGY AND SOILS

5.6.1 Short-term Impacts

The construction of the ASR-11 would have similar effects on the soil at each of the alternative ASR-11 sites. Excavation for the footings of the radar tower typically do not exceed 7 feet in depth. Excavation for a utility trench is typically four feet deep, and may be up to 10 feet wide. The dismantling of the AN/GPN-12 would not require any ground disturbance. Therefore, there would be no impact to the soil or geology from dismantling.

5.6.2 Long-term Impacts

There would be no long-term impacts to the existing soils or geology if the ASR-11 were constructed at any of the alternative sites.

5.7 SURFACE WATER AND GROUNDWATER

5.7.1 Short-term Impacts

It is not anticipated that construction of the ASR-11 at any of the alternative sites would have adverse impacts on surface water because there are no surface water features in the vicinity of any of the three alternative sites. Neither the excavation for the radar tower footings (approximately seven feet deep) nor the excavation for the utility conduits are expected to penetrate the water table in the vicinity of any of the alternative ASR-11 sites. The site survey report notes that each alternative site is well drained with a gravel substrate (USAF, 1999a), so surface runoff is not expected to be a problem.

New stormwater regulations promulgated by EPA on December 8, 1999 require a NPDES Stormwater Permit for construction activities impacting a minimum area of one acre and a maximum of five acres (Phase I of the program required permits for areas greater than five acres). The proposed construction activities associated with the installation of the ASR-11 will not impact the minimal acreage, therefore, none of the alternative sites would require a Stormwater permit under Phase II of the National Stormwater Program.

The dismantling of the AN/GPN-12 would not require ground disturbance and any waste materials that are produced would be removed from the area and disposed of in accordance with base regulations. Therefore, there would be no impact to surface water or ground water.

5.7.2 Long-term Impacts

There would be no long-term impacts to the surface water or groundwater if the ASR-11 were to be constructed at any of the three alternative sites. The sites are being designed to accommodate any surface water flow. There would be minimal change in stormwater runoff at any of the three sites and along access roads. Removal of the AN/GPN-12 is also not expected to have an impact on stormwater runoff.

5.8 BIOLOGICAL RESOURCES

5.8.1 Short-term Impacts

The short-term impacts of installing an ASR-11 would be relatively similar at any of the three alternative sites because all of the sites have minimal existing value in terms of biological resources.

5.8.1.1 Vegetation. The construction of the ASR-11 would have no impact on unique vegetation or plant communities, since the sites are all dominated by ubiquitous species of West Texas scrub. Approximately 0.45 acres would be cleared to facilitate construction and allow for grading and other permanent improvements at any of the three sites, and additional area would be cleared for roadways. The clearing of a small area of West Texas scrub on a base with nearly 2,000 acres of open space is not a substantial adverse impact. Similarly, the impact to vegetation associated with the installation of the utility conduits (e.g. telephone, electricity, and fiber optic cable) is considered to be minimal, although somewhat greater for Site 4 and Site 7, which are located at greater distance from the RAPCON or existing utilities, thereby requiring a greater length of conduit.

The existing AN/GPN-12 site is not vegetated; thus, removal of the AN/GPN-12 would have no adverse impact on vegetation.

5.8.1.2 Wetlands. There are no wetlands in the vicinity of any of the ASR-11 sites or the existing AN/GPN-12. Therefore, no impacts to wetlands are anticipated.

5.8.1.3 Wildlife. Construction of the ASR-11 would require disturbing approximately 0.45 acres, to install the antenna foundation and provide for other site improvements/grading. Construction is not anticipated to have an adverse impact on wildlife habitat. In addition, the noise generated during construction is expected to have minimal impact on wildlife in the area, since the general vicinity of all the sites provides minimal valuable habitat for wildlife. Furthermore, wildlife at each of the three sites is likely to be accustomed to periodic noise intrusions, because of the persistent nature of the airfield operations.

The dismantling of the AN/GPN-12 radar is not anticipated to have any adverse impact, due to the limited wildlife value of the habitat at the site.

5.8.1.4 Threatened and Endangered Species. The state threatened Texas horned lizard (*Phrynosoma cornutum*) is the only state listed species known to occur on Laughlin AFB. The Wildlife Diversity Program at the Texas Parks and Wildlife Department anticipates that the project would have no negative impact to rare species; similarly, the U.S. Fish and Wildlife Service determined that impacts on federally listed species are not likely (USAF, 1999a).

5.8.2 Long-term Impacts

Operation of the ASR-11 at any of the three alternative sites is not anticipated to have any adverse significant adverse impact on biological resources, as noted below.

5.8.2.1 Vegetation. The installation/operation of an ASR-11 at the preferred alternative would result in the permanent clearing of a small area (approximately 140 feet by 140 feet). This area would be covered with a geotextile mat and six inches of crushed stone. No vegetation would be allowed to regrow within this 0.45 acre site. Within the new roadway, gravel would replace existing vegetation, as well. Vegetation at Site 1 and Site 4 that would be lost is typical scrub-shrub vegetation; at Site 7, there would also be loss of some taller mesquite trees and scrub-shrub vegetation. Given the relatively low diversity and low abundance of flora at each of the three sites, the loss of a portion of West Texas scrub on a base with nearly 2,000 acres of open space is not a substantial adverse impact.

5.8.2.2 Wetlands. Since all of the three alternative sites are located in relatively flat upland areas away from wetlands and watercourses, the presence of the ASR-11 structure would have minimal to no effect on wetland habitat areas.

5.8.2.3 Wildlife. Each of the three sites is located in an area characterized by minimal wildlife use. Consequently, the presence and operation of the DASR system should not interfere with

wildlife. The ASR-11 tower could theoretically pose an obstacle to birds flying through the area of the site. However, as discussed in the Programmatic EA for the NAS program (USAF, 1995a), the relatively low height of the ASR-11 antennas is not anticipated to pose a substantial threat to birds flying through the area. Furthermore, as discussed above, the general area of all of the ASR-11 sites offers minimal habitat for birds, and it is unlikely that there would be large numbers of birds flying through the area.

5.8.2.4 Threatened and Endangered Species. The state threatened Texas horned lizard (*Phrynosoma cornutum*) is the only state listed species known to occur on Laughlin AFB. The Wildlife Diversity Program at the Texas Parks and Wildlife Department anticipates that the project would have no negative impact to rare species; similarly, the U.S. Fish and Wildlife Service determined that impacts on federally listed species are not likely (USAF, 1999a).

5.9 AESTHETIC RESOURCES

5.9.1 Short-term Impacts

The construction of the ASR-11 at alternative Site 1, 4, or 7 would not adversely impact aesthetic resources at Laughlin AFB. The aesthetic value of the area is linked to the military function of the base; views of radar facility construction activities would be compatible with that aesthetic value. The construction activity associated with installing the ASR-11 and removing the AN/GPN-12 would not significantly alter the aesthetic resources at the sites.

5.9.2 Long-term Impacts

Alternative Sites 1, 4, and 7 are currently devoid of structures and the presence of a radar facility would not substantially alter the view of the sites from nearby receptors. The aesthetic value of the ASR-11 at any of these sites would be consistent with the aesthetic value of military structures and facilities elsewhere on the base. The added presence of an ASR-11 at alternative Site 1, 4, or 7 would therefore have no substantial impact on the aesthetic resources of Laughlin AFB. Likewise, removing the AN/GPN-12 would not significantly alter the aesthetic resources of the base.

5.10 CULTURAL RESOURCES

5.10.1 Short-term Impacts

Based on archaeological and historical survey reports, cultural resource sites are not likely to be present within the project area for ASR-11 Sites 1, 4, or 7. However, utility construction/trenching for communication lines between Site 7 and RAPCON is expected to occur along the edge of known archaeological sites along the Sacatosa Creek floodplain. Although Site 7 itself is over 1000 feet from mapped archaeological sites, there is little space between the southernmost extent of base runways and the mapped extent of Sacatosa Creek floodplain archaeological sites; as a result, the fiber optic link route for Site 7 identified in the 1999 Integrated Site Survey Report (USAF, 1999a) runs right along the edge of several sites as mapped from the 1994 survey (UTSA-CAR, 1995). A representative of the Texas Historical Commission indicated that the project would have No Effect on National Register-eligible or listed properties or State Archaeological Landmarks, based on the project description and location information provided by URS Greiner, Inc (USAF, 1999a). However, it is possible that artifacts would be excavated during implementation of the project, particularly if Site 7 is selected, requiring some type of mitigation.

The dismantling of the existing AN/GPN-12 radar would have no cultural resource impacts.

5.10.2 Long-term Impacts

There would be no cultural resource impacts related to the operation of the ASR-11 at any of the alternative sites or the removal of the AN/GPN-12.

5.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

5.11.1 Short-term Impacts

5.11.1.1 Pollution Prevention. The construction phase of the DASR system would comply with applicable Laughlin AFB policies and guidelines for pollution prevention. In addition, a pollution prevention plan has been developed for the NAS program. This plan prohibits the use of all Class I ozone depleting chemicals, and directs the contractor to minimize the use of Class II ozone

depleting chemicals and toxic substances. Consequently, hazardous waste generation is anticipated to be reduced to the maximum extent possible during construction of the radar facility and the dismantling of the existing AN/GPN-12 radar. Similar pollution prevention measures would be implemented during ASR-11 construction regardless of the alternative site at which the facility is constructed.

5.11.1.2 Hazardous Waste. At each of the three alternative ASR-11 sites, some hazardous materials and waste would likely be used and generated during the ASR-11 construction, including: equipment fuel, engine oil, hydraulic oil, grease, and other equipment operation and maintenance material. Refueling of equipment may also take place at the alternative ASR-11 site selected for construction. Any hazardous materials used during the ASR-11 construction would be used, stored, transported, and disposed in accordance with base, military, state and federal regulations.

It is anticipated that no contaminated soils would be encountered at Sites 1, 4, or 7. The construction of the ASR-11 would require excavating to a depth of less than seven feet to facilitate the antenna foundation installation. Due to the relatively shallow depth of installation, groundwater would not be encountered at any of the sites. Consequently, there would be no potential for encountering contaminated groundwater at any of the alternative ASR-11 sites. Similarly, the utility trenches would be relatively shallow and would, therefore, not encounter groundwater.

The existing AN/GPN-12 radar may be painted with lead paint. The AN/GPN-12 will be dismantled and transported off-site. The contractor will be required to separately and properly package, mark, and dispose of hazardous materials encountered during the dismantling of the AN/GPN-12 and facilities equipment. Small pieces of lead paint may chip off of the AN/GPN-12 radar during the dismantling process; however, substantial amounts of lead paint would not be left on site as a consequence of the decommissioning of the radar. As part of the dismantling, the area will be surveyed prior to final site decommissioning, and, if present, lead paint chips will be collected and disposed of in accordance with applicable Laughlin AFB policies and procedures.

5.11.2 Long-term Impacts

5.11.2.1 Pollution Prevention. As indicated above, a pollution prevention plan has been developed for the NAS program, which prohibits the use of all Class I ozone depleting chemicals, and directs the contractor to minimize the use of Class II ozone depleting chemicals and toxic substances. In addition, operation of the DASR system would comply with all applicable Laughlin AFB policies and guidelines for pollution prevention. Consequently, hazardous waste generation is anticipated to be reduced to the maximum extent possible during the operation of the radar.

5.11.2.2 Hazardous Waste. Construction of the radar facility at any of the three alternative sites would include the installation of a 1,000 gallon AST for the storage of diesel fuel to be used for emergency generation. Texas state regulations require registration with the TNRCC of AST with a capacity exceeding 1,100 gallons. The proposed AST on the DASR site would not meet the regulatory thresholds, and therefore would not require TNRCC registration. The fuel tank would be affixed with the National Fire Protection Agency Fire Diamond label to indicate the presence of hazardous material/chemicals. The tank would comply with all federal, state, and base spill control requirements, including a leak detention system overfill alarm and double-wall and/or secondary containment as specified in 40 CFR 112.

In addition, hazardous materials and waste would likely be used and generated during operation, including: equipment fuel, engine oil, hydraulic oil, grease, and other equipment operation and maintenance material. All hazardous waste would be used and disposed of in accordance with applicable regulations and base policies. Consequently, it is not anticipated that any soil or groundwater contamination would occur as a result of operating the radar.

5.12 ELECTROMAGNETIC ENERGY

5.12.1 Short-Term Impacts

Construction at any of the ASR-11 alternative sites on Laughlin AFB is not expected to generate RFR at levels that would be harmful to human health. Some low levels of RFR could be generated from commonly used devices at construction sites, such as cellular telephones or portable computers. However, any RFR generated, and any other electric or magnetic fields would be typical of that which exists throughout the human environment and is not anticipated to be harmful to human health.

Dismantling of the existing GPN-12 would occur only after operation of the radar has ceased. Consequently, there should be no RFR hazard to workers involved in the GPN-12 dismantling. Similar to the DASR construction, dismantling activities at the GPN-12 site could generate low levels of RFR from commonly used devices, which are not anticipated to be harmful to human health.

5.12.2 Long-Term Impacts

Operation of the DASR radar at any of the three alternative sites would generate identical levels of electric and magnetic fields, including RFR. As discussed in Section 3.12, the RFR generated by the existing AN/GPN-12 is only hazardous at close distances to the radar when it is operating. Similarly, the RFR generated by the ASR-11 would only be hazardous at close ranges, while the radar is operating (see below). The tower immediately below the radar antenna would be in the spillover region, and would be hazardous to humans while the radar is operating. At any of the three alternative sites, the facility would be sited a sufficient distance from occupied buildings that the radar operation would not pose a RFR hazard to personnel within the general vicinity of any of the DASR sites. To advise personnel in the area of the RFR hazard at close ranges, signs would be posted at the perimeter of the DASR facility warning against approaching the antenna while it is in operation. There would be no RFR generated from the antenna, and therefore no RFR hazard, when the antenna is not in operation.

The following comparison to various RFR safety standards is adapted the October 1997 *Radiofrequency Impact Analysis for Airport Surveillance Radar-11* (SRI, 1997), prepared for the FAA.

Terms such as "safety standards" and "exposure standards" generally refer to, and are frequently used interchangeably with, specifications or guidelines on maximum public or occupational exposure levels to electromagnetic fields. Such levels are usually expressed as maximum power densities or field intensities in specific frequency ranges for stated exposure durations. Exposure guidelines have been developed by private organizations such as the American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE), and the National Council on Radiological Protection (NCRP, now called the National Council on Radiation Protection and Measurements) as voluntary guidelines for occupational or general public exposure, or both. Governmental agencies such as the Federal Communications Commission (FCC) and various state and municipal bodies have adopted such guidelines or variations thereof as enforceable stands. The draft version of FAA Order 3910.3B, Radiation Safety Program (1997) adopts the ANSI/IEEE exposure guidelines.

The ANSI/IEEE (1992) guidelines cover the frequency range from 0.003 MHz to 3000,000 MHz, and separately specify the maximum permissible exposure (MPE) in "uncontrolled environments" (accessible by the general population) and "controlled environments" (such as occupational exposure). In the ASR-11 frequency band of 2,700-2,900 MHz, the MPE for uncontrolled environments is 1.80-1.93 milliwatts per square centimeter (mW/cm^2) averaged over a 30-minute period. The guideline level for controlled environments is 9-10 mW/cm^2 averaged over a 6-minute period.

In 1988, the International Radiation Protection Association (IRPA) published guidelines (1988) for occupational and public exposure to RFR in the frequency range 0.001 MHz to 300,000 MHz. At the ASR-11 frequency, the MPE for occupational exposure is 5 mW/cm^2 averaged over a 6-minute period. The MPE for non-occupational exposure is 1 mW/cm^2 averaged over a 6-minute period. The MPE for pulsed RFR is set at 1,000 times that MPE for time-averaged exposure. Thus, at ASR-11 frequency, the MPE for pulsed RFR is 1,000 mW/cm^2 peak pulse power density.

The NCRP also published guidelines for human exposure. For RFR at ASR-11 frequency, the MPE for occupational exposure is 5 mW/cm^2, averaged over 6 minutes. The corresponding MPE for exposure of the general population is 1 mW/cm^2, averaged over 30 minutes.

In August 1996, the FCC adopted a hybrid standard based in part on the ANSI/IEEE (1992) guidelines and in part on the NCRP guidelines. For occupational exposure to RFR in the ASR-11 frequency band, the FCC MPE is the same as the NCRP guideline level.

The power density of the ASR-11 beam varies considerably between the near field (within 260 feet of the antenna) and the far field (greater than 260 feet away) (FAA, 1997). Thus, far-field conditions apply to almost all the receptors near the proposed radar sites and are presented herein. Any differences in power densities would be conservative, because near-field calculations lead to lower predicted power densities than do far-field calculations. The power density of the ASR-11 signal can be represented by peak pulse power - the maximum power level of a single pulse - or as the power averaged over a time period, usually several or more minutes. At a distance of 23 meters (75 feet) from the ASR-11 antenna, the peak power density of the ASR-11 signal will be 945 mW/cm^2, less than the 1,000 mW/cm^2 MPE for peak power density established by the IRPA, as discussed above. The peak power density will decrease rapidly with distance from the antenna. At all locations more than 23 meters (75 feet) from the ASR-11 antenna, the ASR-11 signal will comply with the MPE for peak power density established by the IRPA.

The average (mean) power radiated by the ASR-11 is 2.1 kilowatts (kW). At any point near the ASR-11 in normal operation (i.e. antenna is rotating), the average power density is lower than the peak density by the factor 0.00034. For the ASR-11 frequency range (uncontrolled environments), the ANSI/IEEE MPE is 1.8 to 1.93 mW/cm^2, averaged over 30 minutes. The average power density of the ASR-11 signal decreases with distance from the antenna and will fall below 1.9 mW/cm^2 at a distance of 10 meters (33 feet) from the radar antenna. Since the ASR-11 will be mounted on a tower greater than 10 meters in height, persons at ground level would not be exposed to RFR levels exceeding the ANSI/IEEE MPE. At distances of more the 13 meters (43 feet) from the ASR-11 antenna, the ASR-11 signal will comply with the MPE levels for the general population, 1.0 mW/cm^2, set forth in IRPA, NCRP, and FCC guidelines, discussed above. Thus,

no impacts to nearby receptors are anticipated at any of the three alternative sites. At all locations near the radar, the ASR-11 signal will comply by an even wider margin with the guideline levels for occupational exposure set forth by ANSI/IEEE, IRPA, NCRP, and FCC. As a precautionary measure, signs would be posted at the perimeter of the DASR facility advising personnel and the public against approaching the radar facility during operation.

On infrequent occasions, the ASR-11 antenna will remain stationary and transmit a signal for maintenance and testing purposes. This type of operation is expected to occur no more than once every several months. In maintenance mode, the ASR-11 signal will be directed at a fixed location above the horizon for up to several minutes at a time. Because the beam will be stationary, average power densities will be higher than during normal operation. In this mode, average power density of the main beam within 153 meters (500 feet) of the ASR-11 will exceed the ANSI/IEEE guideline levels. During this mode of operation, the ASR-11 will be under the direct control of an operator at the radar site and exposure of humans within that distance of the radar is highly unlikely. At locations greater than 153 meters (500 feet) from the ASR-11 antenna, the average power density of the signal from the ASR-11 operating in maintenance mode will comply with the ANSI/IEEE MPE for uncontrolled environments. At locations greater than 205 meters (672 feet) from the ASR-11 antenna, the average power density of the signal from ASR-11 operating in maintenance mode will comply with the IRPA, NCRP, and FCC MPEs for uncontrolled environments.

6.0 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AND SELECTION OF ENVIRONMENTAL PREFERRED ALTERNATIVE

The three alternative sites have similar existing conditions and anticipated effects for most of the parameters evaluated in this EA. All of the sites are located in areas designated as open space. All of the sites are characterized by similar socioeconomic, noise, geologic, hydrologic, biologic, and aesthetic conditions. The sites are located in upland areas vegetated with scrub and grasslands, and are characterized by well-drained soils and deep water tables. Wildlife use of all of the three sites is anticipated to be minimal due to the poor quality of the habitat available at the sites and the close proximity of human activity. No surface water resources or wetlands and no known threatened or endangered species are present at any of the sites. The baseline aesthetic values of the sites are similar; addition of an ASR-11 would be consistent with the aesthetic values of the base in each case. No significant differences in electromagnetic effects are expected. Construction at any of the sites would result in no contact with groundwater, and the consequences of construction at all of the sites would be the same in regard to hazardous materials.

The three alternative sites are at various distances from existing electric, telephone, and data communication lines, and from existing roads. Site 1 appears to be generally closest to existing utilities, Site 4 somewhat more distant, and Site 7 appears to be the furthest, especially for data communication lines. The longer length of trench required for conduits would lead to potentially greater impacts on adjacent land uses due to increased dust and noise levels.

Another difference among the three alternatives is that there is a possibility of encountering archaeologic resources while excavating for the fiber-optic cable conduit, in the event that alternative Site 7 is selected. No cultural resources are expected to be encountered during ASR-11 construction at either Site 1 or Site 4.

While no significant construction impacts have been identified for any of the alternative sites, it is anticipated that construction of the ASR-11 at Site 7 would result in somewhat greater impacts

than either Site 1 or Site 4, due to the distance to utility connections and the proximity to existing cultural resources.

No long-term impacts are anticipated at any of the sites. The existing characteristics of the natural and human environments at the sites are similar at Sites 1, 4, and 7. The radar would generate RFR while operating. Since the ASR-11 will be mounted on a tower greater than 13 meters (43 feet) in height, persons at ground level would not be exposed to RFR levels exceeding the maximum permissible exposure (MPE) levels for the general population. As a precautionary measure, signs would be posted at the perimeter of the DASR facility advising personnel and the public against approaching the radar facility during operation. There are no other facilities within close proximity to any of the sites, so other activities are not expected to be disrupted. During the DASR operation, fuel and other hazardous materials may be used at the site, such as engine oil and grease. However, use and disposal of any hazardous materials would occur in compliance with Laughlin AFB protocols and guidelines as well as applicable state and federal regulations. Consequently, it is anticipated that operational use of hazardous materials will not adversely affect the natural or human environments.

In summary, construction and operation of the ASR-11 facility would result in minimal short-term and long-term impacts, regardless of which site is selected as the preferred location. Both Sites 1 and 4 would be acceptable locations for the ASR-11 facility from an environmental perspective. Site 7 is somewhat less preferable due to the greater impacts that could result from the more extensive utility construction and utility construction adjacent to sensitive archaeological areas.

7.0 MITIGATION

Due to the minimal impacts that are predicted to occur as a result of the proposed ASR-11 construction, few mitigation measures would be required. To minimize noise impacts during construction, mufflers would be used on construction equipment and vehicles. In addition, all equipment and vehicles used during construction would be maintained in good operating condition so that emissions are minimized, thus reducing the potential for air quality impacts. Dust will be controlled on-site by using water to wet down disturbed areas. The small area (approximately 140 feet by 140 feet) that will be permanently cleared for the DASR facility would be covered with a geotextile fabric and crushed stone to stabilize disturbed soils, in order to minimize the potential for erosion. All hazardous materials used during construction would be handled and disposed of in accordance with Laughlin AFB policies and protocols and all applicable state and federal regulations. Traffic management measures will be developed to ensure traffic flow and pedestrian access is maintained. Additional archaeological reconnaissance during design may be required if Site 7 is selected.

During operation of the ASR-11, diesel fuel would be stored at a 1,000 gallon AST and some hazardous materials, such as equipment oil or grease, may be used at the site. Similar to the construction period, all hazardous materials used during operation would be used and disposed of in accordance with Laughlin AFB policies and protocols and all applicable state and federal regulations in order to minimize the potential for media contamination. Additionally, due to the potential for RFR hazards at close distance during operation of the ASR-11, warning signs indicating the safe distance from the operating radar will be installed at the facility perimeter.

LIST OF ACRONYMS AND ABBREVIATIONS

A/C	**Alternating current**
AFB	**Air Force Base**
AM	**Amplitude modulation (radio)**
AN/GPN-12	**(airport surveillance radar designation)**
ANSI	**American National Standards Institute**
AQCR	**Air Quality Control Region**
ASR-11	**(airport surveillance radar designation)**
AST	**above-ground storage tank**
CFR	**Code of Federal Regulations**
DASR	**Digital Airport Surveillance Radar**
dBA	**decibel, A-weighted**
DoD	**(U.S.) Department of Defense**
DRMO	**Defense Reutilization and Marketing Office**
EA	**Environmental Assessment**
EIS	**Environmental Impact Statement**
°F	**degrees Fahrenheit (temperature)**
FAA	**Federal Aviation Authority (Department of Transportation)**
FCC	**Federal Communications Commission**
FM	**Frequency modulation (radio)**
FONSI	**Finding of no significant impact**
Hz	**hertz**
IEEE	**Institute of Electrical Electronics Engineers**
IRP	**Installation Restoration Program**
IRPA	**International Radiation Protection Association**
kHz	**kilohertz**
KVA	**kilovolt-amperes**
kW	**kilowatts**
L_{eq}	**equivalent sound level**
m	**meters**
m/sec	**meters per second**
MCF/day	**thousand cubic feet per day**
mg/m^3	**milligrams per cubic meter**
MHZ	**megahertz**

LIST OF ACRONYMS AND ABBREVIATIONS

MPE	**Maximum Permissible Exposure**
MW	**megawatts**
mW/cm^2	**milliwatts per square centimeter**
$\mu g/m^3$	**micrograms per cubic meter**
μm	**micrometers (microns)**
NAAQS	**National Ambient Air Quality Standards**
NAS	**National Airspace System**
NCRP	**National Council on Radiological Protection**
NEPA	**National Environmental Policy Act**
nm	**nanometers**
NPDES	**National Pollutant Discharge Elimination System**
OSHA	**(U.S.) Occupational Safety and Health Administration**
PM-2.5	**Particulate matter below 2.5 microns**
PM-10	**Particulate matter below 10 microns**
ppm	**parts per million (by volume in air)**
RAPCON	**Radar Approach Control**
RCRA	**Resource Conservation and Recovery Act**
RFR	**Radiofrequency radiation**
TNRCC	**Texas Natural Resource Conservation Commission**
USAF	**United States (Department of the) Air Force**
USEPA	**United States Environmental Protection Agency**
UST	**Underground storage tank**

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APPENDIX A: LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

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Laughlin AFB Civil Engineering, Environmental Group, Christopher LaPietra

Laughlin AFB Civil Engineering, Environmental Group, Julie Willis

Laughlin AFB Civil Engineering, Environmental Group, Phillip Montaigne

Laughlin AFB Civil Engineering, Environmental Group, Andrea Eggleston

Laughlin AFB Civil Engineering, Environmental Group, Nathan Fonnesbeck

Laughlin AFB Civil Engineering, Community Planner (47 CES/CECDP), A. Hayes

Laughlin AFB (47 AMDS/SGPB), Sgt. Tom Clark

MSgt. Timothy Griffin, Communication Plans Department

MSgt. Troy Berg, Communications Maintenance Support

Mr. Eloy Contreros, Communications

National Park Service Visitors Center, Del Rio

APPENDIX B: SPECIES LISTED IN THE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN