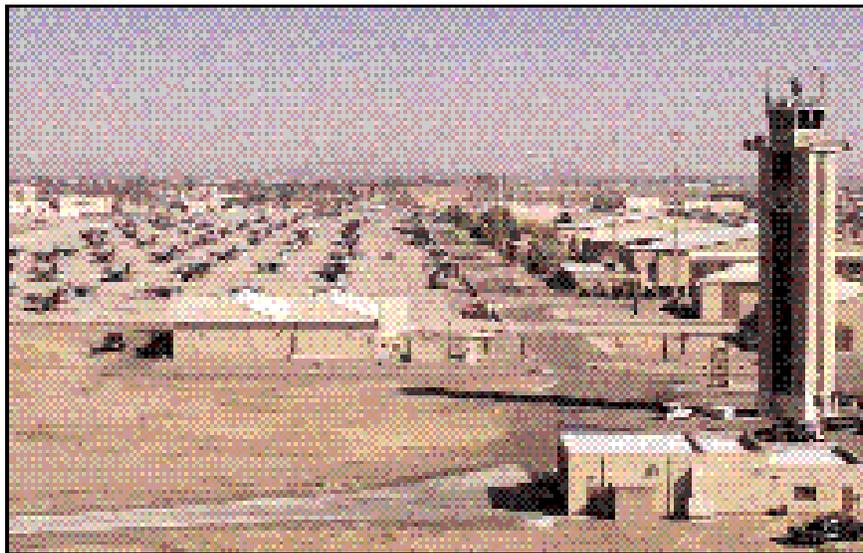


**LUKE AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR
ENVIRONMENTAL ASSESSMENT**



**Prepared by:
Electronics Systems Center
Hanscom AFB, Massachusetts**

February 23, 2001

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1
1.0 PURPOSE AND NEED FOR ACTION.....	1
1.1 INTRODUCTION	1
1.2 PURPOSE OF THE ACTION.....	2
1.3 NEED FOR THE ACTION	2
2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES	3
2.1 PROPOSED ACTION: DASR AT LUKE AFB	3
2.1.1 DASR System.....	3
2.1.2 Alternative ASR-11 Sites.....	8
2.2 NO ACTION ALTERNATIVE.....	10
3.0 AFFECTED ENVIRONMENT.....	14
3.1 LAND USE.....	14
3.1.1 Existing Conditions.....	14
3.1.2 Future Baseline Without the Project.....	19
3.2 SOCIOECONOMICS	19
3.2.1 Existing Conditions.....	19
3.2.1.1 Population	20
3.2.1.2 Employment.....	22
3.2.1.3 Expenditures of Luke AFB	25
3.2.1.4 Housing.....	25
3.2.2 Future Baseline Without the Project.....	27
3.3 UTILITIES AND TRANSPORTATION	27
3.3.1 Existing Conditions.....	27
3.3.1.1 Water Supply and Distribution	27
3.3.1.2 Wastewater Treatment	29
3.3.1.3 Solid Waste	31
3.3.1.4 Electricity.....	31
3.3.1.5 Telephone.....	33
3.3.1.6 Fiber Optic Cable.....	33
3.3.1.7 Natural Gas	33
3.3.1.8 Transportation	36
3.3.2 Future Baseline Without The Project	37
3.4 NOISE.....	37
3.4.1 Existing Conditions	38
3.4.2 Future Baseline Without the Project.....	38
3.5 AIR QUALITY	38
3.5.1 Existing Conditions.....	40
3.5.2 Future Baseline without the Project	41
3.6 GEOLOGY AND SOILS	41
3.6.1 Existing Conditions	41

3.6.1.1 Geology.....	41
3.6.1.2 Soil Resources.....	43
3.6.2 Future Baseline Without the Project	44
3.7 SURFACE WATER AND GROUNDWATER	44
3.7.1 Existing Conditions	44
3.7.1.1 Surface Water.....	44
3.7.1.2 Groundwater	45
3.7.2 Future Baseline Without the Project.	46
3.8 BIOLOGICAL RESOURCES	46
3.8.1 Existing Conditions	46
3.8.1.1 Vegetation.....	46
3.8.1.2 Wetlands	49
3.8.1.3 Wildlife	50
3.8.1.4 Threatened and Endangered Species	50
3.8.2 Future Baseline Without the Project.	51
3.9 AESTHETIC RESOURCES.....	53
3.9.1 Existing Conditions.....	53
3.9.2 Future Baseline Without the Project.....	61
3.10 CULTURAL RESOURCES	61
3.10.1 Existing Conditions.....	62
3.10.1.1 Archaeological Sites	62
3.10.1.2 Historic Structures	62
3.10.2 Future Baseline Without the Project.....	64
3.11 POLLUTION PREVENTION AND HAZARDOUS WASTE.....	64
3.11.1 Existing Conditions.....	64
3.11.1.1 Pollution Prevention	64
3.11.1.2 Hazardous Waste	65
3.11.2 Future Baseline Without the Project.....	68
3.12 ELECTROMAGNETIC ENERGY	68
3.12.1 Existing Conditions.....	68
3.12.2 Future Baseline Without the Project.....	71
4.0 ENVIRONMENTAL CONSEQUENCES	72
4.1 LAND USE.....	72
4.1.1 Short-term Impacts	72
4.1.2 Long-term Impacts	74
4.2 SOCIOECONOMICS	75
4.2.1 Short-term Impacts	75
4.2.2 Long-term Impacts	76
4.2.3 Environmental Justice.....	76
4.3 UTILITIES AND TRANSPORTATION	77
4.3.1 Short-term Impacts	81
4.3.1.1 Water Supply and Distribution	81
4.3.1.2 Wastewater Treatment	81
4.3.1.3 Solid Waste	82
4.3.1.4 Electricity	82
4.3.1.5 Telephone.....	82

4.3.1.6 Fiber Optic Cable.....	82
4.3.1.7 Natural Gas	83
4.3.1.8 Transportation.....	83
4.3.2 Long-term Impacts	83
4.4 NOISE.....	84
4.4.1 Short-term Impacts.....	84
4.4.2 Long-term Impacts.....	84
4.5 AIR QUALITY	85
4.5.1 Short-term Impacts	85
4.5.2 Long-term Impacts	86
4.6 GEOLOGY AND SOILS	87
4.6.1 Short-term Impacts	87
4.6.2 Long-term Impacts	87
4.7 SURFACE WATER AND GROUNDWATER	88
4.7.1 Short-term Impacts	88
4.7.2 Long-term Impacts	88
4.8 BIOLOGICAL RESOURCES.....	88
4.8.1 Short-term Impacts	88
4.8.1.1 Vegetation.....	89
4.8.1.2 Wetlands	89
4.8.1.3 Wildlife	89
4.8.1.4 Threatened and Endangered Species	90
4.8.2 Long-term Impacts	91
4.8.2.1 Vegetation.....	91
4.8.2.2 Wetlands	91
4.8.2.3 Wildlife	91
4.8.2.4 Threatened and Endangered Species	91
4.9 AESTHETIC RESOURCES.....	92
4.9.1 Short-term Impacts	92
4.9.2 Long-term Impacts	92
4.10 CULTURAL RESOURCES	93
4.10.1 Short-term Impacts	93
4.10.2 Long-term Impacts	94
4.11 POLLUTION PREVENTION AND HAZARDOUS WASTE	94
4.11.1 Short-term Impacts	94
4.11.1.1 Pollution Prevention	94
4.11.1.2 Hazardous Waste	94
4.11.2 Long-term Impacts.....	95
4.11.2.1 Pollution Prevention	95
4.11.2.2 Hazardous Waste	96
4.12 ELECTROMAGNETIC ENERGY	96
4.12.1 Short-term Impacts.....	96
4.12.2 Long-term Impacts.....	97

5.0 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AND SELECTION OF ENVIRONMENTALLY PREFERRED ALTERNATIVE	101
6.0 MITIGATION.....	104
7.0 REFERENCES	105

ACRONYMS AND ABBREVIATIONS

APPENDICES

APPENDIX A: LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

APPENDIX B: PRELIMINARY SITE SCREENING CRITERIA FOR LUKE AFB

LIST OF TABLES

Table 2-1. Comparison of Characteristics of Existing AN/GPN-12 and Proposed ASR-11	9
Table 3.1-1. Land Use Designations at Luke AFB	17
Table 3.2-1. Population Trends for Arizona, Maricopa County, and City of Glendale	20
Table 3.2-2. Luke Air Force Base Population Breakdown, Including Non-Residents	21
Table 3.2-3. Income and Ethnicity Statistics for Arizona, Maricopa County, and Census Blocks in the Vicinity of Luke Air Force Base	24
Table 3.2-4. Labor Force, Employment, and Unemployment Data for Arizona, Maricopa County, and Glendale for September 2000	24
Table 3.2-5. Housing Units and Vacancy.....	26
Table 3.5-1. National and Maricopa County Ambient Air Quality Standards.....	39
Table 3.5-2. Annual Criteria Pollutant Emission Quantities for Maricopa County and Luke AFB.....	41
Table 3.8-1. Vegetation Commonly Found on Luke Air Force Base Property.....	48
Table 3.8-2. Federally Listed Threatened and Endangered Species Found in Maricopa County.....	52
Table 3.8-3. Candidate Species Potentially Occurring on Luke Air Force Base	52
Table 4.3-1. Required Lengths of New Utility Connections.....	81

LIST OF FIGURES

Figure 2-1.	Luke AFB Location Map	4
Figure 2-2.	Location of Existing Radar Facility & Proposed ASR-11 Sites, Luke AFB	5
Figure 2-3.	Typical ASR-11 Facility	7
Figure 2-4.	Alternative ASR-11 Site 2, Luke AFB	11
Figure 2-5.	Alternative ASR-11 Site 5, Luke AFB	12
Figure 2-6.	Alternative ASR-11 Site 7, Luke AFB	13
Figure 3.1-1.	Land Use at Luke AFB	16
Figure 3.2-1.	Population Growth of City of Glendale	21
Figure 3.2-2.	Census Block Groups in the Area of Luke AFB.....	23
Figure 3.2-3.	Employment by Industry for Maricopa County and Glendale.....	26
Figure 3.3-1.	Existing Water Distribution System on Luke AFB	28
Figure 3.3-2.	Existing Sewer System on Luke AFB	30
Figure 3.3-3.	Existing Electrical Distribution System on Luke AFB.....	32
Figure 3.3-4.	Existing Telephone System on Luke AFB	34
Figure 3.3-5.	Existing Fiber Optic System on Luke AFB	35
Figure 3.9-1.	View Angles for Photographs Taken at Site 2.....	55
Figure 3.9-2.	Photographs of Alternative ASR-11 Site 2.....	56
Figure 3.9-3.	View Angles for Photographs Taken at Site 5.....	57
Figure 3.9-4.	Photographs of Alternative ASR-11 Site 5	58
Figure 3.9-5.	View Angles for Photographs Taken at Site 7.....	59
Figure 3.9-6.	Photographs of Alternative ASR-11 Site 7.....	60
Figure 3.9-7.	Photograph of Existing AN/GPN-12	61
Figure 4.3-1.	Fiber Optic Cable Detail, Site 2.....	78
Figure 4.3-2.	Fiber Optic Link Route, Site 5.....	79
Figure 4.3-3.	Fiber Optic Link Route, Site 7.....	80

EXECUTIVE SUMMARY

This environmental assessment (EA) has been completed as part of the National Environmental Policy Act (NEPA) process, in compliance with U.S. Air Force (USAF) instruction AFI 32-7061. According to this instruction, the EA provides analysis sufficient to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) and to aid federal agencies in complying with NEPA when no EIS is required.

This EA describes the proposed project to install a Digital Airport Surveillance Radar (DASR) at Luke Air Force Base (AFB) in Arizona. 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. DoD NAS is a component of the aviation system capital investment plan developed by the Federal Aviation Administration (FAA) to modernize approach control systems in the United States and its territories.

The NAS program will comprehensively upgrade air traffic control systems infrastructure by systematically replacing analog systems with state-of-the-art, digital technology. The purpose of the DASR component of the NAS program is to detect and process aircraft position and weather conditions at airfields. The DASR system will use the ASR-11 radar to accurately locate aircraft, in terms of range, azimuth, and altitude; provide information regarding aircraft identification code; identify emergency conditions; and report six discreet weather precipitation levels. The ASR-11 at Luke AFB is needed to replace the older existing AN/GPN-12 Airport Surveillance Radar.

The DASR facilities at Luke AFB would consist of: primary and secondary radar electronics, rotating antenna, 47-foot or 57-foot tower (depending on the site selected), utility cabling, an uninterrupted power supply, an emergency generator, power conditioning, electronic equipment grounding systems, and a fuel storage system (1,000 gallon above-ground storage tank). Facility construction, including separate concrete foundations for the ASR-11 antenna tower, equipment shelter, and engine generator shelter, fencing, and security systems would generally be within a 0.45 acre site (140 feet by 140 feet), although site constraints may require the reconfiguration of the DASR facilities to fit within a smaller area. Additional miscellaneous site improvements may include minor re-grading, installation of geotextile fabric beneath six inches of crushed stone, and an unpaved access road (if necessary). 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 Luke AFB.

Eight areas were initially identified and evaluated as potential ASR-11 sites. Four of these sites were eliminated after preliminary assessment indicated that a radar at these locations would not provide suitable coverage; a fifth site was eliminated because its proximity to the existing, operational radar would have required significant downtime of the AN/GPN-12 during DASR construction activities. The three remaining alternative sites on Luke AFB have been identified as potential locations for the ASR-11, based on operational, construction, and environmental siting criteria contained in the *National Airspace System Digital Airport Surveillance Radar Siting Plan* and the Luke AFB Final Site Survey Report. The three remaining sites (2, 5, and 7) are evaluated in this EA.

Site 2 is located in the northwest portion of the base approximately 2,100 feet south of the existing AN/GPN-12 and 450 feet north of a demolition area. Site 5 is located in the southeast portion of the base in a parking lot adjacent to a recreational area near the South Gatehouse. Site 7 is located in the southwest portion of the base and east of the runways on a narrow strip of land between Super Sabre Street and the base boundary fence. Both Sites 2 and 7 are located in proximity to IRP sites, with elevated metals near Site 2 and the potential for petroleum hydrocarbons, VOCs, and SVOCs above background levels near Site 7.

Issues that must be addressed during construction at any of the sites are elevated noise levels, increased dust, traffic and access disruption, aesthetic effects, site stability, and storm water management issues. Potential impacts in these areas would be reduced using standard mitigation measures as outlined below:

- Prior to construction, a Wildlife Services Technician should be consulted, to minimize potential impacts to burrowing owls.
- During the construction period, sheeting or supports of some kind may be used in the areas excavated for the tower footings and utility trenches in order to prevent collapse of these excavated areas.
- To minimize noise impacts during construction, mufflers would be used on construction equipment and vehicles.
- 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 onsite by using water to wet down disturbed areas.
- All areas disturbed for the DASR system construction would be seeded with a native seed mixture or covered with a geotextile fabric and crushed stone to stabilize the disturbed soils, in order to minimize the potential for erosion and sedimentation.

- Trench construction for fiber optic cable would be monitored by Luke AFB personnel to minimize the potential for displacing cultural artifacts.
- All hazardous materials used during construction of the ASR-11 would be handled and disposed of in accordance with Luke AFB policies and protocols and all applicable state and federal regulations.
- Traffic management measures will be developed to facilitate traffic flow and pedestrian access.

Potential future impacts associated with operation of the ASR-11 facility would be minimized through use of mitigation measures including the following:

- All hazardous materials used during operation of the ASR-11 would be handled and disposed of in accordance with Luke AFB policies and protocols and all applicable state and federal regulations.
- Due to the potential for RFR hazards during operation, warning signs, indicating the safe distance from the operating radar, would be installed at the facility perimeter.

All three sites are acceptable from an environmental perspective, however Site 5 is less preferable than Sites 2 or 7 due to the proximity to the recreational area. Site 2 does pose some engineering challenges, due to recent subsidence and the potential to encounter elevated levels of metals in the soils, and Site 7 would require additional design work, due to the siting constraints between the existing roadway and perimeter fence. Table ES-1 provides a summary of the potential environmental impacts associated with each of the alternative sites. The Air Force has selected Site 7 as the preferred ASR-11 location; however, this EA identifies potential impacts associated with placing the ASR-11 at each of the alternative sites equally.

Table ES-1. Environmental Impact Summary Matrix for the Alternative ASR-11 Sites at Luke AFB

Category	No Action Alternative	Existing AN/GPN-12 Removal	Site 2	Site 5	Site 7
Land Use	No Impact	Land currently occupied by the AN/GPN-12 could be reclaimed by Luke AFB.	Construction and operation of ASR-11 are anticipated to be compatible with adjacent land uses, although coordination with Weapons Safety regarding neighboring demolition and alternate munitions transport (Super Sabre St.) would be required.	Construction of the ASR-11 would occur in proximity to a playground and recreational fields. During construction, these neighboring land uses may be subject to increased noise, dust, and traffic. Long-term aesthetic impacts to the recreational area are also possible. Site is also located along the incoming explosive shipment route.	Construction and operation of the ASR-11 are anticipated to be compatible with adjacent land uses, although the standard DASR facility design would need to be modified to fit between Super Sabre Street and the base perimeter fence. Site is along the alternate munitions transport route.
Socioeconomics	No Impact	Dismantling of AN/GPN-12 expected to have short-term minor contributions to the local economy; no long-term impacts are expected.	Installation of ASR-11 expected to have short-term minor contributions to the local economy; no long-term impacts are expected.	Installation of ASR-11 expected to have short-term minor contributions to the local economy; no long-term impacts are expected. Site is closer to off-base housing, with greater potential to raise environmental justice concerns.	Installation of ASR-11 expected to have short-term minor contributions to the local economy; no long-term impacts are expected.
Utilities and Transportation	No Impact	No impacts to utilities anticipated. Minor short-term impacts are possible to on-base traffic during dismantling.	Connection of fiber optic line to the RAPCON would require installation of approximately 7,925 feet of cable. Connections to both telephone and electricity are available within 500 to 540 feet of site.	Connection of fiber optic line to the RAPCON would require installation of approximately 6,250 feet of cable. Connections to both telephone and electricity are available within 100 feet of site.	Connection of fiber optic line to the RAPCON would require installation of approximately 1,900 feet of cable. Connections to both telephone and electricity are available within 50 to 400 feet of site.
Noise	No Impact	Dismantling of AN/GPN-12 may result in short-term noise impacts due to construction activities in vicinity of the base golf course. No net impact in long term.	Construction of the ASR-11 would generally occur at least 2000 feet from receptors, and occur in an area dominated by aircraft sound levels, thus only slight potential for noise impacts during construction. Operation of the ASR-11 system would not generate excessive or persistent levels of noise, therefore no long-term impacts are anticipated.	Construction of the ASR-11 would occur in the vicinity of a playground and recreational fields, in one of the more quiet areas on base; thus, construction activities may result in noise impacts. However, operation of the ASR-11 system would not generate excessive or persistent levels of noise, therefore no long-term impacts are anticipated.	Construction of the ASR-11 would occur in vicinity of the 944 th Fighter reserve unit along Super Sabre Street. Although ambient noise levels are generally high in this area, the construction may present a noise impact. However, operation of the ASR-11 system would not generate excessive or persistent levels of noise, therefore no long-term impacts are anticipated.
Air Quality	Short term impacts from removal of existing AN/GPN-12 and installation of ASR-11 expected to consist of dust generation from construction activities and anticipated to be minimal, however moderate impacts are anticipated at Site 2 due to a greater area expected to be disturbed through utility trenching. Long term impacts associated with all alternatives consist of evaporative fuel loss from aboveground storage tank and emissions from on-site emergency generator. Neither source is anticipated to represent a substantial impact to air quality, although Luke AFB is approaching its state-allotted capacity for diesel generators.				
Geology and Soils	No Impact	No Impact	Ground in the vicinity of the site has subsided by approximately 20 feet in the last fifty years, and additional structural support for a radar tower constructed at this site may be required.	No Impact	No Impact
Surface Water and Groundwater	No Impact	No surface water resources are located proximate to sites and no construction or dismantling activities are expected to encounter groundwater. Neither Site 2 nor Site 5 is within the floodplain. Site 7 is within the 100-year floodplain as mapped by FEMA (although Luke AFB is currently investigating this); thus construction would require approval from HQ AETC.			
Biological Resources	No Impact	No Impact	Clearing of ¾ acre of sparse desert scrub vegetation would be required; possible limited wildlife displacement at site.	No vegetation currently exists at site (since it is paved); thus biological impacts limited to vicinity of utility trenches.	Clearing of ½ acre of sparse desert scrub vegetation would be required; possible limited wildlife displacement at site.
Aesthetic Resources	No Impact	No Net Impact	Site is located in remote northwestern corner of base, and thus less likely to have aesthetic impact during construction or operation.	Site borders a playground and recreational fields that may experience aesthetic impacts during construction and operation. Site would also be visible immediately upon entering South Gate, and may be visible to off-base residents along Litchfield Road development.	Site would be squeezed between Super Sabre Road and base perimeter fence; some potential aesthetic impact to neighboring buildings, such as the 944 th Fighter Wing reserve unit.
Cultural Resources	No known cultural resources exist within or near existing or proposed radar locations, therefore no impacts are anticipated. Base personnel have indicated a somewhat greater potential to encounter cultural artifacts when fiber optic cable trenching to Site 2 is installed. Base environmental personnel will provide on-site monitoring during initial construction.				
Pollution Prevention and Hazardous Waste	Hazardous materials used during operation of facility will continue being handled in compliance with all applicable regulations and base policies, therefore no impacts are expected.	Portions of the radar contain lead paint, which has potential to chip off during the dismantling.	Potential to encounter lead and chromium at elevated concentrations in surface and subsurface soil during construction. Hazardous materials used during facility operation will be handled in compliance with base policies and regulations.	No contaminated soils anticipated to be encountered during construction. Hazardous materials used during facility operation will be handled in compliance with base policies and regulations.	Potential to encounter petroleum hydrocarbons, SVOCs, and VOCs above background levels in soils during construction. Hazardous materials used during facility operation will be handled in compliance with base policies and regulations.
Electromagnetic Energy	No impact expected - due to the potential for RFR hazards during operation, warning signs, indicating the safe distance from the existing radar, are installed at the facility perimeter	No Net Impact	No impacts expected – due to the potential for RFR hazards during operation, warning signs, indicating the safe distance from the operating radar, would be installed at the facility perimeter. Potential conflicts with live munitions transport (near all 3 sites) to be investigated by Weapons Safety.		

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 issued internal instruction AFI 32-7061 (USAF, 2000a) that contains policies, responsibilities, and procedures dictating how NEPA should be implemented for USAF projects.

This environmental assessment (EA) has been prepared in compliance with AFI 32-7061. 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 Luke Air Force Base (AFB) in Arizona. 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 detailed the need for the program.

The programmatic EA and FONSI are available on the internet at <http://www.hanscom.af.mil/ESC-BP/pollprev/products.htm>. 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 Luke AFB, and evaluates the consequences of constructing and operating 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. The new radar facility will not increase or decrease the current number of flights, change aircraft patterns, or otherwise alter existing base operations.

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 Luke AFB is needed to replace the existing AN/GPN-12 airport surveillance radar, which was installed in 1973. 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

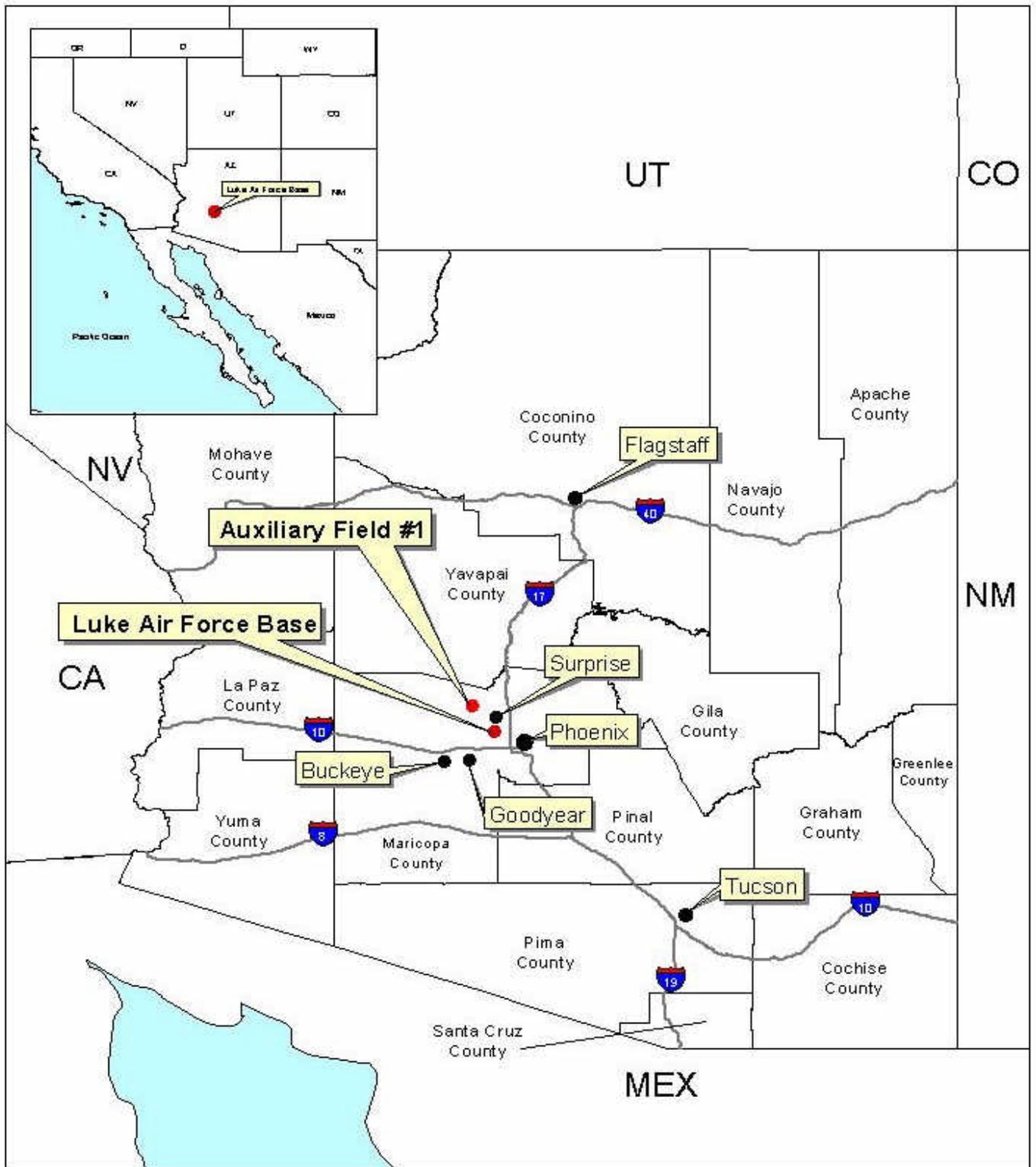
The proposed action is the installation of an ASR-11 at Luke AFB in Arizona (Figure 2-1) to replace the existing AN/GPN-12 radar facility. The Air Force has selected a preferred site (Site 7) for the radar based on operational and base considerations. Alternatives to the proposed action include no action, or installation of the ASR-11 at an alternative site. The no-action alternative consists of **not** constructing the ASR-11 facility and would involve the continued use of the existing AN/GPN-12 system. Three sites, including Sites 2, 5, and 7 (Figure 2-2) were identified on Luke AFB, in accordance with the NAS Siting Plan (USAF, 1995a). This EA discusses and evaluates potential impacts associated with the placement of the ASR-11 at each of the three alternative sites and also summarizes the potential impacts associated with the no-action alternative.

2.1 PROPOSED ACTION: DASR AT LUKE AFB

2.1.1 DASR System

The DASR system would detect and process aircraft position and weather conditions at the airfield. The DASR system 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.



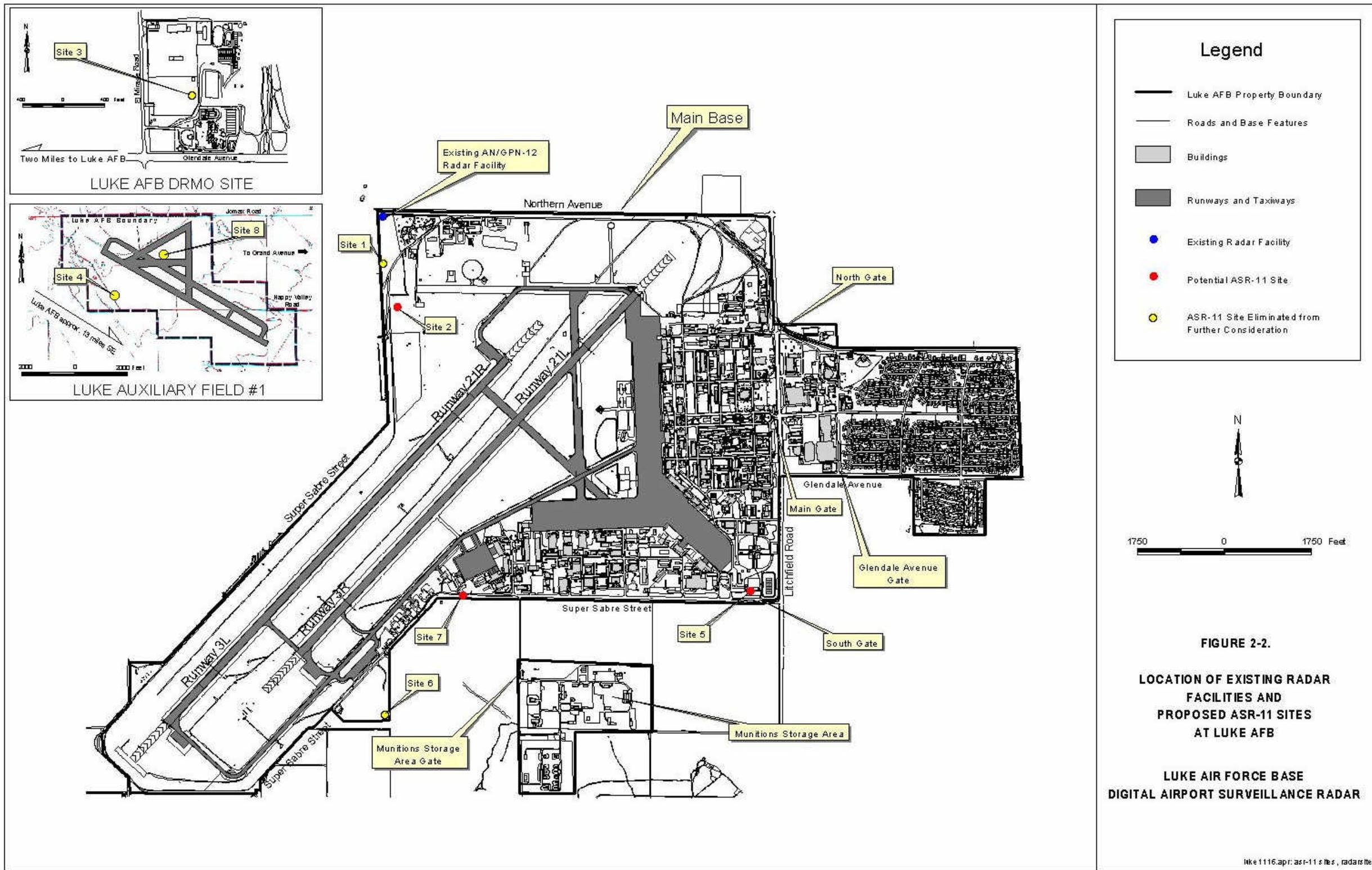
Source: ESRI



50 0 50 100 Miles

FIGURE 2-1.
LUKE AFB LOCATION MAP

INR1116.apr:locat01.m.ap



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. The DASR system would provide highly accurate target data to the Luke 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 AN/GPN-12.

The DASR facilities at Luke AFB would consist of: primary and secondary radar electronics, rotating antenna, 47-foot (Sites 2 and 7) or 57-foot (Site 5) tower, utility cabling, an uninterrupted power supply, an emergency generator, power conditioning, electronic equipment grounding systems, and a fuel storage system (1,000 gallon above-ground storage tank). Facility construction, including separate concrete foundations for the ASR-11 antenna tower, equipment shelter, and engine generator shelter, fencing (if necessary), and security systems (see [Figure 2-3](#) for a photograph of a typical ASR-11 facility) would be within a 0.45 acre site (140 feet by 140 feet) for two of the sites. Due to area limitations, facility construction at the third site would require additional engineering consideration to determine the final construction area. If necessary, facility construction at Sites 2 and 5 may extend up to 160 feet by 160 feet to allow for gradual final site grading. Due to space limitations, the standard 160-foot by 160-foot site size would not be feasible at the ASR-11 alternative Site 7. Additional miscellaneous site improvements may include minor re-grading, installation of geotextile fabric beneath six inches of crushed stone, and an unpaved access road (if necessary).

Depending on the site chosen, approximately 50 to 540 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, 2000b). The telephone connections and fiber optic connections may be made in a common 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 1,900 and 7,925 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).

No new roads would be constructed with the exception of a gravel road to access the DASR site, if necessary. Once the new DASR system is operational, the existing AN/GPN-12 would be dismantled and structures would be removed to existing grade. Any subsequent below-ground activities (removal of footings, etc.) would be the responsibility of Luke AFB. Upon completion, the ground would be reclaimed by the base.

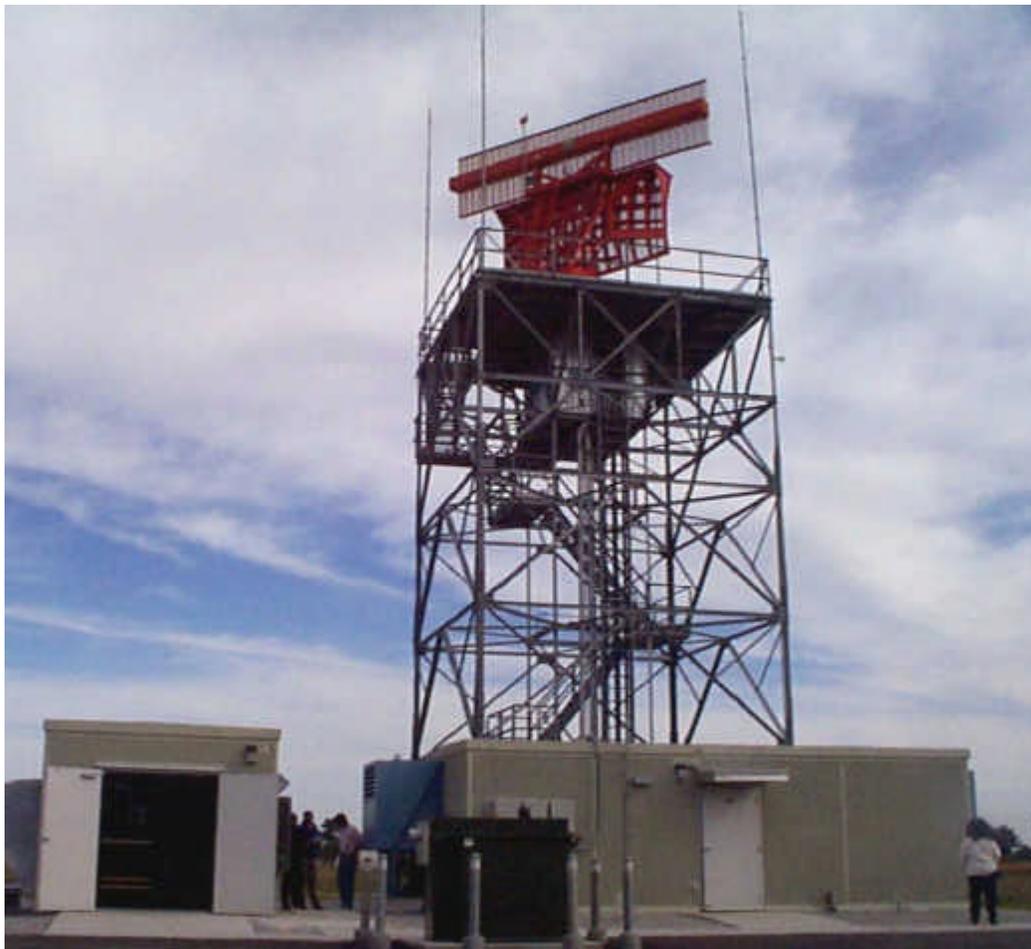


Figure 2-3. Typical ASR-11 Facility

2.1.2 Alternative ASR-11 Sites

Three alternative sites on Luke 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.

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 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, 2000b).

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

	Existing AN/GPN-12	Proposed ASR-11
Frequency	2815 MHz	2700-2900 MHz; 2 frequencies separated by at least 30 MHz
Power Peak	425 kW	19.5 kW (1 microsec) 18.0 kW (89 microsec)
Average	--	1600 Watts (Solid state)
Pulse Repetition Frequency	1002-1004 pulses/second	720-1050 pulses/second

Sources: USAF, 2000c; Belden, 1999; MITRE, 1997

Initial site selection screening criteria applied in November and December of 1999 identified eight sites (Sites 1 through 8, Figure 2-2) for consideration at the downselect meeting held on January 4, 2000 (Appendix B). Site 5 was initially rejected during the January downselect meeting; however, it was reinstated as a viable alternative pursuant to a February 28, 2000 downselect telecon. At this time, Site 8, which was previously selected as a potential site, was rejected. The following sites were rejected from further consideration due to location or lack of adequate radar coverage.

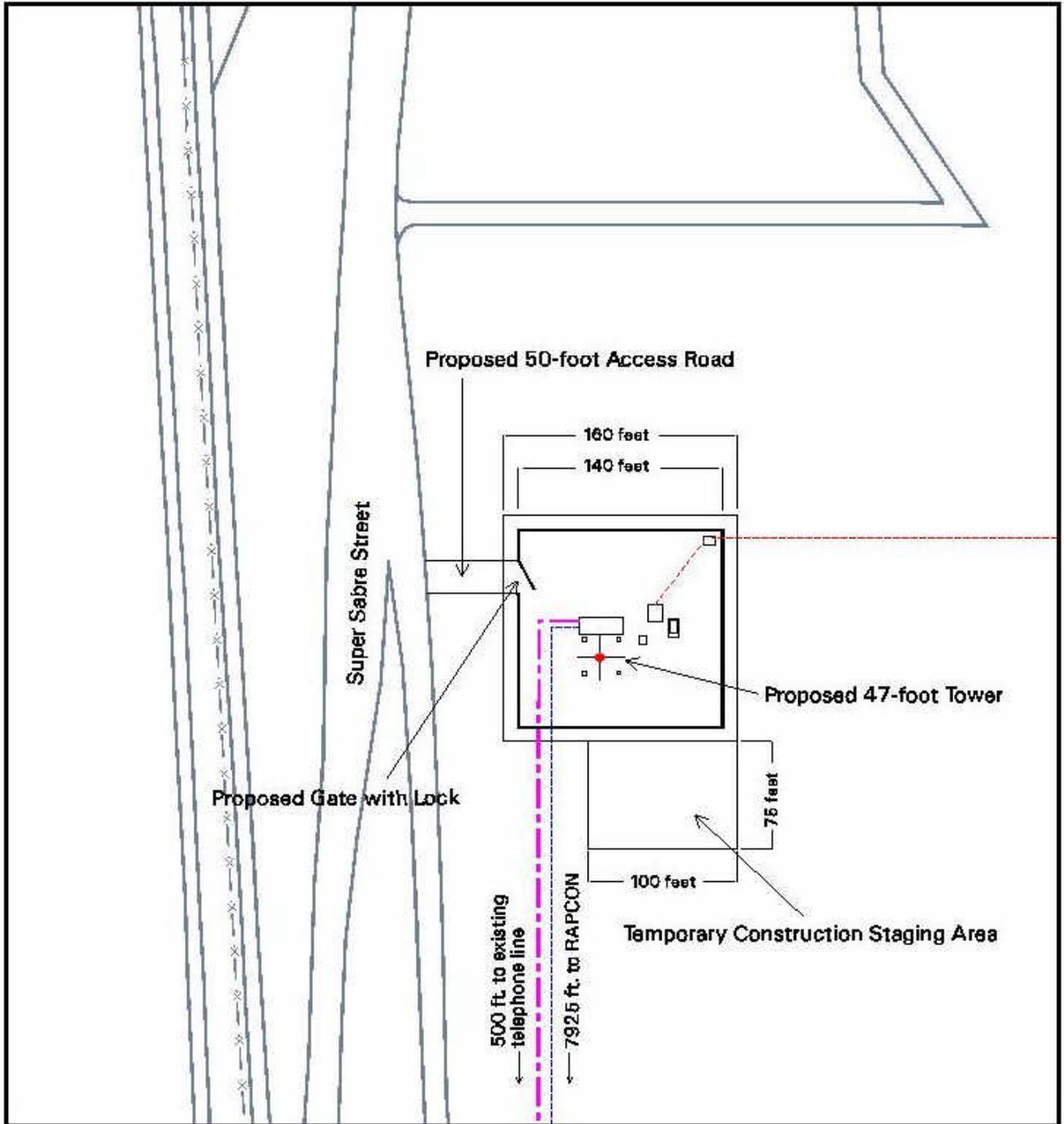
Site 1 is located approximately 1,000 feet south of the existing AN/GPN-12 and was eliminated due to concerns of downtime during construction of the new ASR-11. Site 3 is located two miles east of Luke AFB on the Defense Reutilization and Marketing Office (DRMO) property. Site 3 provided the least desirable coverage when compared to the other sites and the future of the DRMO site was uncertain. Therefore, the site was rejected from further evaluation. Sites 4 and 8 are located at the Luke AFB Auxiliary Field No. 1. These sites were rejected due to lack of coverage to the base runways. Site 6 is located behind the hot gun berm that runs adjacent to Super Sabre Street. Due to the location of the site within half nautical mile (nmi) of the touchdown area for Runway 3R/21L, the site was unable to provide coverage for that runway and was, therefore, rejected from further evaluation (USAF, 2000b).

Sites 2, 5, and 7 were selected for further investigation (Figure 2-2; [Figures 2-4](#) through [2-6](#)). Site 2 is located in the northwest portion of the base approximately 2,100 feet south of the existing AN/GPN-12 and 450 feet north of a demolition area. Site 5 is located in the southeast portion of the base in a parking lot adjacent to the South Gatehouse. Site 7 is located in the southwest portion of the base and east of the runways on a narrow strip of land between Super Sabre Street and the base boundary fence.

2.2 NO ACTION ALTERNATIVE

Implementation of the No Action Alternative would result in the continued use of the AN/GPN-12 radar. Continued use and reliance on the AN/GPN-12 would deny Luke AFB of the improved technology offered by the new DASR system. Luke AFB would not benefit from the improved system reliability, additional weather data, reduced maintenance costs, and improved performance provided by the ASR-11 radar.

Conditions reflecting the No Action Alternative are discussed for each of the twelve main environmental parameters evaluated in Chapter Three. For each parameter, the No Action Alternative is characterized in the section addressing Future Baseline Without the Project.



A:\5\modif\bas\figure\fig2

LEGEND

- - - - - Proposed Fiber Optic Cable
- - - - - Proposed Telephone Service
- - - - - Proposed Electrical Service
- Proposed Fence
- x - x - x Existing Luke AFB Boundary Fence

Source: Luke AFB

LUKE AIR FORCE BASE

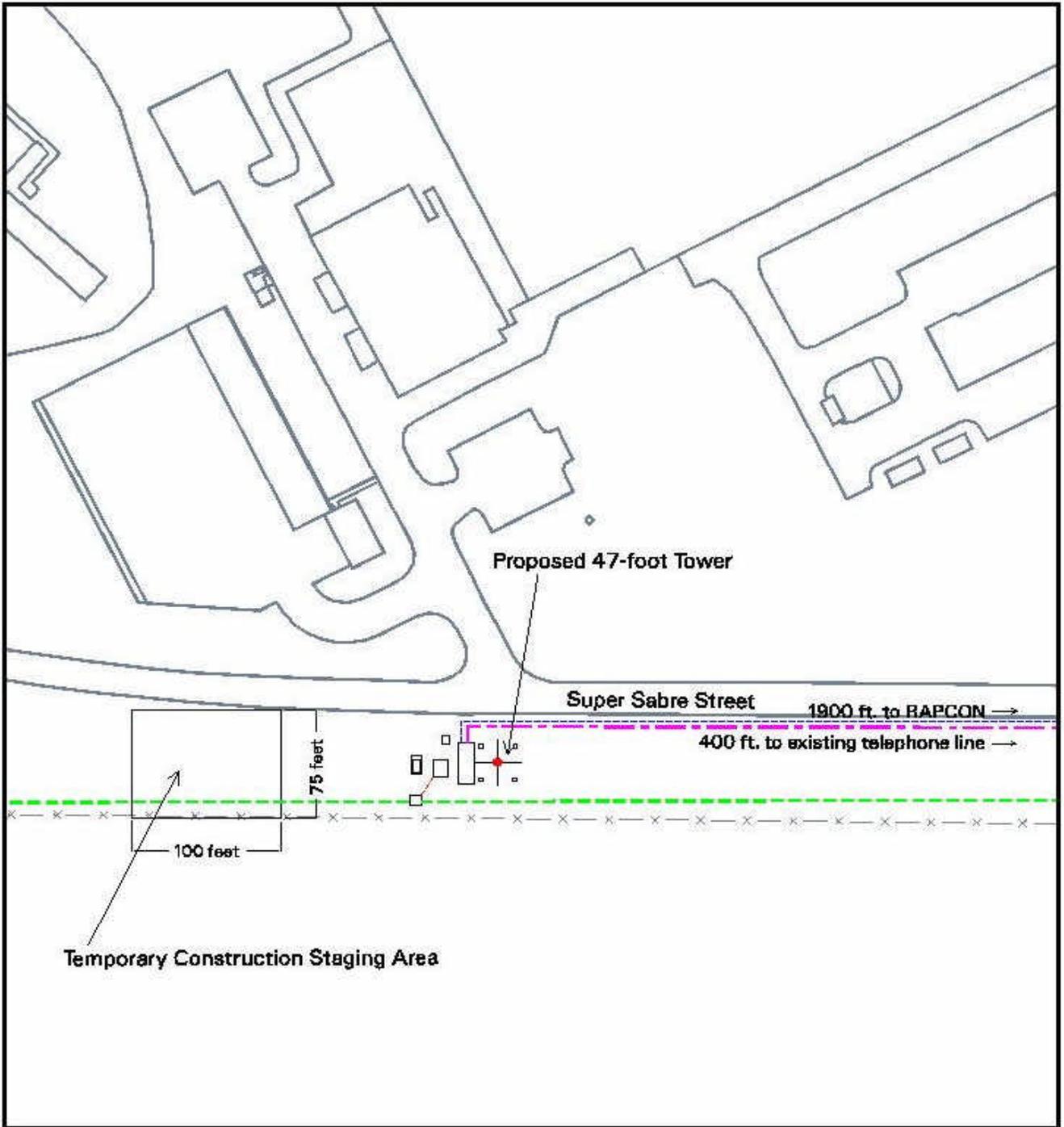
100

0

100

SCALE IN FEET

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



LEGEND

- Proposed Fiber Optic Cable
- Proposed Telephone Service
- Proposed Electrical Service
- Existing Electrical Service
- x - x - x Existing Luke AFB Boundary Fence

Source: Luke AFB

LUKE AIR FORCE BASE

SCALE IN FEET

FIGURE 2-6. ALTERNATIVE ASR-11 SITE 7, LUKE 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 and operation of the ASR-11 can be determined. General conditions on Luke AFB are presented for each of the parameters and site specific detail is included, as available. Environmental conditions at the existing AN/GPN-12 site are also described to assess any potential issues associated with its removal. The following information was obtained from several documents/reports obtained from Luke AFB Environmental Flight staff and supplemented with data collected during site visits conducted in January 2000 and subsequent communications with base personnel.

3.1 LAND USE

The purpose of this section is to characterize land uses throughout Luke AFB and the areas surrounding the base. This section addresses land use attributes of the existing AN/GPN-12 site, as well as the alternative ASR-11 alternative sites: Site 2, Site 5, and Site 7.

3.1.1 Existing Conditions

Luke AFB is located 20 miles northwest of Phoenix within the city limits of Glendale in Maricopa County, Arizona. The base is located in the Sonoran Desert and the western portion of the Valley of the Sun. The major cities of Flagstaff and Tucson are located approximately 90 miles to the north and 100 miles to the southeast, respectively. Other cities immediately surrounding Glendale include Buckeye, Goodyear, and Surprise. The AFB is accessible from Interstate 10, which is located at least 6 miles to the south, and Interstate 17, which is located 14 miles to the east (Figure 2-1).

Luke AFB occupies 3,540 acres of federally-owned land. In addition, the base maintains 2,000 acres in easements to reduce potential off-base interference with the approach and departure of base aircraft. The base also has use of the 2.7 million-acre Barry M. Goldwater Range located southwest of the base for air-to-ground and air-to-air tactical exercises. According to maps provided by base personnel, Luke AFB is composed of the main base (2,200 acres), detention

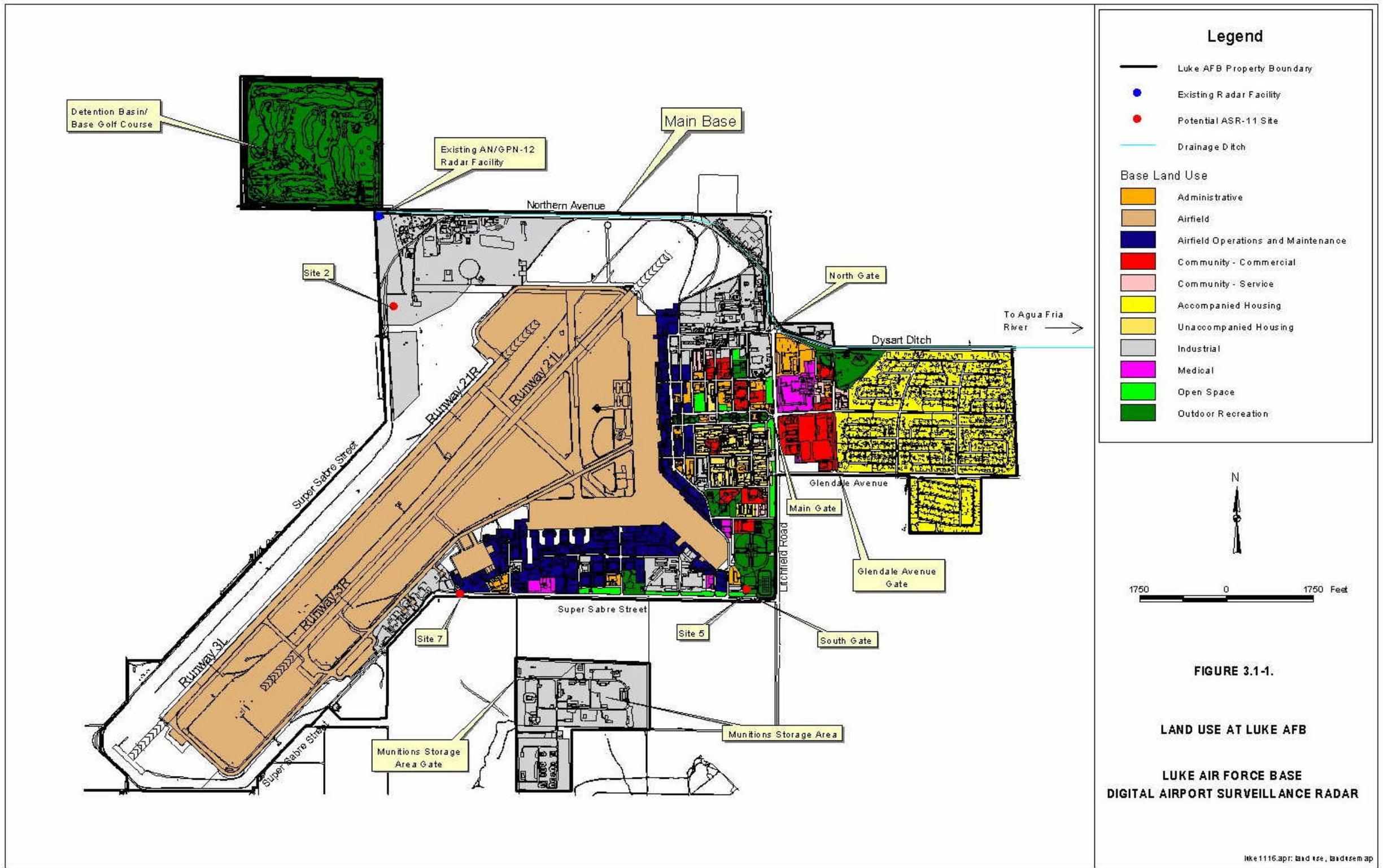
basin area (175 acres), and munitions storage area (120 acres). An Auxiliary Field No.1, of which the Luke AFB owns 400 acres and the Arizona State Land Department owns the remaining 705 acres, is located approximately 13 miles northwest and the DRMO Facility (40 acres) is located approximately 2 miles east of the main base.

According to the Luke AFB land use map, the main base is characterized by eleven land use categories including: administrative, airfield, airfield operational and maintenance, community–commercial, community–service, accompanied housing, unaccompanied housing, industrial, medical, open space, and outdoor recreation (Figure 3.1-1, Table 3.1-1).

Approximately 18 percent of the base, including the northwest and northeast corners, scattered areas along the southern perimeter, and the munitions storage area, is classified as industrial. Approximately 12 percent of the base is characterized as runway, taxiway, or apron. This land use category dominates the central and southwestern portions of the base and includes Runway 21R/3L and Runway 21L/3R. Airfield operations and maintenance land uses are located to the east and south of the airfield. East of Litchfield Road is an accompanied housing area, which occupies approximately nine percent of the base. Approximately 36 percent of the base has not been characterized into one of the land use categories. This area is immediately adjacent to and between Runways 21R/3L and 21L/3R, and in the clear zones for approach and departure.

Luke AFB has recently converted approximately 175 acres of land located 100 feet northwest of the main base, previously designated as open space and used as a stormwater detention basin, into a dual use golf course for base personnel. A drainage channel, called the Dysart Drain, conveys stormwater from the detention basin/golf course along the northern perimeter of the base parallel to Northern Avenue and eventually discharges it to the Agua Fria River.

Most of the area to the north, west, and south of the base is zoned for agricultural and low-density residential development (USAF, 1996b). The built-up area of the city of Glendale is located east of Luke AFB, and it is in this area that there is much strip commercial and mixed residential development.



Source: Luke AFB

Table 3.1-1 Land Use Designations at Luke AFB¹

Land Use	Acreage	Percent of Total
Administrative	43	2.0
Runway, Taxiway, and Aprons	259	11.7
Airfield Operations and Maintenance	128	5.8
Community–Commercial	48	2.2
Community–Service	8	0.4
Housing–Accompanied	207	9.4
Housing–Unaccompanied	35	1.6
Industrial	396	18.0
Medical	21	1.0
Open Space	25	1.1
Outdoor Recreation	231	10.5
Uncharacterized	1,034	36.3
Total	2,435	100

¹ The breakdown of land use characterizations and associated acreage does not include the Auxiliary Field #1.

Source: USAF, 1996a datalayer. Areas digitized by M&E to calculate acreages.

Maricopa County and the city of Glendale have implemented zoning overlay districts to promote land use and development compatibility with military operations at the base. This district, called the Westside Military Airbase Overlay District, was established based on noise contours and land use compatibility for the unincorporated area around Luke AFB (Maricopa, 2000a).

The proposed ASR-11 sites and the existing AN/GPN-12 are located along the perimeter of the main base. The following describes land use activities in the immediate vicinity of these sites.

Site 2 is located approximately 2,100 feet south of the existing AN/GPN-12 in an area characterized as industrial. The site is located approximately 0.5 nmi west of Runway 21R in the runway restrictive zone and approximately 5,040 feet from the air traffic control tower at an

elevation of approximately 1,102 feet above mean sea level (USAF, 2000b). A demolition area is located approximately 450 feet to the south. This area is designated for performing Explosive Ordnance Disposal (EOD) proficiency training. This training is limited to the detonation of no more than five pounds of non-fragmenting or bare-charge demolition explosive. Training ranges may also be used to burn non-fragmenting explosives under certain conditions. An area of known lead and chromium contamination is located approximately 125 feet to the east (See Section 3.11 for more details). Site 2 is also located approximately 2,200 feet southeast of the base golf course. Beyond the base perimeter in the vicinity of Site 2, the area is primarily agricultural.

Site 5 is located in a paved parking lot approximately 500 feet west of the South Gate in an area characterized as outdoor recreation. Although the site location is adjacent to a base playground, soccer field, and track, the site itself is within a paved parking lot. Site 5 is located approximately 5,100 feet from the air traffic control tower at an elevation of approximately 1,080 feet above mean sea level (USAF, 2000b). Five existing concrete pads are located immediately adjacent to the proposed site. Beyond the base perimeter in the vicinity of Site 5, the area is a mixture of both residential and agricultural uses. A residential development, accessed from Litchfield Road, is located approximately 1,000 feet southeast of Site 5.

Site 7 is located on the south side of Super Sabre Street and adjacent to the southern base boundary in an uncharacterized land use area. The north side of Super Sabre Street is primarily used for aircraft operation and maintenance, as well as industrial uses. The site is near the 944th Fighter Wing reserve unit. Two hush houses are located approximately 1,000 feet to the west and one hush house is located approximately 500 feet to the northwest of the proposed site. Site 7 is located approximately 1,400 feet from the air traffic control tower at an elevation of approximately 1,075 feet above mean sea level (USAF, 2000b). The proposed site has been disturbed, as a result of the construction of South Sabre Street and underground utilities. The site is primarily soil and gravel with minimal vegetation and bordered by bituminous concrete on two sides. Beyond the base perimeter in the vicinity of Site 7, the area is mostly agricultural.

The existing AN/GPN-12 is located in the northwest corner of the main base in an area characterized for aircraft operations and maintenance. The existing AN/GPN-12 is approximately 100 feet southeast of the southeastern corner of the base golf course.

3.1.2 Future Baseline Without Project

The Luke AFB General Plan completed in 1996 indicates that future plans for the base include the consolidation of similar land uses and the elimination of incompatible land uses (USAF, 1996a). According to base personnel, the General Plan is currently being revised and will be available in 2001.

In the future without the project, the land use characterizations at the three alternative sites are not anticipated to change. The location of Site 2 would remain within an undeveloped, industrial use area. Although a firing range in an area adjacent to Site 2 was previously proposed in the 1996 General Plan, that construction has not commenced (USAF, 2000d). The revised general plan, to be completed during the year 2001, cites no such firing range proposed for construction in this area (USAF, 2001). Site 5 would remain within a paved parking lot characterized for outdoor recreational use. It is anticipated that the land use at Site 7 would remain uncharacterized.

The surrounding communities are experiencing rapid growth and development. Local planning and zoning ordinances are aimed at preventing residential development around the immediate perimeter of Luke AFB. (Maricopa County, 2000b).

3.2 SOCIOECONOMIC CONDITIONS

3.2.1 Existing Conditions

This section addresses the population, employment, general economic condition, and housing of Luke AFB and the surrounding area. 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 Luke AFB, including the City of Glendale and Maricopa County.

3.2.1.1 Population. According to the U.S. Bureau of the Census, the population of Arizona in 1990 was 3.6 million; the 1999 estimated population was 4.7 million people (Table 3.2-1). This represents a population increase of approximately 30.4 percent over one decade. Maricopa County had a population of approximately 2.1 million in 1990; the 1999 estimated population was 2.8 million people. This represents a population increase of approximately 34.8 percent over one decade (USBC, 1990 and 2000). The City of Glendale has experienced rapid growth in population especially during the decade between 1980 and 1990 when the city was the 14th fastest growing city in the U.S. with a population increase of almost 40 percent. Since 1980, the city has grown 76 percent to its present population of 205,894 (Figure 3.2-1) (Glendale, 2000).

Table 3.2-1. Population Trends for Arizona, Maricopa County, and City of Glendale

Area	1980 Census	1990 Census	1999 Estimate	% Change (1990-1999)	2010 Estimate
Arizona	2,718,215	3,665,228	4,778,332	30.4	5,519,000*
Maricopa County	1,509,061	2,122,101	2,861,395	34.8	3,640,140
Glendale	99,231	148,134	205,894 (2000 Estimate)	39.0	241,452

Note: USBC population projection for Arizona is 5,230,000 people by 2005 and 5,808,000 by 2015

Sources: U.S. Bureau of the Census, 1990 and 1999; City of Glendale, 2000

The population associated with Luke AFB consists of approximately 5,400 active duty military personnel and approximately 1,000 reservists (Table 3.2-2). Civilian employees on the base total approximately 1,000 people. There are approximately 7,900 family members and approximately 11,000 students affiliated with Luke AFB. The base also provides medical and other services for approximately 60,000 military retirees (USAF, 1996a).

Table 3.2-2. Luke Air Force Base Approximate Population Breakdown, Including Non-Residents

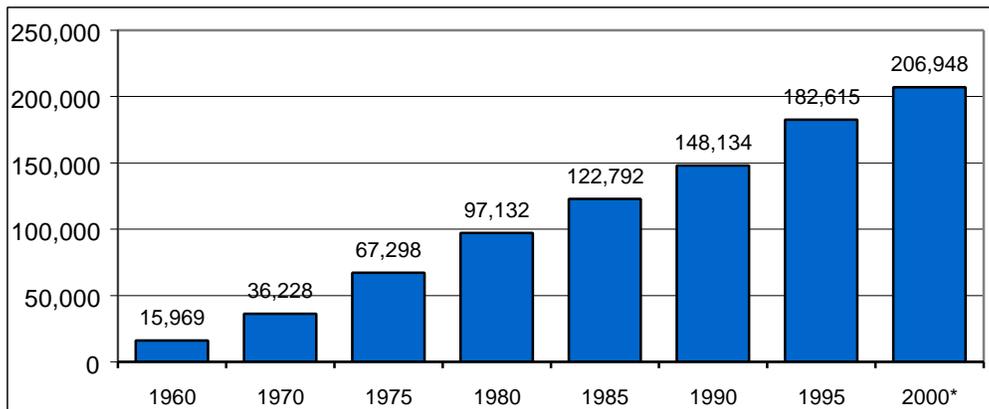
Category	Number
Military Personnel	5,300
Civilian Personnel	1,000
Military Reserves	1,100
Dependents	6,700
Students Trained*	11,000
Retirees**	60,000
Non-appropriated funded employees	300

*Approximately 11,000 students are trained each year at Luke.

** Retirees use Luke AFB for medical care, shopping, banking and other services.

Source: USAF, 2001

Figure 3.2-1 Population Growth of City of Glendale



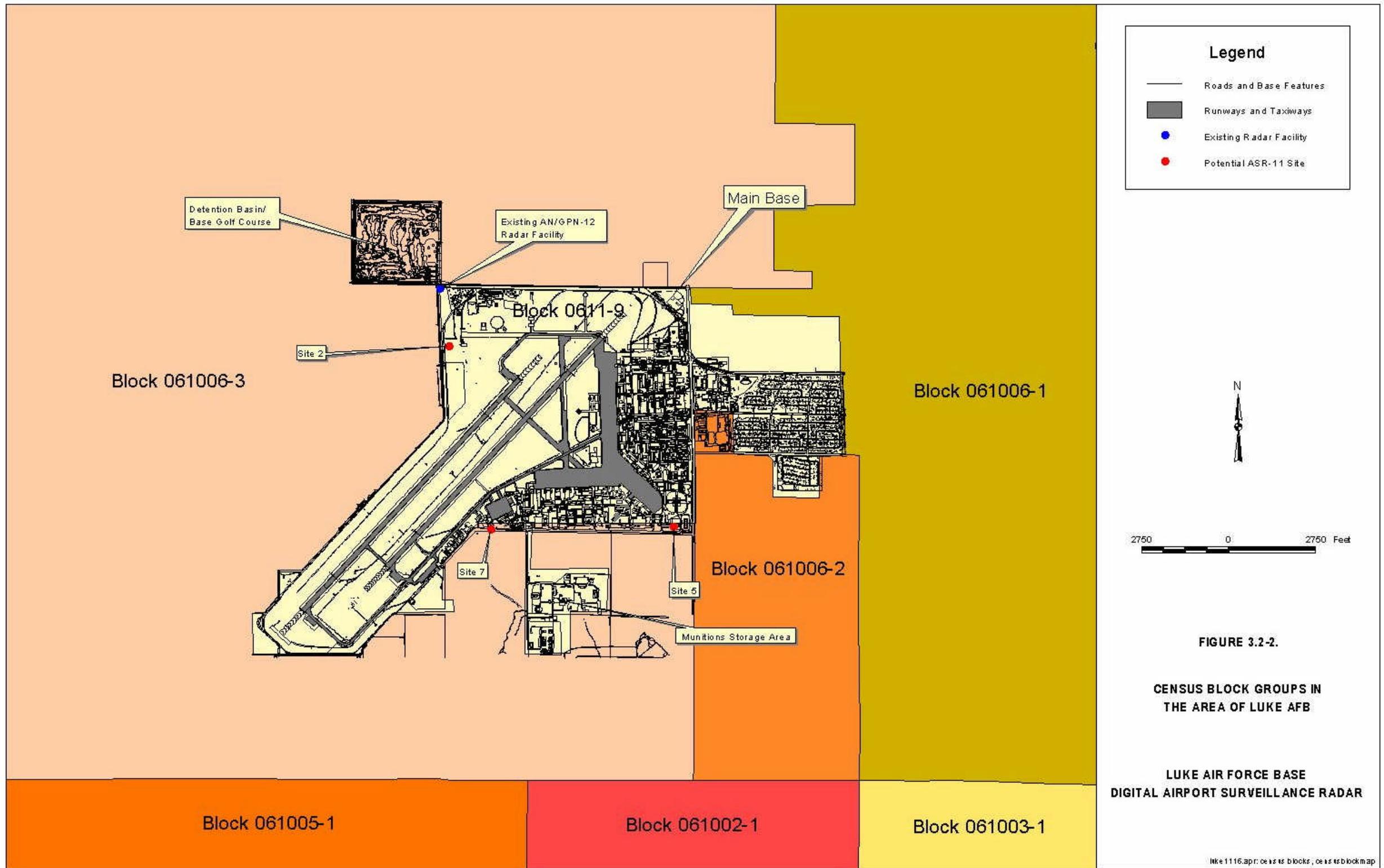
* Estimate

Source: City of Glendale, 1997

The main base area of Luke AFB and the munitions storage area are located entirely within the Census Block Group number 0611-9 (Figure 3.2-2). This census block consists of base operations and a mix of high density and single-family housing. Three other census blocks surround the base and include the ancillary base properties. The detention basin/golf course area is located within Census Block Group 061006-3 and the waste annex is within Census Block Group 061006-1 (USBC, 1990).

Although the census block containing Luke AFB represents the largest population in the area, Census Blocks 0611-9, 61006-1, and 61006-2 indicate relatively similar percentages of persons below the poverty levels, all of which are below the state level and relatively consistent with Maricopa County and the City of Glendale (Table 3.2-3). Census Block 061006-3 has a higher percentage of its population below the poverty level, exceeding the percentage reported for the state as a whole. Block group 0611-9, comprising the main base, generally has a lower percentage of white persons and a higher number of black persons than the surrounding block groups, Glendale, Maricopa County, or the state. The main base also has a lower percentage of Hispanic persons than any of the surrounding block groups, at nearly half the state average and somewhat less than the averages for Glendale and Maricopa County.

3.2.1.2 Employment. As of September 2000, the civilian labor force totaled 2,405,800 in the state of Arizona, 1,551,500 in Maricopa County, and 113,546 in the City of Glendale (Table 3.2-4). The unemployment rates of Glendale and Maricopa County are identical, and lower than the overall unemployment rates for the state of Arizona (Table 3.2-4). Luke AFB employs approximately 7,700 people, of which approximately 1,500 are civilians (Luke, 2000). Including civilian and non-civilian employment, the base is the single largest employer in the area (USAF, 1996a).



Source: ESRI; Luke AFB

Table 3.2-3. Income and Ethnicity Statistics for Arizona, Maricopa County, and Census Blocks in Vicinity of Luke AFB

	Arizona	Maricopa County	Glendale	Census Block Groups for Maricopa County			
				0611-9	061006-1	061006-2	061006-3
Total Persons	3,665,228	2,122,101	148,134	4371	1145	1851	2009
Number of Households	1,368,843	807,560	53,669	983	359	642	579
Percent Below Poverty Level	15.7	12.3	11.5	10.4	12.7	11.5	17.1
ETHNICITY PERCENTAGES							
White	80.8	84.8	85.0	77.1	91.1	74.3	87.5
Black	3.0	3.5	3.0	13.5	0.4	4.3	1.4
American Indian	5.6	1.8	0.9	0.7	0.9	0.9	0.2
Asia/Pacific Islander	1.5	1.7	2.1	4.7	0.3	6.8	0.9
Hispanic	18.8	16.3	15.5	9.4	13.2	24.7	14.7
Other	9.1	8.2	8.9	4.0	7.3	13.7	9.9

Source: USBC, 1990

Table 3.2-4. Labor Force, Employment, and Unemployment Data for Arizona, Maricopa County, and Glendale for September 2000

Area	Labor Force	Employed	Unemployed	Unemployment Rate (percent)
Arizona	2,405,800	2,320,100	85,700	3.7
Maricopa County	1,551,500	1,510,500	41,000	2.7
Glendale	113,546	110,532	3,014	2.7

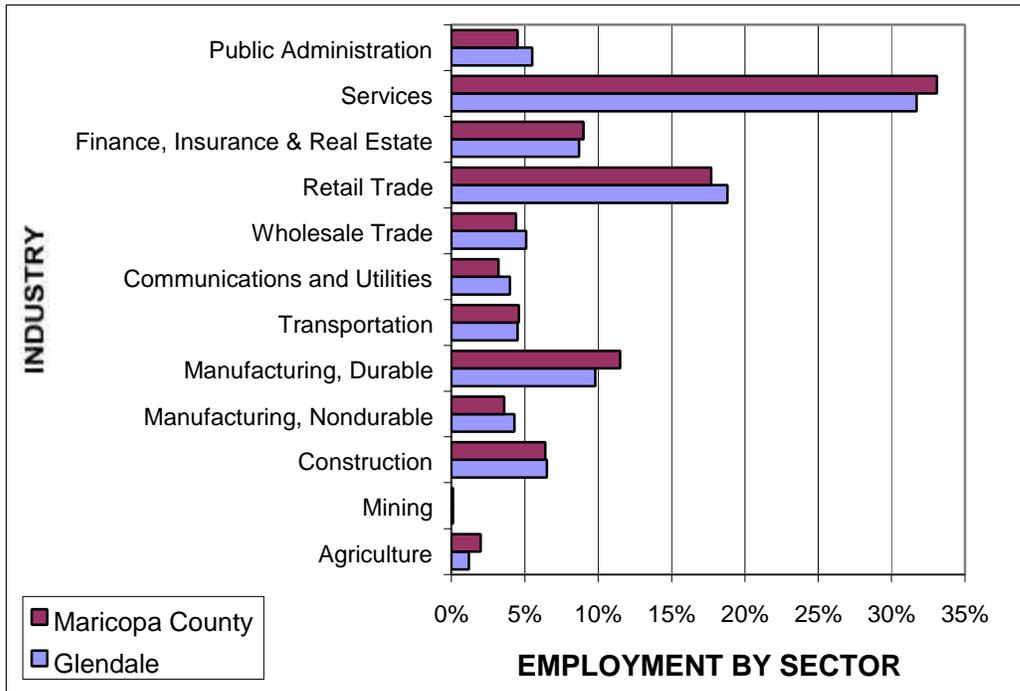
Sources: Arizona Department of Economic Security, 2000; Bureau of Labor Statistics, 2000

The main economic sectors in Arizona include services, trade, and manufacturing. The single largest economic sector is services, employing approximately 615,538 people (AZ DOC, 2000). Wholesale and retail trade provide more than 495,987 jobs. Many of these jobs are related to tourism, which generates more than 115,000 jobs and supports an additional 185,000 employees indirectly. Similar to the state, the main economic sector for Maricopa County and Glendale is services and retail trade, both employing greater than 30 percent and 15 percent of the labor force, respectively (Figure 3.2-3) (Glendale, 2000).

3.2.1.3. Expenditures of Luke Air Force Base. Luke AFB contributes approximately \$529 million to the economy of the area through its direct employment and purchases from local businesses. The military payroll is approximately \$161 million and the civilian payroll is approximately \$42 million. Secondary jobs created by the base are estimated at 4,200 within Maricopa County (USAF, 1996a).

3.2.1.4 Housing. In 1990, there were 1,659,430 housing units in Arizona, of which approximately 18 percent were vacant or used only for seasonal/occasional purposes. Of the occupied housing units in the state of Arizona, approximately 64 percent were owner occupied and 36 percent were renter occupied (USBC, 1990). Housing data from Maricopa County mirrors that of the state as a whole. Of the 870,066 total housing units in Maricopa County, approximately 15 percent were vacant or utilized only seasonally/occasionally. Of the occupied housing units in the county, 62 percent were owner occupied and 38 percent were renter occupied (Table 3.2-5). While seasonal/recreational housing accounts for much (26 to 33 percent) of the vacancies in Arizona and Maricopa County, seasonal/recreational housing accounts for less than six percent of the vacancies within the City of Glendale, which had approximately 61,218 housing units, and an 88 percent occupancy rate in 1990.

Figure 3.2-3. Employment by Industry for Maricopa County and Glendale



Source: City of Glendale, 2000

Since 1990, 90 percent of all new units constructed within Maricopa County have been single family homes. The county’s sustained growth has driven permit requests for single family homes to an all-time high and has led to escalating rents (USBC, 2000).

Table 3.2-5. Housing Units and Vacancy (1990)

AREA	OCCUPIED		VACANT		TOTAL UNITS
	By Owner	By Renter	Empty	Seasonal	
Arizona	878,561	490,282	194,483	96,104	1,659,430
Maricopa	458,426	280,695	96,753	34,192	870,066
Glendale	33,326	20,343	7,125	424	61,218

Source: USBC, 1990

Luke AFB has 874 housing units, primarily contained within either Saguaro Manor, north of Glendale Avenue, or Ocotillo Manor, south of Glendale Avenue. Off-base housing is also available and includes 338 apartment complexes (60,300 units) and 37 mobile home courts (4,503 spaces) (Luke, 2000). Quarters for non-commissioned officers are two, three, and four bedroom duplexes. Officers with families are offered single-unit company grade and field grade houses. For airmen, quarters include modular, dormitory, and motel styles (USAF, 1996a).

3.2.2 Future Baseline Without Project

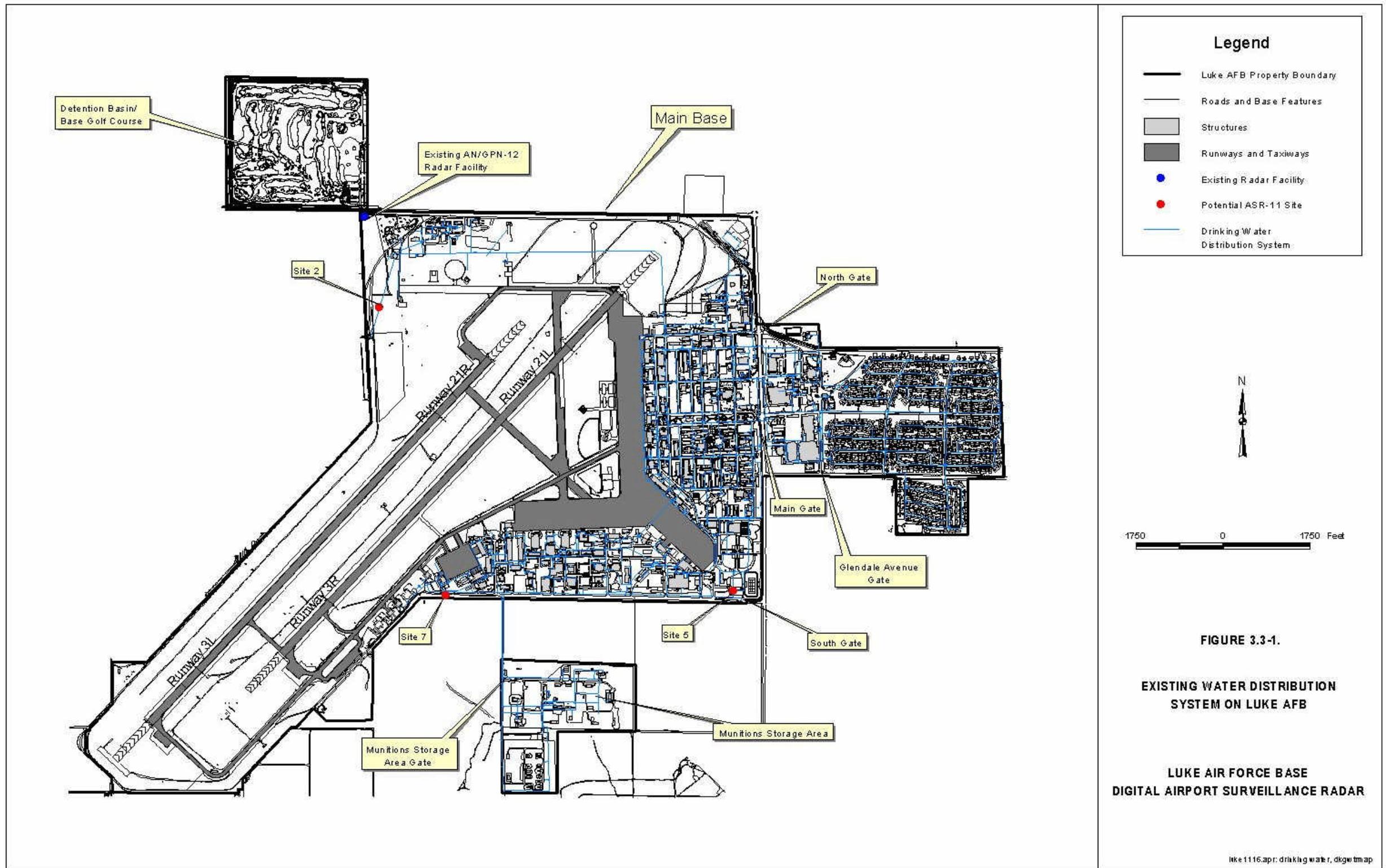
The socioeconomic characteristics of Arizona, Maricopa County, and the City of Glendale are not expected to change substantially in the future without the proposed project. State projections indicate that the population of Arizona will increase by 9 to 11 percent in the next ten years (USBC, 2000). It is not anticipated that any substantial impacts would result from changes at Luke AFB unless there is a major expansion or reduction in base operation. Presently, there is no indication of any changes planned at Luke AFB that would substantially affect the population, housing, or employment.

3.3 UTILITIES AND TRANSPORTATION

3.3.1 Existing Conditions

The utility service at Luke AFB, including availability in the vicinity of the alternative ASR-11 sites, is discussed in this section. The utilities include water, wastewater, solid waste, electricity, telephone, fiber optic, and natural gas. Transportation is described in section 3.3.1.8.

3.3.1.1 Water Supply and Distribution. Luke AFB has an internal water system. At this time, outside water sources are not anticipated to be needed. Potable water supply for the base is supplied by seven groundwater wells. Three of the wells are located in the northwest portion of the base and supply a low-pressure distribution system for administration, dormitories, and base housing uses. The remaining four wells are located either southeast of the runway or in the northeastern portion of the base. These wells supply a high-pressure distribution system and support fire protection needs and aircraft maintenance ([Figure 3.3-1](#)). The collected water is



Source: Luke AFB

stored in two ground level tanks and three elevated storage tanks. The five water storage tanks on the base have a combined storage capacity of 1.7 million gallons (USAF, 1996a).

Site 2 is located proximate to a water distribution line that connects a production well, located adjacent to the demolition area, to a water storage tank. A water distribution line traverses **Site 5** from south of the baseball fields to Super Sabre Street. A water distribution line is also located along Super Sabre Street adjacent to **Site 7**. The existing **AN/GPN-12** is located adjacent to a water distribution line that runs along Northern Avenue. The existing AN/GPN-12 is also located approximately 1,000 feet northwest of a production well and a water storage tank.

3.3.1.2 Wastewater Treatment. The wastewater treatment plant for the base's industrial and municipal wastewater is located at the waste annex east of the housing area on Luke AFB proper. The treatment plant has a capacity to treat 500,000 gallons per day by oxidation and tertiary sand filter ultraviolet disinfection. A portion of the treated effluent is recycled and used to irrigate grass and landscaped areas on the base and housing areas, as well as the new golf course.

Due to land subsidence in the vicinity of Luke AFB (See Section 3.6), the wastewater collection system on the base requires frequent maintenance and structural considerations. A 17-foot change in elevation at the north side of the base has necessitated the construction of 16 pump stations throughout the base including three within the family housing area. Since many of the sewer lines on base are over 50 years old, the base has initiated a program to replace or rehabilitate the older sections of its collection network (Figure 3.3-2). In 1995-96, the lines in the base housing area and the force main and sewer lines in Glendale Avenue were replaced (USAF, 1996a).

Site 2 is located approximately 1,800 feet from an existing sewer line. An effluent line to convey treated effluent to the golf course for irrigation was recently constructed within Northern Avenue, approximately 2,200 feet from Site 2.

Site 5 is located approximately 400 feet from an existing sewer line that terminates at Building 859. A pump station is located at Building 840 approximately 900 feet northwest of Site 5.

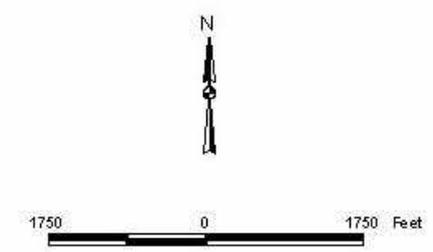
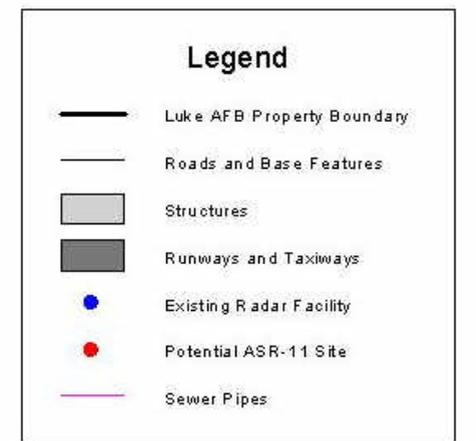
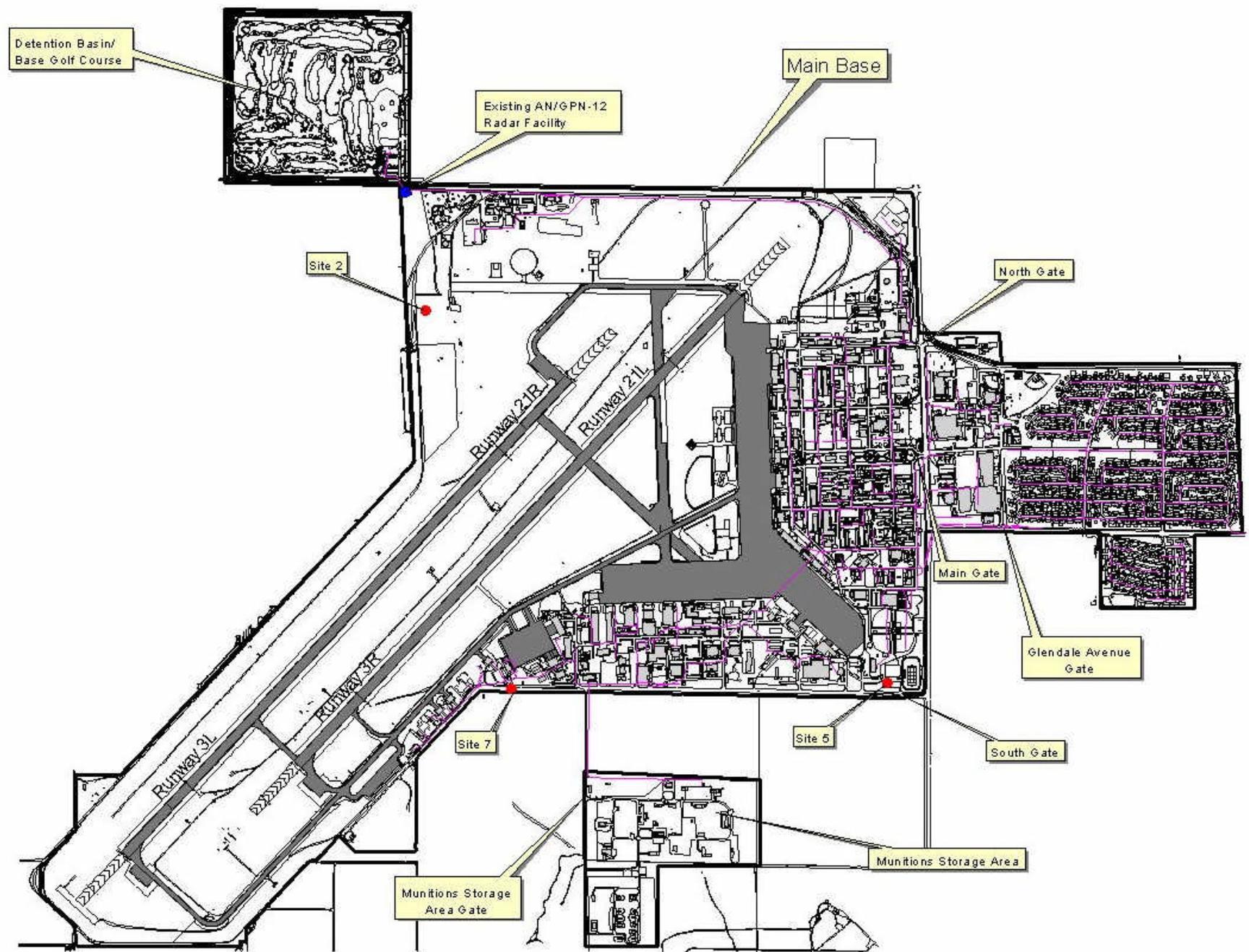


FIGURE 3.3-2.
EXISTING SEWER SYSTEM ON LUKE AFB
LUKE AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

Luke 1116.apr: was le wabr, was le wa br m ap

Source: Luke AFB

Site 7 is located approximately 175 feet from existing sewer lines and a pump station at Building 911 on the north side of Super Sabre Street. Other pump stations are located approximately 550 feet to the east of the site and 1,200 feet to the west of the site.

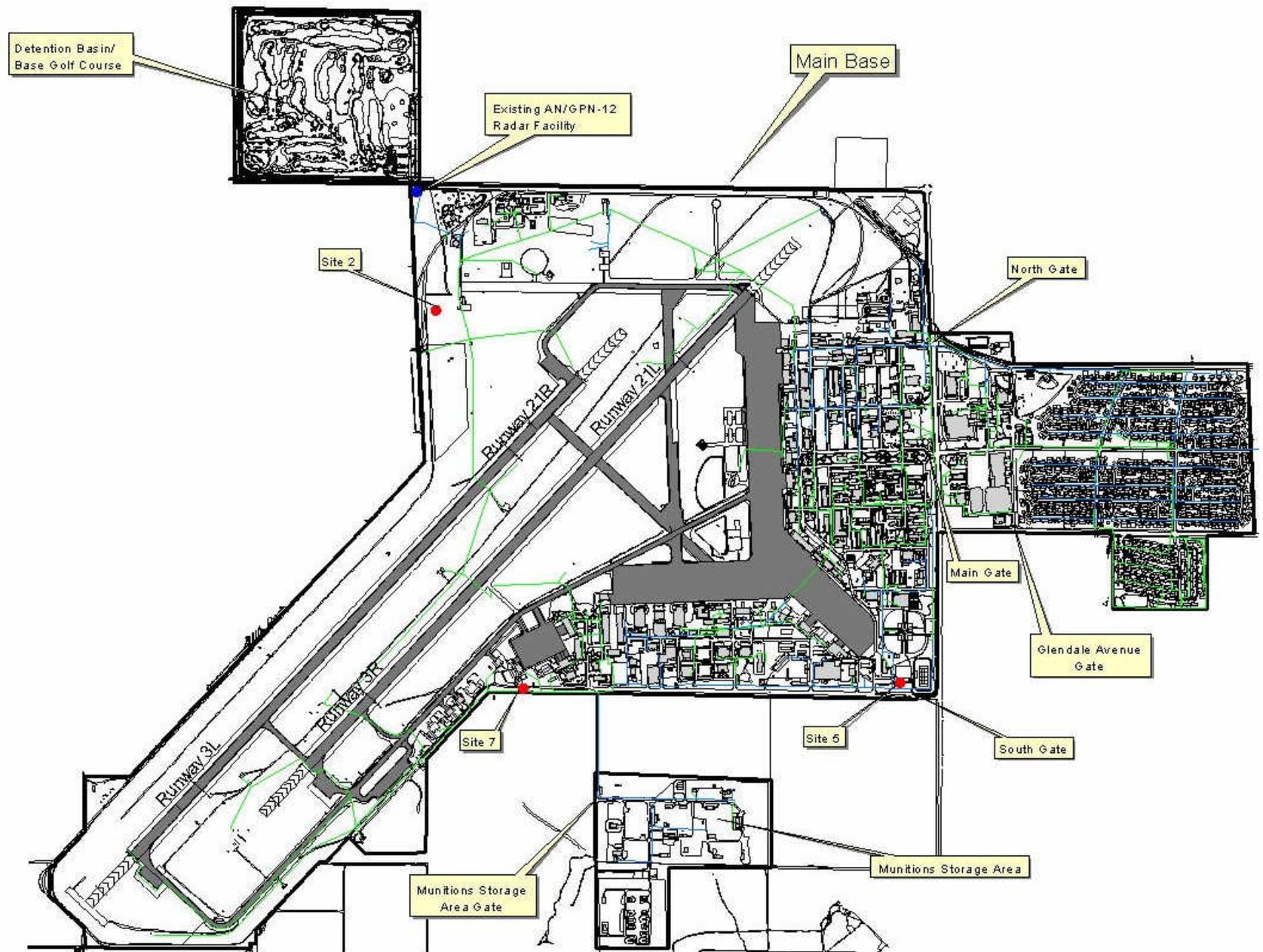
The existing **AN/GPN-12** is located approximately 1,200 feet northwest of an existing sewer line. The effluent line from the wastewater treatment plant to the golf course is located within Northern Avenue, adjacent to the AN/GPN-12 site.

3.3.1.3 Solid Waste. Solid waste from the base housing area, industrial, and aircraft maintenance and operation areas on Luke AFB is collected by a contractor. A contract with a recycling company provides curbside recycling for the base housing. No on-base landfills are in operation. A Trash and Recycling Management Plan was implemented in March 1996 to reduce solid waste by 50 percent in 1997.

3.3.1.4 Electricity. The base electrical distribution system, which is supplied by Arizona Public Service, consists of a main substation supplied by two circuits of 69 kilovolt (kV) transmission lines. The system includes two main 12.47 kV parallel substations and five main radial distribution feeders. The two parallel substations supply electricity to the main base, including military family housing and airfield. The 12.47 kV circuits distribute electrical power throughout the entire base area via overhead and underground line circuits.

Approximately 85 percent of the electrical transmission lines are above-ground. This includes the majority of the lines in the cantonment area and military housing north of Glendale Avenue. Luke AFB is currently in the process of consolidating and locating the utilities below ground. Backup electrical power is supplied to mission-critical facilities by diesel generators (USAF, 1996a). The main electrical lines at Luke AFB are shown on [Figure 3.3-3](#).

Electrical power exists in the vicinity of each of the alternative ASR-11 sites. A primary underground electrical line is located approximately 540 feet east of **Site 2**. **Site 5** is located approximately 100 feet from a primary line that runs along Super Sabre Street. **Site 7** is located 50 feet from an underground distribution line that currently runs along the perimeter of the base.



Legend

- Luke AFB Property Boundary
- Roads and Base Features
- Structures
- Runways and Taxiways
- Existing Radar Facility
- Potential ASR-11 Site
- Primary Overhead Power Lines
- Primary Underground Power Lines

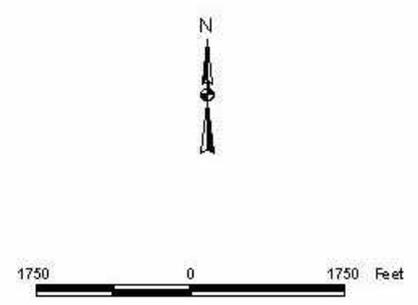


FIGURE 3.3-3.
EXISTING ELECTRICAL DISTRIBUTION SYSTEM ON LUKE AFB
LUKE AIR FORCE BASE DIGITAL AIRPORT SURVEILLANCE RADAR

luke1116.apr.electrical.electrical.msp

Source: Luke AFB

3.3.1.5 Telephone. The communications system for Luke AFB includes ducted and direct-buried copper cables for voice and low speed data transfer (Figure 3.3-4). Copper cables continue to support analog voice and low speed data requirements; however, due to the physical capability constraints of the conventional distribution system, fiber optic cable is replacing the previous system and becoming the predominant communications medium.

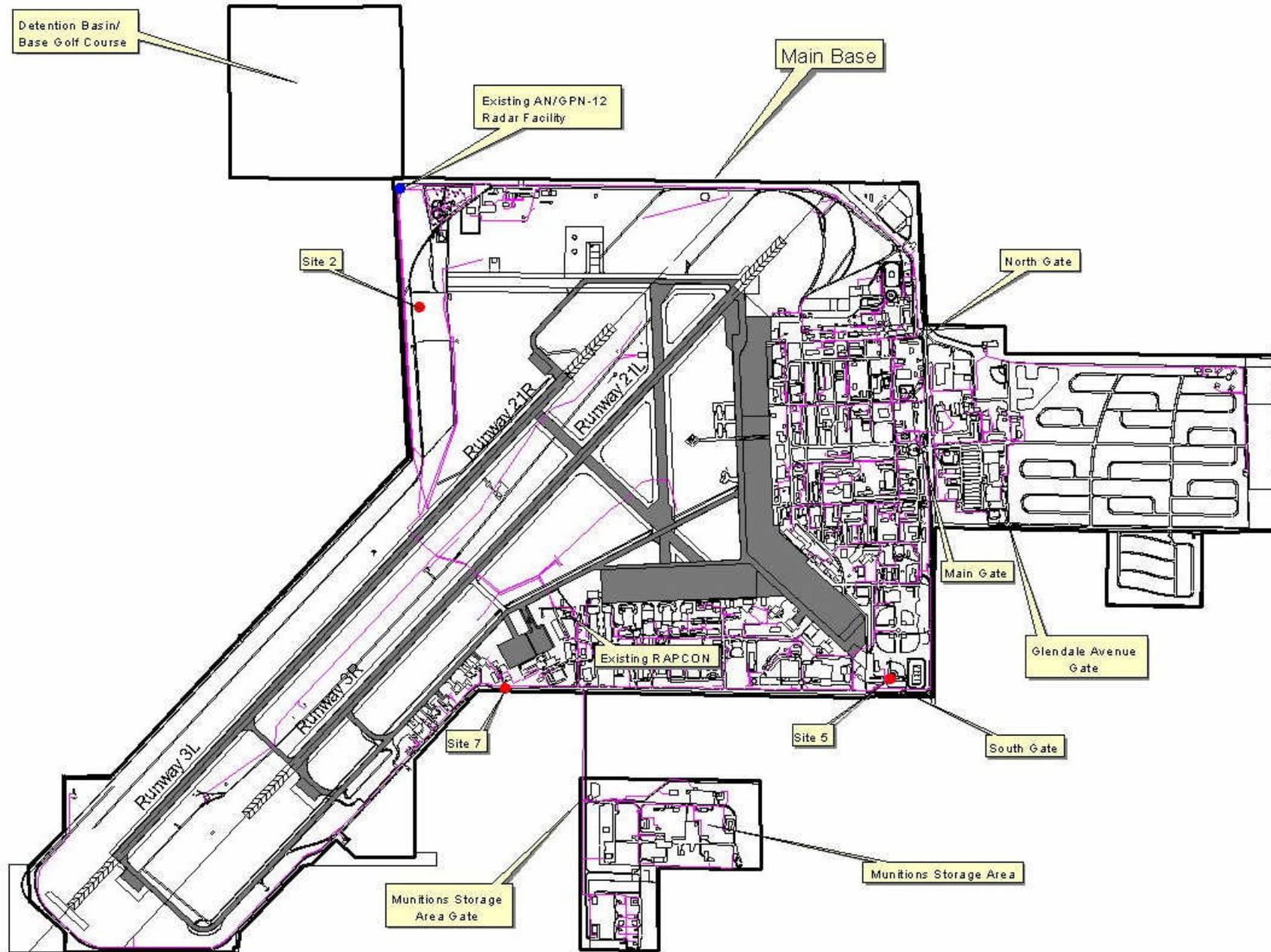
Site 2 is located approximately 500 feet from dial-up telephone lines that run along the perimeter road to Building 1039. **Site 5** is located approximately 100 feet north of telephone lines located along Super Sabre Street. Telephone connection is available approximately 400 feet from **Site 7** along Super Sabre Street.

3.3.1.6 Fiber Optic. The fiber optic communication system at Luke AFB consists of a main fiber optic foundation with ancillary hub facilities (Figure 3.3-5). This distribution system supports data, digitized voice, and digitized video at very high transmission rates.

Although fiber optic lines are located in the vicinity of each site (with the exception of Site 2), the Air Force prefers to connect the DASR facilities directly to the RAPCON, as opposed to splicing into existing fiber optic cables. **Site 2** is located on the opposite side of the runway from the RAPCON; thus, this site would require the longest connection (although a portion of the new cabling could be installed within an existing conduit beneath one of the two runways). **Sites 5** and **7** are located closer to the RAPCON, although connection lengths would still be relatively long (See Section 4.3.1).

3.3.1.7 Natural Gas. Natural gas at Luke AFB is provided by Southwest Gas Corporation. The main base gas distribution system, which was replaced in 1989, distributes natural gas at an average of 20 pounds per square inch (psi). The gas mains are located on the east and southeast portions of the base in the location of the base housing and the support buildings.

No natural gas lines are located in the vicinity of **Site 2** or the existing **AN/GPN-12**. **Site 5** is located approximately 100 feet from a gas main within Super Sabre Street. **Site 7** is located approximately 800 feet from the terminus of a gas main beneath Super Sabre Street.



Legend

- Luke AFB Property Boundary
- Roads and Base Features
- Runways and Taxiways
- Existing Radar Facility
- Potential ASR-11 Sites
- Existing Telephone Wire

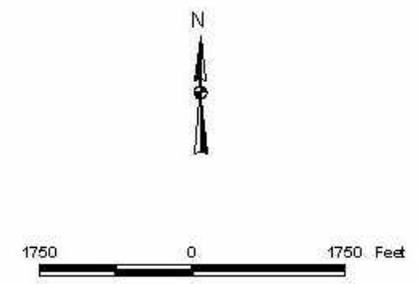
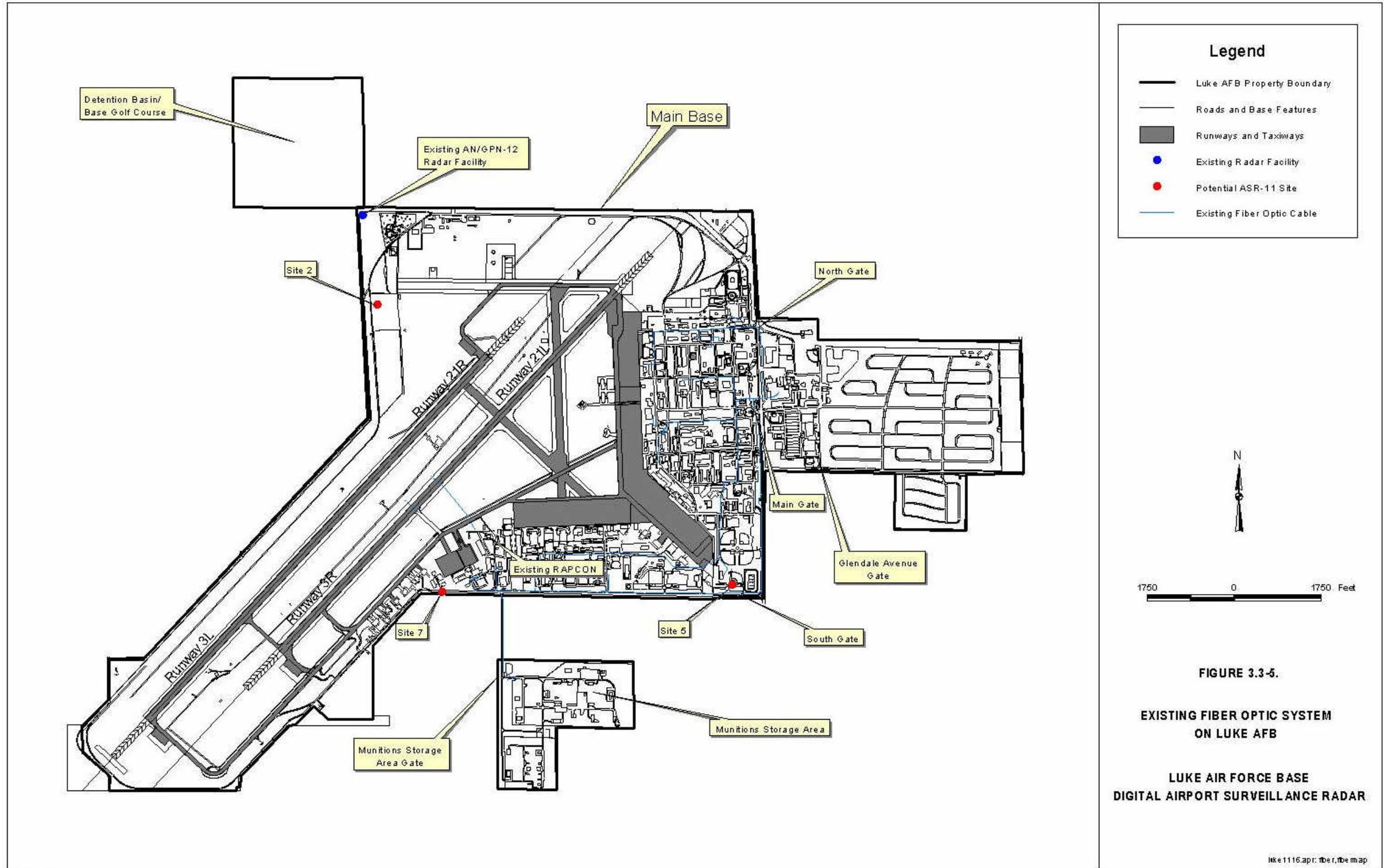


FIGURE 3.3-4.
EXISTING TELEPHONE SYSTEM
ON LUKE AFB

LUKE AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

lke1116.apr:photo, photomap

Source: Luke AFB



Source: Luke AFB

3.3.1.8 Transportation. Three major highways are located in the vicinity of Luke AFB including Interstate 17 which is a north-south route from Flagstaff; Interstate 40, which is an east-west route; and Interstate 10, which is a east-west route (Figure 2-1). Local Route 303 runs parallel to the western perimeter of the base. Commercial airline service for the Phoenix area is provided by the Phoenix Sky Harbor International Airport, as well as its two sister general aviation reliever airports: Phoenix Deer Valley Airport and the Phoenix Goodyear Airport.

The three main arterial roads serving the main base are Northern Avenue, Litchfield Road, and Glendale Avenue (Figure 2-2). These are public arterial roads and located off-base. Northern Avenue serves the north portion of the base and Glendale Avenue connects the base directly to the city of Glendale. Litchfield Road, a north-south arterial, provides direct access to the base through the three gates of the main base. The Main Entrance and Visitors Center are at the intersection of Thunderbird Road and Litchfield Road. The second and third gates are located at the intersections of Litchfield Road with Lightning Street and Super Sabre Street, respectively. A fourth gate is located at the munitions storage area south of the main base.

According to the General Plan, a cursory review of parking lots during work hours has indicated that some lots are being overutilized while others are underutilized. Some parking lots are used primarily for reservist exercises, occurring only on weekends. Parking inadequacies exist at the Base Exchange, the Commissary, and the pharmacy's short-term parking area. A Military Traffic Management Command study was completed in 1983; however, this information is outdated due to the expansion of personnel and related services at the base and no recent information is available (USAF, 1996b).

Luke AFB loads and expends a large amount of live explosives. Most of these explosives are stored at the Munitions Storage Area (MSA) located to the south of the main base. Designated routes for the transportation of explosives have been established along Super Sabre Street and Ammo Road. A temporary storage site for vehicles carrying munitions is located inside the South Gate and the main vehicle storage site is located near the gate at the MSA. Several areas on the base are designated as quantity safety distance zones and allow only limited construction activities. These safety distance zones encompass the MSA and the runways, runway aprons, and surrounding areas.

Site 2 is located in close vicinity of Super Sabre Street, which is designated as an alternative munitions convoy route. **Site 5** is located in a paved parking lot, along the incoming explosives shipment route and in the immediate vicinity of the temporary suspect vehicle site (USAF, 1996a). **Site 7** is located adjacent to Super Sabre Street and along the alternative munitions convoy route. The existing **AN/GPN-12** is located adjacent to Northern Avenue, which is not designated as a munitions convoy route.

3.3.2 Future Baseline Without The Project

No substantial changes in water, wastewater treatment, solid waste, or natural gas are anticipated at Luke AFB in the near future. Some improvements are planned for the electrical, telephone, and fiber optic systems including the conversion of the telephone systems to technologically advanced systems, thereby replacing the out-dated systems currently in place. Parking lot utilization is not anticipated to change in the future without the project. Traffic congestion in the metropolitan Phoenix area is currently being evaluated by planning councils of various communities to develop transit alternatives to minimize traffic congestion. Potential transit alternatives may reduce traffic on the arterial roads surrounding the base.

3.4 NOISE

The existing noise environment of Luke AFB in general is discussed in this section, as well as the noise environments of the three alternative ASR-11 sites and the existing AN/GPN-12 location. Many federal agencies use the day-night average sound level to describe noise and to predict community effects from long term exposure to noise. In addition, this noise level classification system is used to determine the appropriateness of a given use of specific land (land use compatibility) relative to the average level of environmental noise experienced at the location. These guidelines are described in the *Air Installation Compatible Use Zone (AICUZ) Program Handbook* (USAF, 1991). Noise levels below 65 decibels are considered to be compatible with residential land use. Residential land use is discouraged in areas with a noise level between 65-70 decibels, strongly discouraged in areas with sound levels between 70 and 75 decibels, and considered generally unacceptable for areas with noise levels exceeding 75 decibels.

3.4.1 Existing Conditions

The primary source of noise in the vicinity of Luke AFB is a result of normal base operation and aircraft usage and maintenance. Noise generated independent of aircraft flight noise on Luke AFB (maintenance and shop operations, ground traffic, construction, etc.) is comparable to the noise generated in the surrounding community; therefore, noise generated during aircraft flight operations represents the most substantial noise source on the base. The associated noise contours generally follow the shape of the runways with the area of highest decibels (80 and higher) in the immediate vicinity of the runways and extended areas of higher level noise following the aircraft approach and departure corridors (USAF, 1996a).

Site 2 is within an airfield operation noise contour characterized as having day-night levels (DNL) of approximately 80 dBA or greater. **Site 5**, which is characterized as having the lowest ambient noise levels of the three alternative sites, is located between the 65 and 70 dBA noise contours. **Site 7**, located along the 80 dBA contour, likely exhibits ambient noise levels similar to Site 2. The existing **AN/GPN-12** is located in an area where estimated DNLs average between 75 and 80 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 three alternative DASR sites or at the AN/GPN-12 in the future without the project. No major changes in land use activities are expected to occur in the vicinity of the alternative sites, and thus future noise levels are anticipated to be similar to those which currently characterize the area.

3.5 AIR QUALITY

Existing air quality characteristics in the vicinity of the three alternative ASR-11 sites are discussed in this section. Information was compiled from regional data and is expected to describe site specific characteristics.

The U. S. Environmental Protection Agency (EPA) 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, EPA has developed 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, EPA has issued NAAQS for six criteria pollutants (Table 3.5-1): carbon monoxide, sulfur dioxide (SO₂), ozone (O₃), nitrogen dioxide (NO₂), lead (Pb), and particulates (e.g., PM-10, particles with a diameter less than or equal to 10 micrometers (µm)). Pollutant emissions from Luke AFB are regulated by the Air Pollution Control Division of the Maricopa County Environmental Services Department. Currently, the air quality standards set forth by the county are identical to the NAAQS, with the addition of a standard for total suspended particulate (TSP) (USAF, 1996b).

Table 3.5-1. National and Maricopa County¹ Ambient Air Quality Standards

Air Pollutant	Averaging Time	NAAQS (mg/m³)	MC AQS(mg/m³)
Total Suspended Particulate (TSP)	24-hour	N/A	260
	Annual	N/A	75
Particulate matter of diameter less than 10 microns (PM ₁₀)	24-hour	150	150
	Annual	50	50
Sulfur Dioxide	3-hour	1,300	1,300
	24-hour	365	365
	Annual	80	80
Ozone	1-hour	235	235
Carbon Monoxide	1-hour	40,000	40,000
	8-hour	10,000	10,000
Nitrogen Dioxide	Annual	100	100
Lead	Quarterly	1.5	1.5

¹ Maricopa County has adopted all NAAQS with the addition of a standard for total suspended particulate
MC AQS = Maricopa County Air Quality Standards
NAAQS = National Ambient Air Quality Standards
N/A = Not applicable
µg/m³ = micrograms per cubic meter
Source: USAF, 1996b

3.5.1 Existing Conditions

Luke AFB is located in the Salt River Valley in the interior of Arizona. The Salt River Valley is located in the Sonoran Desert and therefore the climate is very dry. Temperature ranges from very hot in the summer, typically exceeding 100 degrees Fahrenheit (F), to mild in the winter with many winter days exceeding 70 degrees F. Annual precipitation for the area is approximately seven inches. The Salt River Valley is characterized by light winds. High winds associated with thunderstorms occur periodically in the summer (USAF, 2000b).

As of November 29, 1996, the State of Arizona received interim approval for the federal Title V permit program, established by the 1990 federal Clean Air Act Amendments. This program requires major stationary sources of air pollution to obtain operating permits that assure compliance with all applicable federal air pollution control requirements (ADEQ, 2000). Luke AFB has obtained a Title V Operating Permit from the Arizona Department of Environmental Quality, Air Quality Division.

Luke AFB is located west of Phoenix and near Litchfield Park, in Maricopa County. These areas have been designated as nonattainment areas with respect to specific air contaminants. Phoenix is a nonattainment area for PM₁₀, ozone, and carbon monoxide. Motor vehicle operation in the Phoenix metropolitan area contributes significantly to the nonattainment status of PM₁₀ and carbon monoxide. These two pollutants are most likely to exceed the NAAQS during winter and spring months when prolonged temperature inversions prevent sufficient atmospheric mixing and dispersion. The nonattainment designation for ozone is in part caused by sources of volatile organic compounds including petroleum storage, gasoline combustion, solvent usage, and painting. The monitored NAAQS exceedances of ozone generally occur in the summer months when high temperatures trigger increased volatilization of stored petroleum liquids. These volatile organic compound emissions contribute to the formation of ozone and photochemical smog during periods of intense sunlight (ADEQ, 2000).

Air pollutant emissions are generated at Luke AFB from various sources including military aircraft, field activities, boilers, surface coating, and painting operations. Generating equipment is also a source of pollutant emission. Under the Title V Operating permit, the base is allotted a certain capacity for diesel generator operation by the county and is currently approaching that

capacity. Annual criteria pollutant emissions estimated for Maricopa County and Luke AFB during 1990 are presented in Table 3.5-2.

3.5.2 Future Baseline without the Project

Without the project, air quality in the vicinity of the three proposed ASR-11 sites and the existing AN/GPN-12 is expected to remain 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 Maricopa County will contribute to emissions due to increasing traffic and use of small engines. These two tendencies may counteract each other resulting in no appreciable overall change. Without the installation of the ASR-11, the base will still be required to monitor diesel generator operation to prevent exceedance of the allotted capacity for diesel generator operation under the Title V Operating permit.

Table 3.5-2. Annual Criteria Pollutant Emissions for Maricopa County and Luke AFB, 1990

Emission Inventory	EMISSIONS (TONS/YEAR)				
	Carbon Monoxide	Volatile Organic Emissions	Nitrogen Dioxide	Sulfur Dioxide	PM ₁₀
Maricopa County 1990	349,490	82,059	52,186	6,160	46,399
Luke AFB	10.5	69.5	24.0	4.2	4.4

Source: USAF, 1996b

3.6 GEOLOGY AND SOILS

3.6.1 Existing Conditions

General characteristics of soils and geology (including topography and geologic hazards) on the base are discussed in this section. Site-specific data relevant to the three alternative ASR-11 sites are provided as available.

3.6.1.1 Geology. Luke AFB lies in the western portion of the Salt River Valley (WSRV), which is located within the Basin and Range Physiographic Province. The Basin and Range province

consists of narrow, elongated mountain ranges formed by northwesterly trending fault blocks. The WSRV is surrounded by a number of mountain ranges including; the White Tank Mountains located approximately seven miles to the west, which trend north-south and are remnants of faulted blocks of the earth's crust (USAF, 1997); the Sierra Estrella Mountains located approximately seven miles to the south; and the Hieroglyphic Mountains located approximately 15 miles to the north (USAF, 1999). The topography at Luke AFB generally slopes downward at an average gradient of 25 feet per mile from north to south with elevations ranging from 1,100 feet above mean sea level (MSL) at the northwest corner to 1,080 feet above MSL at the southeast corner (USAF, 1999).

Underlying a portion of Luke AFB is the Luke Salt Body. The Luke Salt Body, a large intrusive mass of halite, occurs in a crescent-shaped arc extending south and east of Luke AFB. Subsurface geophysical investigations indicate that the salt may be as much as 10,000 feet thick near Luke AFB; the top of the salt is at a depth of 790 feet. The lateral extent of this salt deposit is approximately 10 miles long and varies from 4 to 8 miles wide. This salt deposit has been mined commercially since 1969 (USAF, 1996b).

The Salt River Valley is known to be undergoing land subsidence due to extensive groundwater withdrawal. Groundwater levels in the area declined by more than 300 feet in the approximately 50 year period between 1923 and 1977 (See Section 3.7 for details on groundwater). With such large depletions, the alluvium has compacted and subsided, thereby creating earth fissures. The earth fissures at Luke AFB are associated with irregular surfaces of the underlying Luke Salt Body. Several earth fissures have been identified on Luke AFB including a north-south trending fissure located east of Dysart Road extending from north of Glendale Road across Northern Avenue, and another fissure located east of Dysart Road and south of Glendale Avenue (USAF, 1996b).

Seismic activity in Arizona is generally limited to the Flagstaff region; however, recent movement of larger magnitude in the San Andreas Fault Zone have been recorded in Phoenix and surrounding communities. Although Luke AFB is subject to low seismic activity (Seismic Zone I), the Arizona Earthquake Information Center has calculated a maximum probable earthquake of magnitude 7.5 for the Phoenix Area (USAF, 1996b).

Neither the proposed ASR-11 sites (**Sites 2, 5, or 7**) nor the existing **AN/GPN-12** is located within the vicinity of the identified fissures, although the northwestern corner of the base, where Site 2 is located, has subsided approximately 20 feet in the past 50 years (USAF, 2000h).

3.6.1.2 Soil Resources. Luke AFB is located in the Salt River Valley of the Basin and Range Physiographic Province, which is characterized by broad, deep alluvial-filled valleys separated by steep, discontinuous, subparallel mountain ranges (USAF, 1996b). The erosion of the surrounding White Tank Mountains has deposited large volumes of sands and gravels on the valley floors. Rock types found on Luke AFB include gravel-sized fragments of metamorphic gneiss and igneous granite, both typical of the White Tank Mountains. These rocks are found randomly dispersed in the soil matrix consisting of loam or a mixture of sands, silts, and clays (USAF, 1997).

Eight soil series and one soil complex occur on the base, including the Antho, Calciorthid, Estrella, Gilman, Glenbar, Laveen, Mohall, Pinal, and Rilliro-Perryville complex (USAF, 1996a).

The underlying soils in the vicinity of **Site 2** have been characterized as Gilman loam. This series is typically located within floodplains and alluvial fans. Gilman loam is well drained with slow runoff and moderate permeability. The soil is considered neither prime farmland nor a hydric soil (USAF, 1996a & 2000b).

Site 5 is located on Pinal loam which is typically located within alluvial fans and terraces. This series is well drained with slow to medium runoff and moderate permeability in the upper part and very slow permeability in the duripan. The soil is considered neither prime farmland nor a hydric soil (USAF, 1996a & 2000b).

The soils underlying **Site 7** have been characterized as Mohall clay loam. This series is typically located within relict basin floors, fan terraces, and stream terraces. Mohall clay is well drained with slow runoff and moderate to slow permeability. The soil is considered neither prime farmland nor a hydric soil (USAF, 1996a & 2000b).

The existing **AN/GPN-12** is located in an area comprised of Gilman loam. As described for Site 2, this soil is well drained with slow runoff and moderate permeability.

3.6.2 Future Baseline Without the Project

The geology and soil conditions at the base may potentially change in the future without the project due to the continued subsidence of land as a result of groundwater withdrawal and/or seismic activity. It is expected that the existing soil types will continue to represent the area of the alternative ASR-11 sites and existing AN/GPN-12.

3.7 SURFACE WATER AND GROUNDWATER

3.7.1 Existing Conditions

The characteristics for surface water and groundwater on the base are discussed in this section and are expected to generally describe the area around the three alternative ASR-11 sites and existing AN/GPN-12.

3.7.1.1 Surface Water. Luke AFB is located in the Salt River Valley in the Lower Colorado River Basin. Surface streams and rivers near Luke AFB include the Agua Fria River, Salt River, and Gila River. These ephemeral watercourses typically convey water only in response to precipitation during storms. These lotic systems in the Luke AFB vicinity begin in the upland, mountainous regions of the Central Highlands or the Colorado Plateau and flow to the south and west to the Colorado River, discharging to the Gulf of California. The Agua Fria River, located approximately two miles east of Luke AFB, is dammed by the New Waddell Dam upstream within the Hieroglyphic Mountains. The dam forms Lake Pleasant, approximately 25 miles northeast of Luke AFB. This dam and reservoir allow the water resources of the Agua Fria River to be used for irrigation on a constant basis and also aid in flood control. The Salt and Gila Rivers are also dammed for irrigation and flood control (USAF, 1999).

Due to alteration of drainage patterns at Luke AFB from land subsidence (See Section 3.6), a series of drainage ditches, canals, and detention basins have been constructed to collect surface water drainage and control off-base stormwater runoff from entering Luke AFB. The Dysart Drain, for example, was constructed in 1958 to collect stormwater flow that would otherwise

flood the base. The drain was built in conjunction with McMicken Dam, which is approximately six miles northwest of Luke AFB. McMicken Dam retains flows from 320-square mile drainage area, a large portion of which would otherwise flood Luke AFB. The impounded floodwaters are conveyed to Agua Fria River located approximately 4.5 miles to the east (USAF, 1996b).

The 125-acre detention basin to the northwest of the base proper drains to the Dysart Drain (Figure 3.1-1). The basin includes several grouted riprap inflow spillways to direct flow into the basin. The majority of the flow enters from Reems Road at the northwest corner of the basin. The collected stormwater is conveyed into a culvert outlet and discharged to the Dysart Drain (USAF, 1996b).

No perennial surface waters are located on Luke AFB property. **Sites 2, 7,** and the existing **AN/GPN-12** are not located near a natural surface water body. Site 2 is located approximately 2,200 feet south of the man-made Dysart Drain. According to the base layout map, **Site 5** is located approximately 125 feet north of an intermittent stream off base property on the southern side of Super Sabre Street and approximately 1,000 feet west of another unnamed stream outside Luke AFB property.

3.7.1.2 Groundwater. Luke AFB is located in the Phoenix Active Management Area (AMA), an aquifer protection area under the jurisdiction of the Arizona Department of Water Resources. The Phoenix AMA covers approximately 5,646 square miles and includes the majority of Maricopa County. The AMA consists of seven groundwater subbasins: East Salt River Valley, West Salt River Valley, Hassayampa, Rainbow Valley, Fountain Hills, Lake Pleasant, and Carefree. Luke AFB is located in the West Salt River Valley (ADWR, 1999).

Luke AFB relies on uncontaminated groundwater reservoirs lying 500 feet below the land's surface for its water supply (DAF, 1997). The groundwater in the vicinity of the base occurs under perched, unconfined, and semi-confined conditions. The major aquifers consist of the saturated portions of the alluvial silt, clay, sand, and gravel basin fill material that is more than 1,000 feet thick. Excessive pumping of groundwater for agriculture and municipal uses has lowered groundwater levels over large portions of the WSRV subbasin in the vicinity of Luke AFB. Groundwater elevations have declined approximately 300 feet in the area since large scale

pumping began in 1930s, resulting in a cone of depression underlying several square miles in the vicinity of Luke AFB (USAF, 1996b).

Depth to groundwater in the vicinity of **Sites 2, 5, 7,** and existing **AN/GPN-12** is approximately 350 to 400 feet. Because of unusually large volumes of precipitation during the winters of 1977, 1978, and 1980, that resulted in regional flooding, groundwater levels rose about 10 to 40 feet in wells in the vicinity of Luke AFB. However, an overall decline of approximately 300 feet since the 1930s still exists (USAF, 1996b).

3.7.2 Future Baseline Without the Project

No substantial changes in surface water conditions are expected to occur in the future without the project. Implementation of Best Management Practices during normal activities on the base will help to reduce both point and non-point source pollution from stormwater. Withdrawal of groundwater supplies for drinking water sources will continue without the implementation of the project. Because the base is located within the Phoenix AMA, the withdrawal of groundwater will be monitored by the Arizona Department of Water Resources (ADWR, 1999).

3.8 BIOLOGICAL RESOURCES

This section contains descriptions of biological resources, including vegetation, wetlands, and wildlife, for Luke AFB and its vicinity, including the proposed ASR-11 sites and the existing AN/GPN-12 site.

3.8.1 Existing Conditions

3.8.1.1 Vegetation. Luke AFB is situated in the Lower Colorado River Valley, the largest and most arid region of the Sonoran Desert. This region is characterized by open and relatively simple vegetative growth. Most plants found in this region have developed physiological adaptations to slow transpiration to survive the harsh desert conditions, which include high temperatures and low precipitation. Common plants in the Lower Colorado River Valley Subdivision include creosote bush (*Larrea tridentata*), bursage (*Ambrosia* sp.), brittlebush (*Encelia farinosa*), and foothill paloverde (*Cercidium* sp.) (USAF, 1996b).

Approximately 778 acres of Luke AFB are developed with military or military-support facilities. The sparse vegetation at Luke AFB falls into four main types: microphyllous desert scrub, which includes scrubland or low woodland vegetation; microphyll woodlands, which is characterized by large shrub and small tree species; disturbed sites typically lacking vegetation or with some weedy, annual species; and landscape vegetation consisting of mixed plantings of introduced and native species (USAF, 1997).

Approximately 15 percent of the main base along with the munitions storage area is dominated by microphyllous desert vegetation, mainly salt bush and creosote bush. Salt bush is more dominant at the lower elevations, in somewhat well-drained land, while creosote bush is more dominant in the elevated upland sites. Natural drainageways in the vicinity of Luke AFB are strongly dominated by mesquite with the occasional presence of blue palo verde, salt cedar, and Mexican palo verde.

The main base consists of mostly disturbed areas such as the runways, taxiways, housing, and other military support buildings. Most of the disturbed areas on the base are mowed areas of bermuda grass and other invasive grasses and forbs (USAF, 1997). A native perennial grass that persists around the airfield appears to be alkali sacaton. Other plants that occur in this area include Comb bur, fiddleneck, little mallows, plantains, mustards, cryptanthas, and filarees. Perennial forbs that persist on the site likely include globe mallows and desert straw. Table 3.8-1 identifies the vegetation commonly found on Luke AFB property.

Vegetation at **Site 2** is extremely sparse due to the arid conditions as well as the previous disturbance associated with the demolition area located 450 feet to the south (USAF, 2000b). The limited persistent vegetation consists of grasses. During periods of rain, however, the area flourishes with short-lived shrubs and grasses. Maximum tree height in the distant vicinity of this site ranges from 30 to 50 feet.

Site 5 is located in a paved parking area adjacent to the South Gate of the base. No vegetation exists directly on the site although a row of mesquite trees, ranging from 20 to 30 feet in height, is located approximately 10 feet south of the site. A drainage swale lined with crushed stone and scattered ornamental tree and shrub plantings is located adjacent to Site 5.

Table 3.8-1 Vegetation Commonly Found on Luke AFB Property

Scientific Name	Common Name
GRASSES AND HERBACEOUS COVER	
<i>Amsinkia intermedia</i>	Fiddleneck
<i>Brassica</i> sp.	Mustard
<i>Cryptantha</i> sp.	Popcorn flower
<i>Cynodon dactylon</i>	Bermuda grass
<i>Erodium</i> sp.	Filaree
<i>Malva parviflora</i>	Little mallow
<i>Pectocarya</i> sp.	Comb bur
<i>Plantago</i> sp.	Plantain
<i>Sporobolus airoides</i>	Alkali sacaton
SHRUBS	
<i>Atriplex halimus</i>	Salt bush
<i>Baccharis sarothroides</i>	Desert broom
<i>Larrea tridentata</i>	Creosote bush
<i>Sphaeralcea ambigua</i>	Globe mallow
TREES	
<i>Acacia</i> sp.	Acacia
<i>Cercidium</i> sp.	Palo verde
<i>Cereus giganteus</i>	Sanguaro cactus
<i>Citrus aurantium</i>	Sour orange
<i>Fraxinus velutina</i>	Arizona ash
<i>Pinus halepensis</i>	Allepo pine
<i>Prosopis</i> sp.	Mesquite
<i>Tamarix chinensis</i>	Salt cedar
<i>Washingtonia robusta</i>	Mexican fan palm

Source: Urban Forest Plan Report. (USAF, 1997)

Site 7 is sparsely vegetated with grasses and has been disturbed during construction of Super Sabre Street and for underground utility installation. The site is bordered on two sides by a bituminous concrete street and a parking lot to the north and east, respectively.

Vegetation at the existing **AN/GPN-12** is similar to the vegetation found at Site 2, which is located approximately 2,100 feet south of the existing AN/GPN-12. Due to the arid conditions, vegetation is sparse and consists primarily of grasses.

3.8.1.2 Wetlands. No wetlands have been identified on Luke AFB proper or on the ancillary base areas (USAF, 1996a). Due to the limiting hydrological conditions present in the desert environment, coupled with the relatively flat terrain in the valley area, stormwater flows over the land surface to either man-made drainage channels or into nearby rivers. In addition, the hardpacked soils in this region prevent potential infiltration of surface water. As indicated in Section 3.6, groundwater levels have severely receded over 300 feet since the 1930s.

The Dysart Drain, located on the northern boundary of the base, was found to support hydrophytic vegetation and evidence of wetland hydrology; however, hydric soils were not present and, therefore, the area did not meet the 3-parameter definition of a federal wetland, which requires wetland vegetation, hydrology, and hydric soils (USAF, 1996b).

Portions of Luke AFB are situated within Zone A of the 100-year floodplain. Most of the base, however, including the runway and taxiway areas, most of the housing area, and most of the developed areas in the eastern portion of the base, are located outside of the 100-year floodplain. **Sites 2, 5,** and the existing **AN/GPN-12** are not within the 100-year floodplain.

Site 7, is within the 100-year floodplain, as indicated by the most recent FEMA study available. Although the FEMA study was recently revised, Site 7 is still listed as within the 100-year floodplain. Luke AFB is currently investigating the boundary of the 100-year floodplain in this area (more detailed discussion of this dispute will be presented in the General Plan 2001), asserting that the recent construction of the detention basin has had a greater effect of reducing the potential for flooding at Site 7.

3.8.1.3 Wildlife. The wildlife community of Luke AFB is typical of Arizona Upland and Lower Colorado River Valley habitats in central Arizona. These regions experience harsh environmental conditions, such as high temperatures, low precipitation, and high salt content in both soils and water resources. The occurrence of wildlife, both terrestrial and aerial, is directly related to the vegetation biomass. Amphibians are also directly influenced by the sporadic, seasonal precipitation.

Despite these severely limiting environmental factors, including disturbance and development, some species of mammals, amphibians, and reptiles persist in the area. Characteristic mammal species are nocturnal burrowers (kangaroo rats and pocket mice). Amphibians are limited because of dry conditions, although several species of highly adapted toads occur within the vicinity. A diverse assemblage of reptiles is characteristic of this region. Reptiles found near the base include the side-blotched lizard (*Uta stansburiana*) and western whiptail (*Cnemidophorus tigris*). Wildlife species that do not intensely rely on unique habitat elements are the most abundant and widespread. Examples of such wildlife include coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), and round-tailed ground squirrels (*Spermophilus* sp.).

Game species such as black-tailed jackrabbit, desert cottontail (*Sylvilagus auduboni*), Gambel's quail (*Callipepla gambelii*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), and javelina (*Tayassu tajacu*) have been noted near Luke AFB (USAF, 1996b).

3.8.1.4 Threatened and Endangered Species. According to United States Fish and Wildlife Service (USFWS), three plant and ten animal species have been federally-listed as either endangered or threatened in Maricopa County (Table 3.8-2) (USAF, 2000b). No populations of federally-listed or candidate species of plants are known to occur on Luke AFB; however, many species observed on base are given protection under the Arizona Native Plant Law. These plants include, but are not limited to cacti, mesquite, palo verde, and species of the agavaceae and liliaceae family (USAF, 1996a).

In addition to the ten federally-listed threatened or endangered animals, five species having current federal candidate status have been found on the base (Table 3.8-3) (USAF, 1996a). Candidate species are those which are being considered for addition to the list of threatened or

endangered species. Although candidate species have no legal protection under the Endangered Species Act, it is recommended by the USFWS that these species be considered during the planning process in the event that the species becomes listed prior to project completion. According to the Arizona Fish and Game Department, the lowland leopard frog (*Rana yavapaiensis*), a state special status species, has also been documented as occurring within a five-mile radius of the three alternative sites at Luke AFB (USAF, 2000b; AZ G&F, 2000b). However, the lowland leopard frogs are aquatic and typically found in small to medium-sized streams and occasionally in small ponds; they often concentrate near deep pools in association with root masses of large riparian trees (NMGF, 2000). Thus, they are not known to occur on Luke AFB (USAF, 2000i).

Given the typical habitat requirements listed in Table 3.8-2, it is unlikely that any threatened or endangered species would be present at either **Sites 2, 5, 7**, or the existing **AN/GPN-12**. However, all three sites are proximate to desert scrub areas that may be suitable habitat for a number of the candidate species potentially occurring on Luke AFB (Table 3.8-3), such as the California leaf-nose bat, Arizona pocket mouse, and Western burrowing owl.

3.8.2 Future Baseline without the Project

Without the project, the status of the vegetation, wetlands, and wildlife is expected to remain similar to existing conditions in the areas of the proposed ASR-11 and the existing AN/GPN-12 sites. There are no anticipated land use changes that would alter the characteristics of the biological resources at Sites 2, 5, and 7.

Table 3.8-2. Federally-listed Threatened and Endangered Species Found in Maricopa County

SCIENTIFIC NAME	COMMON NAME	TYPICAL HABITAT
<i>Agave arizonica</i>	Agave arizona	oak-juniper woodland and mountain mahogany-oak scrub transition areas
<i>Purshia subintegra</i>	Arizona cliffrose	tertiary limestone soils
<i>Echinocereus triglochidiatus arizonicus</i>	Arizona hedgehog cactus	interior chapparal and madrean evergreen woodland
<i>Leptonycteris curasoae verbabuena</i>	Lesser long-nosed bat	desert scrub with loosely branched flowering agaves and/or columnar cacti as food source
<i>Antilocapra americana sonoriensis</i>	Sonoran pronghorn	broad, inter-mountain alluvial valleys with creosote bush-bursage and paloverde-mixed cacti associations
<i>Cyprinodon macularius</i>	Desert pupfish	shallow springs, small streams, and marshes
<i>Poeciliopsis occidentalis occidentalis</i>	Gila topminnow	small streams, springs, and vegetated shallows
<i>Xyrauchen texanus</i>	Razorback sucker	riverine or lacustrine areas
<i>Haliaeetus leucocephalus</i>	Bald eagle	large trees or cliffs near water with abundant prey
<i>Glaucidium brasilianum cactorum</i>	Cactus ferruginous pygmy owl	mature cottonwood/ willow, riparian woodlands, mesquite woods, and adjacent desert scrub
<i>Strix occidentalis lucida</i>	Mexican spotted owl	montane canyons and dense mixed conifer forests with multi-layered foliage
<i>Empidonax traillii extimus</i>	Southwestern willow flycatcher	cottonwood/willow and tamarisk vegetation along rivers and streams
<i>Rallus longirostris yumanensis</i>	Yuma clapper rail	freshwater and brackish marshes

Source: USAF, 2000a; USAF, 1996b

Table 3.8-3 Candidate Species Potentially Occurring on Luke AFB

SCIENTIFIC NAME	COMMON NAME	TYPICAL HABITAT
<i>Buteo regalis</i>	Ferruginous hawk	prairies, brushy open country
<i>Lanius ludovicianus</i>	Loggerhead shrike	open habitats with scattered shrubs, trees, and manmade perches
<i>Macrotus californicus</i>	California leaf-nose bat	roosts in mines and caves in desert scrub habitats
<i>Perognathus amplus</i>	Yavapai Arizona pocket mouse	arid desert with scattered, well-spaced vegetation
<i>Athene cunicularia hypugaea</i>	Western burrowing owl	deserts, grasslands, fallow fields

Source: USAF, 1996a

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. [Figures 3.9-1, 3.9-3, and 3.9-5](#) show the locations from which photographs were taken during the site survey in January 2000.

3.9.1 Existing Conditions

Luke AFB consists of approximately 350 buildings (excluding housing), the earliest of which were constructed in 1941. There is no comprehensive landscape architecture plan providing direction for the overall landscape development and maintenance of the base. In the past, landscaping associated with new construction was done without specific direction and this resulted in little design continuity. However, recent efforts by maintenance engineering personnel have provided some improved landscape concepts promoting xeriscape, or landscaping for dry conditions, coupled with the use of indigenous plants (USAF, 1996a). Maintenance engineering personnel are presently preparing a comprehensive landscape development and maintenance plan. According to the General Plan, adoption and implementation of this plan will create a visually attractive installation, and protect the environment. This plan will provide an organized theme, identify plant materials to be used, give direction for plant location, address environmental needs and concerns, and establish maintenance practices (USAF, 1996a).

There is what may be described as a functional aesthetic quality on the main portion of the base, with features like runways, aircraft hangars, lights, antennae, and towers considered an integral part of the Luke AFB landscape. These basic features and the typical base activities give the impression of an organized and functional military installation.

Site 2 contained only sparse vegetation at the time of the survey, due to dry conditions and previous human disturbance at the site. Site 2 is located within a generally level area north of the demolition area, and is approximately 2,200 feet south of the new base golf course. [Figure 3.9-1](#) shows the locations from which photographs were taken of Site 2. An agricultural field, currently

in rose production, is located to the west of the site, on the far side of the chainlink fence (View 2-A, Figure 3.9-2). The site is located in a relatively remote area on the northwestern side of the runways, and thus few buildings are in the vicinity. View 2-B (Figure 3.9-2) depicts the site, facing south towards the demolition area; the perimeter fence separating the private agricultural land from the base is visible at the right of the photograph.

Site 5 is located just inside the south gate. It is situated in a paved parking area, adjacent to outdoor recreation areas, including a children's playground. Figure 3.9-3 shows the locations from which photographs were taken of Site 5. View 5-A faces north from the site and shows the pavement in the foreground and the playground which lies just beyond (Figure 3.9-4). Although no vegetation exists on the site itself, the parcel is adjacent to a crushed stone swale with scattered ornamental tree and shrub plantings, including mesquite trees. View 5-B presents a view of the site toward the northwest, with the shorter one-story buildings characteristic of the southeastern corner of the base visible in the background (Figure 3.9-4).

Site 7 is located on a narrow strip of land on the south side of Super Sabre Street. Figure 3.9-5 shows the location of photographs taken of Site 7. The site is abutted by a parking lot, and privately owned land lies to the south, just on the other side of the existing base perimeter fence (See Figure 3.9-6, View 7-A). The site itself contains little vegetation, which is also likely a result of the dry conditions and previous construction work in this vicinity. The areas to the north and west of the site are characterized by a number of hangers, offices, and other buildings located along the flightline, in sharp contrast with areas to the south which reflect the undeveloped characteristics of the scrubby Sonoran Desert. A view to the west of the site, towards the runways, is presented in View 7-B (Figure 3.9-6).

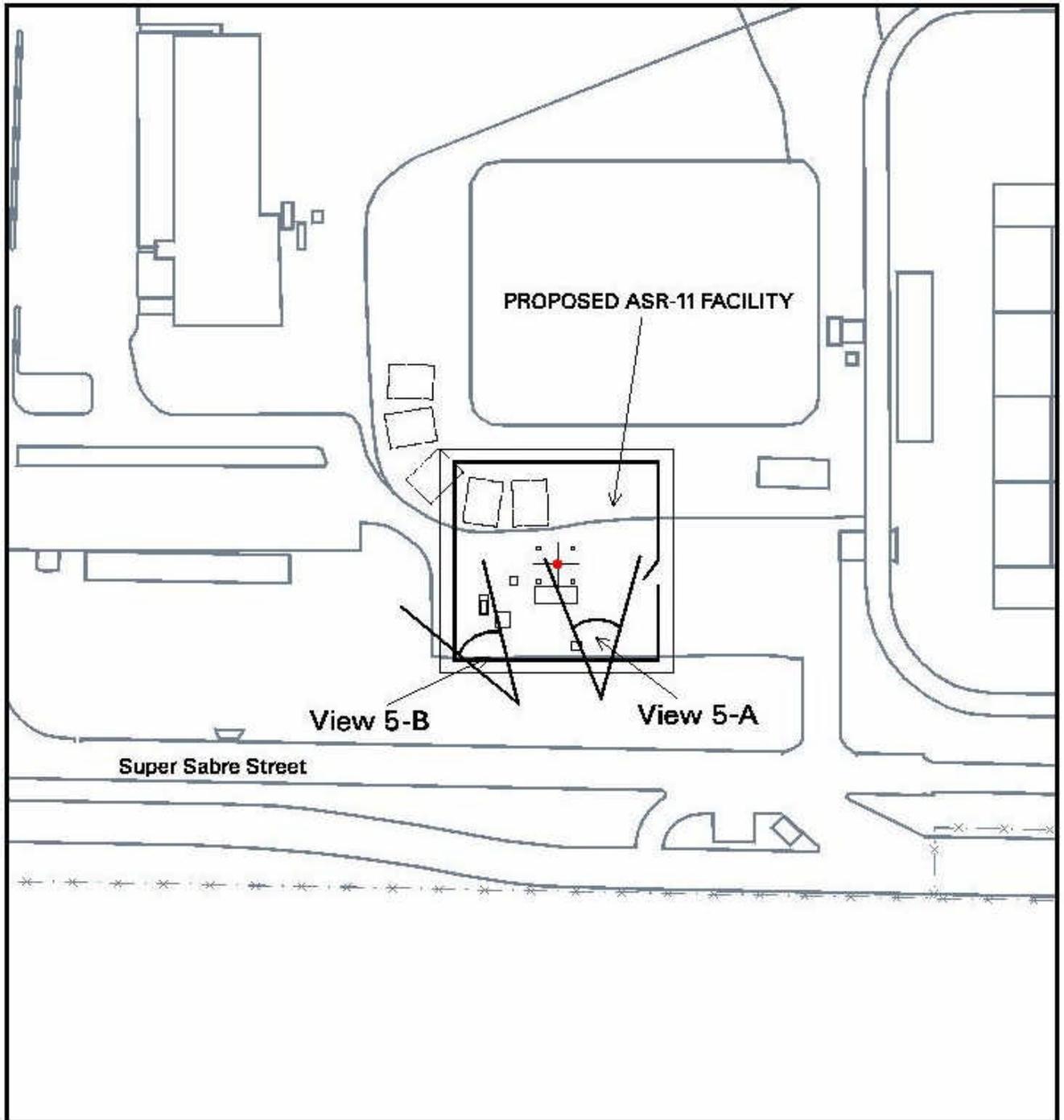
Figure 3.9-2 Photographs of Site 2 Taken During the January, 2000 Site Visit



View 2-A. Photograph of Site 2 facing to the west, toward the base perimeter fence and the agricultural area beyond.



View 2-B. Photograph of Site 2 facing south, towards the demolition area.



/145/lockdown/luke/afba5_xpw

LEGEND

A	Photograph View Point
—	Proposed Fence
x — x — x	Existing Luke AFB Boundary Fence
•	Proposed ASR-11 Tower Location
- - -	Existing Concrete Pads

Source: Luke AFB

LUKE AIR FORCE BASE
GLENDALE, ARIZONA

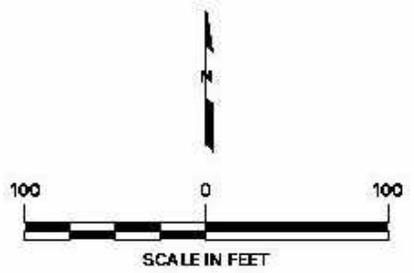


FIGURE 3.9-3. VIEW ANGLES FOR PHOTOGRAPHS TAKEN AT SITE 5

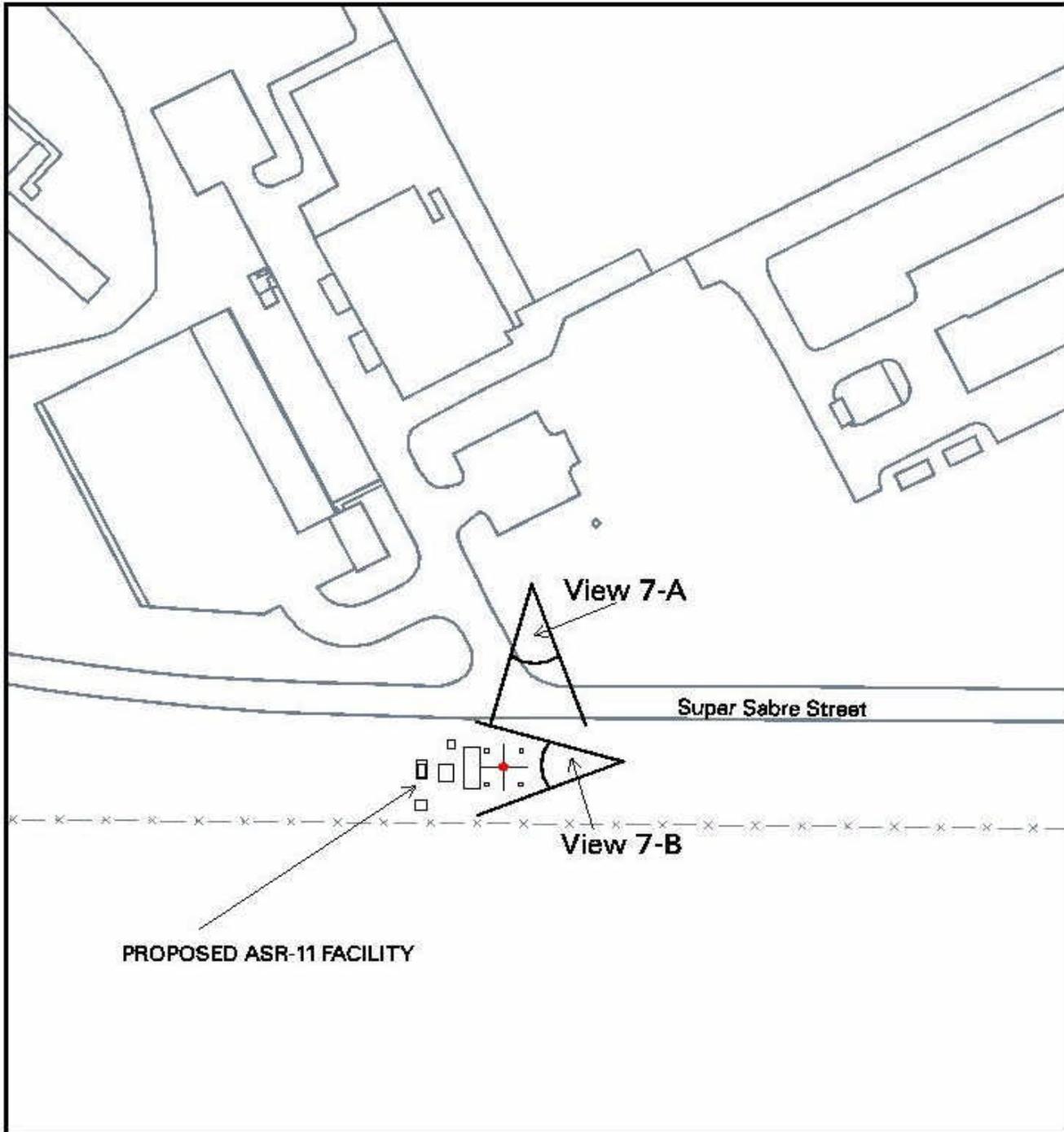
Figure 3.9-4 Photographs of Site 5 Taken During the January, 2000 Site Visit



View 5-A. Photograph of Site 5 facing to the north, toward the recreational area and playground.



View 5-B. Photograph of Site 5 facing northwest, towards base industrial and administrative uses.



PROPOSED ASR-11 FACILITY

View 7-A

Super Sabre Street

View 7-B

\\ns1\lock\ch\h\luke\site7_300

LEGEND	
A	Photograph View Point
x - x - x	Existing Luke AFB Boundary Fence
•	Proposed ASR-11 Tower Location

Source: Luke AFB

LUKE AIR FORCE BASE
GLENDALE, ARIZONA

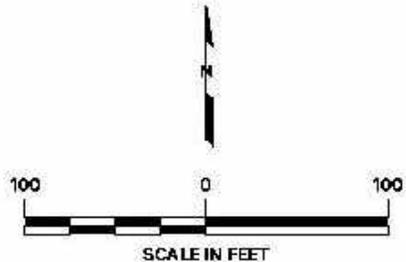


FIGURE 3.9-5. VIEW ANGLES FOR PHOTOGRAPHS TAKEN AT SITE 7

Figure 3.9-6 Photographs of Site 7 Taken During the January, 2000 Site Visit



View 7-A. Photograph of Site 7 facing to the south, taken from Super Sabre Street.



View 7-B. Photograph of Site 7, westward, towards the runways.



Figure 3.9-7. Existing AN/GPN-12

The existing **AN/GPN-12** radar is located in the far northwestern corner of the base, in an area generally devoid of buildings. Undeveloped private land lies to the west of the radar, and the new golf course is just across Northern Avenue. The existing radar, along with associated equipment shelters, is shown to the left.

3.9.2 Future Baseline Without the Project

Luke AFB, through its plan of development, is attempting to develop in a manner that accomplishes its mission, optimizes existing facilities, and provides the most efficient, professional surroundings possible (USAF, 1996a). The base is currently in the process of developing its five year plan of capital improvement projects for the period 2001 through 2006. At this time, there are no planned land use changes in the immediate vicinity of **Sites 2, 5, or 7** that would substantially alter the future aesthetic conditions of its surroundings. The aesthetic characteristics of the area of the existing **AN/GPN-20** site has recently been altered by the completion of the new base golf course, just across Northern Avenue, but no additional changes in the aesthetics of this area are anticipated in the near future.

3.10 CULTURAL RESOURCES

This section identifies cultural resources that have been identified at Luke AFB and indicates if any known resource areas are located in the vicinity of the existing AN/GPN-12 location or the alternative ASR-11 sites.

3.10.1 Existing Conditions

An integrated cultural resources management plan (ICRMP) was developed for Luke AFB to facilitate ongoing, long term management of important cultural resources that may be present at Luke AFB and the Auxiliary Airfield 1 (USAF, 1998). Responsibility for implementation of the ICRMP lies with the Luke AFB Base Civil Engineer and flows specifically to the Environmental Programs unit.

3.10.1.1 Archaeological Sites. Seven cultural resources inventories have been conducted at least partially within land owned by Luke AFB or within the several perpetual easements that abut the base (USAF, 1998). A single prehistoric archaeological site (a sherd and lithic scatter) has been recorded as extending within the privately owned, perpetual easement that surrounds the munitions storage area. Two other archaeological sites have been recorded immediately south of the base perimeter. These sites have not been tested to determine whether or not they contain important research value, and do not appear to be affected by current base activities (USAF, 1998).

The known archaeological sites described above are not proximate to any of the three alternative ASR-11 sites (**Site 2**, **Site 5**, or **Site 7**) or the existing **AN/GPN-12**. However, there is a slight possibility that prehistoric (Native American) or historic (Euroamerican or Native American) archaeological sites, or traditional cultural properties could be present, although not presently recognized (USAF, 1998). Base personnel have indicated that the alignment for utility connections to Site 2 would have a somewhat greater potential for cultural artifacts than the other alternative ASR-11 sites (USAF, 2001).

3.10.1.2 Historic Properties. Federal regulations define historic properties as prehistoric and historic sites, buildings, structures, districts, or objects included in, or eligible for inclusion in, the National Register of Historic Places, as well as artifacts, records, and remains related to such properties. To be determined eligible for inclusion in the National Register, properties must be important in American history, architecture, archaeology, engineering, or culture. Ordinarily, only properties 50 years or older, directly associated with the Air Force's military mission, are evaluated for National Register listing. Under certain circumstances, however, younger properties may require evaluation. In view of the fact that, like World War II, the Cold War had

a tremendous impact on cultural and political developments throughout the world, the USAF requires its installations in the US to consider Cold War-era properties for National Register eligibility because of the concern that highly significant properties may be destroyed prior to reaching the 50-year mark.

Approximately 50 buildings/permanent structures were constructed at Luke AFB during World War II. The Air Force has determined that the only World War II era building/structure eligible for listing on the National Register is the base flagpole. The Arizona State Historic Preservation Officer (SHPO) concurred with this determination; however, the pole has not been nominated for listing. The flagpole is considered eligible for National Register listing because it is associated with an event(s) that has made significant contribution to the broad pattern of American history and because it remains the traditional focal point of the base. The USAF does not regard the other 49 World War II properties at Luke AFB worthy of preservation or additional consideration because either the degree of exterior/interior modifications has destroyed their integrity or that the two essentially intact structures (the water tower and water storage tank) do not reflect or represent the historic military flight context for which Luke AFB is important.

Of the 1,032 buildings and structures constructed during the Cold War era, only one (the blockhouse) has been determined to be of such exceptional national significance as it related to the military mission that it warranted evaluation for the National Register prior to turning 50 years old. This giant concrete “blockhouse” housed a computer system linked to radar surveillance, a system designed to detect and respond to enemy aircraft attack, during the period from 1960 to 1983 when Luke AFB hosted a Semi-Automatic Ground Environment (SAGE) defense system. Following the transfer of the SAGE Unit to March AFB, the blockhouse at Luke AFB in 1987 was converted into an office building called the Support Center. In a consensus determination between the Air Force and the SHPO, it was agreed that aside from the “blockhouse”, none of the Cold War properties at Luke AFB currently qualifies for listing on the National Register (USAF, 1998). Of the remaining 1,031 Cold War era buildings/structures, only nine additional buildings were determined to be directly related to the military mission, and thus would be potentially eligible for the Nation Register upon turning 50 years old.

None of the alternative ASR-11 sites (Site 2, Site 5, or Site 7) nor the existing AN/GPN-12 is located near either the flagpole or the blockhouse; thus, none of the sites is proximate to properties currently eligible for the NRHP.

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 sites or the existing AN/GPN-12 location in the future without the project due to the absence of cultural resources in the respective areas. Only one (the flagpole) of the World War II era buildings was determined to have both maintained its structural integrity and been directly associated with the Air Force's military mission; thus, it is unlikely that any of the remaining WWII era buildings would be nominated for the National Register. Only 10 of the 1,032 Cold War era buildings/structures on Luke AFB have been identified as directly related to the military mission; one of these (the blockhouse) was determined to be of such exceptional national significance that it was considered eligible for the National Register prior to the building turning 50 years old. Of the remaining nine mission-related, Cold War era buildings, which were constructed between 1953 and 1989, the oldest will reach the 50-year mark in the year 2003. Accordingly, these nine mission-related, Cold War era buildings will require evaluation for eligibility to the National Register, once they reach 50 years of age. Because a proper historical perspective requires time depth, a definitive assessment of eligibility for the base's Cold War properties cannot be made "ahead of time".

3.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

3.11.1 Existing Conditions

The following sections describe current conditions and practices on the base with regard to pollution prevention and hazardous waste.

3.11.1.1 Pollution Prevention. Overall on Luke AFB 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; and a lead-based paint management plan. The overall implementation of these policies and procedures on the base is expected to reduce

existing and potential pollution. 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.

3.11.1.2 Hazardous Waste. Hazardous waste generated at Luke AFB includes antifreeze, paint, stripping elements, batteries, oils, spent solvents, photo lab corrosive liquids, pathology laboratory process wastes, and other wastes associated with aircraft operation and maintenance. Most of the hazardous wastes are stored in buildings. Satellite storage areas can contain no more than 55 gallons of waste for an unlimited duration. Locations permitted for 90-day storage sites can contain any amount of hazardous waste up to 90 days and then must be removed/relocated by a permitted contractor. The Hazardous Material Pharmacy (Building 927) is a supply warehouse where ordering, tracking, storing, distributing, and using hazardous materials is regulated through effective use of single-point control.

By 1997, the base had removed most of the remaining underground storage tanks (USTs) and replaced them with aboveground tanks or vaulted underground systems. Twelve USTs are in service at Luke AFB.

The DoD began comprehensive environmental investigations at Luke AFB in 1981 as part of the Installation Restoration Program (IRP), initially identifying 16 sites. As investigation continued, more sites were added, reaching a total of 33 potential sources of contamination following preliminary assessment. Some sites were determined to require no further action. The EPA added Luke AFB to the National Priorities List (NPL) in 1990. The base was divided into two operable units: (OU-1) which defines the Luke AFB sitewide final remedy (primarily groundwater), and (OU-2) which includes remediation and investigation of soils at eight sites.

Only two out of 25 sites in OU-1 require active remediation. Seven of the sites have institutional controls as the selected remedy. The rest of the sites do not require remediation; a base-wide risk assessment has shown that contaminants left in place will not pose a risk to human health or the

environment. The two sites that require active remediation are the Petroleum, Oil, Lubricants (POL) area and the old construction debris landfill adjacent to the skeet range.

Two sites in OU-2 required a remedy selection. One site used biodegradation for remediation of polyaromatic hydrocarbons (PAHs) in the soil; the other site required a soil cap and cap maintenance.

Site 2 is located just east of the IRP site DP-13 (Drainage Ditch Disposal Area) (USAF, 2000b). DP-13 is part of a landfill area. During the 1940s, this site was the location of a drainage ditch that was reportedly used for general refuse disposal. The ditch was filled and covered when the base was deactivated in 1946. No known or suspected industrial-type wastes or hazardous wastes were disposed of at this site. A Remedial Investigation (RI) was conducted to characterize the contents of the landfill area and the vertical and lateral extent of constituents of potential concern. Volatile organic compounds (VOCs) were detected at levels near the detection limits in numerous soil gas samples scattered across the site. Within the surface and subsurface soil, petroleum hydrocarbons were detected, although no comparison values are available. No VOCs were detected. No semi-volatile organic compounds (SVOCs) were detected at levels above Agency for Toxic Substances and Disease Registry (ATSDR) comparison values. Chromium (2.9 ppm to 15,900 ppm) and lead (6 ppm to 36,000 ppm) were detected at concentrations above background. A risk assessment concluded that since DP-13 is fenced and inaccessible to the public, under current land uses (infrequent military training exercises) exposure to contaminants at detected levels is not anticipated to result in adverse health effects. Similarly, additional sampling to determine the potential hazard for present or future construction workers, who may be exposed to subsurface contamination, indicated that sporadic exposure to contaminants at detected concentrations was not expected to result in adverse health effects (ATSDR, 1997).

No hazardous waste storage sites or accumulation points, no IRP sites, and no USTs are located near **Site 5**.

Site 7 is located on the fringe of IRP site DP-23, known as the Old Surface Impoundment Area. In the late 1940s, an impoundment dam was constructed along an old natural drainage system flowing south off the base. This site may have been used for the disposal of POL waste until construction covered the site in 1969. The dam was buried, but was not removed during construction. Eighty percent of this area is currently either paved with asphalt, under tarmac, or under concrete. Within the surface and subsurface soil, petroleum hydrocarbons were detected. VOCs were detected at trace levels, below ATSDR comparison values. Only one SVOC, benzo(a)pyrene, was detected at concentrations above the Preliminary Remediation Goals (PRG). Benzo(a)pyrene was detected at concentrations in surface and subsurface soils, extending beyond the base property, at concentrations ranging from 0.17 ppm to 3.3 ppm; these concentrations exceed the PRG of 0.78 ppm and ATSDR comparison values. As part of the corrective activities for this IRP site, all soils with benzo(a)pyrene concentrations above the PRG were excavated. Excavated soils were biologically treated to reduce contaminant concentrations. Monitoring was conducted to confirm effectiveness of treatment. Treated soils were returned for final disposal in 1995. The risk assessment concluded no public health hazard would likely result from exposure to soils at this site, since soils with contamination were removed (ATSDR, 1997).

Site 7 is also located west of the South Fire Training Area, IRP site FT-06. This site was used as the original fire department training area for the base between 1941 and 1946, and again from 1951 to 1973. POL waste was poured onto a mock aircraft in a cleared, unlined, bermed circular pit (total of 13 pits). The structures were then set on fire and extinguished with water and aqueous film-forming foam (AFFF). Eighty percent of the site is currently paved, including portions that are under building foundations, parking lot asphalt, and a concrete-lined storm drain canal. Within the subsurface soils, petroleum hydrocarbons, SVOCs, and VOCs (including BTEX, Trichloroethylene [TCE], and tetrachloroethylene [PCE] were detected; no PCBs were detected. No dioxins or furans were detected in surface soil samples. Within the groundwater, no VOCs, SVOCs, or metals were detected above background levels. 1,2-dibromo-3-chloropropane (DBCP), an agricultural pesticide, was present in groundwater at levels below ATSDR comparison values. The Record of Decision (ROD) for this IRP site recommended no further action. The pits had been taken out of service and are located under the concrete parking lot. Since the subsurface contamination is inaccessible to the public, the risk assessment concluded

that no public health hazard was associated with exposure to soil (or groundwater) contamination at this site (ATSDR, 1997).

The existing **AN/GPN-12** is located just northwest of IRP site OT-10 (Concrete Rubble Burial Site). Beginning in 1951, concrete and asphalt rubble from runway repair and extension operations were accumulated above ground at this site. In 1974, all of the accumulated rubble was buried in a pit. No known or suspected hazardous wastes were disposed of at this site. Because this site is located within the boundaries of DP-13, and because the landfill contents are presumed to be similar, the two sites were investigated as a single unit. (See characterization of DP-13 under description of ASR Site 2) (ATSDR, 1997).

3.11.2 Future Baseline Without the Project.

It is anticipated that remediation of past hazardous waste sites will continue, as Luke AFB advances in the process of being delisted from the NPL. Continuing pollution prevention measures on the base, such as management of hazardous materials and newly generated wastes, may reduce potential for new sources of contamination to arise at any of the sites (ADEQ, 1999).

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, 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 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; short-wave, 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. 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 ASR-11 sites and the existing AN/GPN-12 are expected to remain similar to those currently present. There is no planned change in land use at the site locations that would substantially alter the electromagnetic field characteristics in the area.

4.0 ENVIRONMENTAL CONSEQUENCES

The No Action alternative would leave the 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 Luke 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.

The proposed action would involve the construction of a new ASR-11 facility and the removal of the existing AN/GPN-12. Potential impacts associated with the action alternative involve those resulting from construction (short-term) and operation (long-term) of the DASR system. The potential impacts are described in this section for each of the alternative ASR-11 sites (Site 2, Site 5, and Site 7). Impacts are presented by environmental parameter. Mitigation measures that may be required to reduce impacts are described in Section 6.0.

4.1 LAND USE

4.1.1 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. Construction of the ASR-11 facility would also include the utilization of a temporary construction staging area approximately 75 feet by 100 feet adjacent to the ASR-11 site. This staging area would be used by construction personnel to store equipment for use during construction of the ASR-11.

Site 2 is located on the relatively open western perimeter of the base, with relatively few active ground operations, except for a demolition area located approximately 450 feet to the south. Due to the approximate distance to the demolition area, noise and dust impacts are anticipated to be minimal. Construction of the DASR is not anticipated to interfere with this neighboring land use, although coordination may be required to investigate potential interference between radio signals generated during construction and the neighboring demolition activities. Site 2 is located adjacent to Super Sabre Street which is an alternate munitions convey route; however, it is anticipated that the short duration of increased traffic coupled with the road usage as an alternate route, would have minimal impact on the transportation of munitions.

Construction of the ASR-11 at **Site 5**, near the South Gate, would be located within a paved parking area characterized as outdoor recreation. The elevated noise and increased dust associated with the construction activities for the ASR-11 could temporarily impact the adjacent recreational area, including a playground and baseball field. Due to the presence of these recreational features, Luke AFB considers construction of the ASR-11 in this location as an incompatible land use. Short-term impacts to the recreational areas from construction staging areas and equipment also include aesthetic impacts. Site 5 is located within the vicinity of the incoming explosive shipment route; therefore, potential traffic conflicts may occur. It is anticipated that the construction of the radar would not impact the residential development located approximately 1,000 feet to the southeast, with the exception of potential increased traffic on local roads leading to the base.

Site 7 is located in the southwestern corner of the main base between the base property fence and Super Sabre Street. The site is in an undeveloped area of uncharacterized land use with moderate building density north of Super Sabre Street, including the 944th Fighter Wing reserve unit. These buildings are located on the north side of Super Sabre Street and may potentially be impacted by increased noise and dust, as well as traffic disruptions, generated during construction. Site 7 is located adjacent to Super Sabre Street which is an alternate munitions convey route; however, it is anticipated that the short duration of increased traffic would have minimal impact on the transportation of munitions or access to the adjacent buildings.

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 would not be defined until final design, it is anticipated that some land uses along the alignments would be affected by elevated noise levels and increased dust associated with open trench excavation. The alternative sites are relatively similar with regard to the distance/area of impact for installing telephone and electric utilities (all between 50 and 540 feet); however, the sites differ substantially with regard to the amount of trench excavation that would be required for the fiber optic cable connection (Figures 2-4, 2-5, and 2-6). **Site 7** would require the shortest trench of approximately 1,900 feet to connect to the RAPCON. **Site 2** would require a connection of approximately 4,225 feet from the site to an existing duct bank located midfield between the two runways. Most of this would be open trench excavation; however, the portion beneath Runway 3L/21R would be drilled/bored (An additional 3,700 feet of cable would be installed within an existing conduit between the midfield area and the RAPCON, with little if any surface disruption during installation). **Site 5** would require nearly 1.2 miles (6,250 feet) of trench. The degree of disruption to land use is typically proportional to the length of conduit to be installed, although it may be possible to avoid sensitive receptors on longer routes. However, the duration of construction will be relatively short and the nature of the impact would be typical of routine utility construction.

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 due to the location of the radar in a relatively open area along the perimeter of the base characterized as industrial. The southern portion of the base golf course, located approximately 100 feet from the existing radar, may be impacted by increased noise and dust during the dismantling activities; however, these impacts are anticipated to be minimal and for a short duration.

4.1.2 Long-term Impacts

Installation of the ASR-11 at **Site 2** would be generally compatible with the surrounding industrial land uses and nearby aircraft operations and maintenance. Site 2 is located just east of

an IRP site of known lead and chromium contamination; however, the operation of the radar facility would not be anticipated to interfere with future monitoring associated with this IRP site. Weapons Safety has indicated that no conflicts are anticipated between radiation emitted from the proposed radar and the explosive devices located at the demolition area (USAF, 2000f).

Installation of the ASR-11 at **Site 5**, in the southeastern corner of the base, would result in the loss of a small area of land currently classified as outdoor recreation. Although the site is within an area characterized as recreation, the site is actually located in a paved parking lot. Use of the site for parking would be lost; the presence of the radar would alter the aesthetics and would be an incompatible land use to the nearby recreational facilities. The radar may be visible to some residents located to the southeast of the main base.

Installation of the ASR-11 at **Site 7** would generally be consistent with the adjacent land uses; however, as described previously, the standard 140-foot by 140-foot footprint for the ASR-11 would need to be modified to fit within the constraints of the base property and Super Sabre Street. Site 7 is located on the fringe of IRP site DP-23, which had been previously remediated to remove petroleum hydrocarbons, SVOCs, and VOCs contamination at that location. Potential aesthetic impacts may occur to the 944th Fighter Wing reserve unit located north of Super Sabre Street, to the east of Site 7.

Removal of the existing **AN/GPN-12** may somewhat improve the aesthetic views from the golf course situated on the opposite side of Northern Avenue and from traffic along Northern Avenue. This land could be reclaimed by Luke AFB for other purposes consistent with its setting.

4.2 SOCIOECONOMICS

4.2.1 Short-term Impacts

Construction of the ASR-11 at any of the three alternative sites would require similar work efforts, and therefore, would have similar effects on socioeconomic conditions at the base.

Construction at **Site 2**, **Site 5**, or **Site 7** would not adversely impact the socioeconomic conditions at Luke AFB. There would be a slight short-term increase in the revenue generated in the surrounding area due to construction employees utilizing local businesses for supplies and personal use. 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 effects on socioeconomic conditions are anticipated as a result of this activity.

4.2.2 Long-term Impacts

In the absence of other independent activities at Luke 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 therefore, would have no long-term effects on socioeconomic conditions.

4.2.3 Environmental Justice

Under its instructions for the Environmental Impact Analysis Process (32 CFR Part 989), the Air Force must demonstrate compliance with 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.

Sites 2, **5**, and **7** are all located within the same Census Block (0611-9) (See Figure 3.2-1). Similarly, all three sites are located along the perimeter of the base, and therefore have the potential to impact off-base private property. Census Block 061006-3 wraps around the northern, western, and southern sides of the main base; thus all three alternative sites are proximate to this off-base block group. Site 5 is in the southeastern corner of the main base, and therefore is also abutted by Census Block 061006-2.

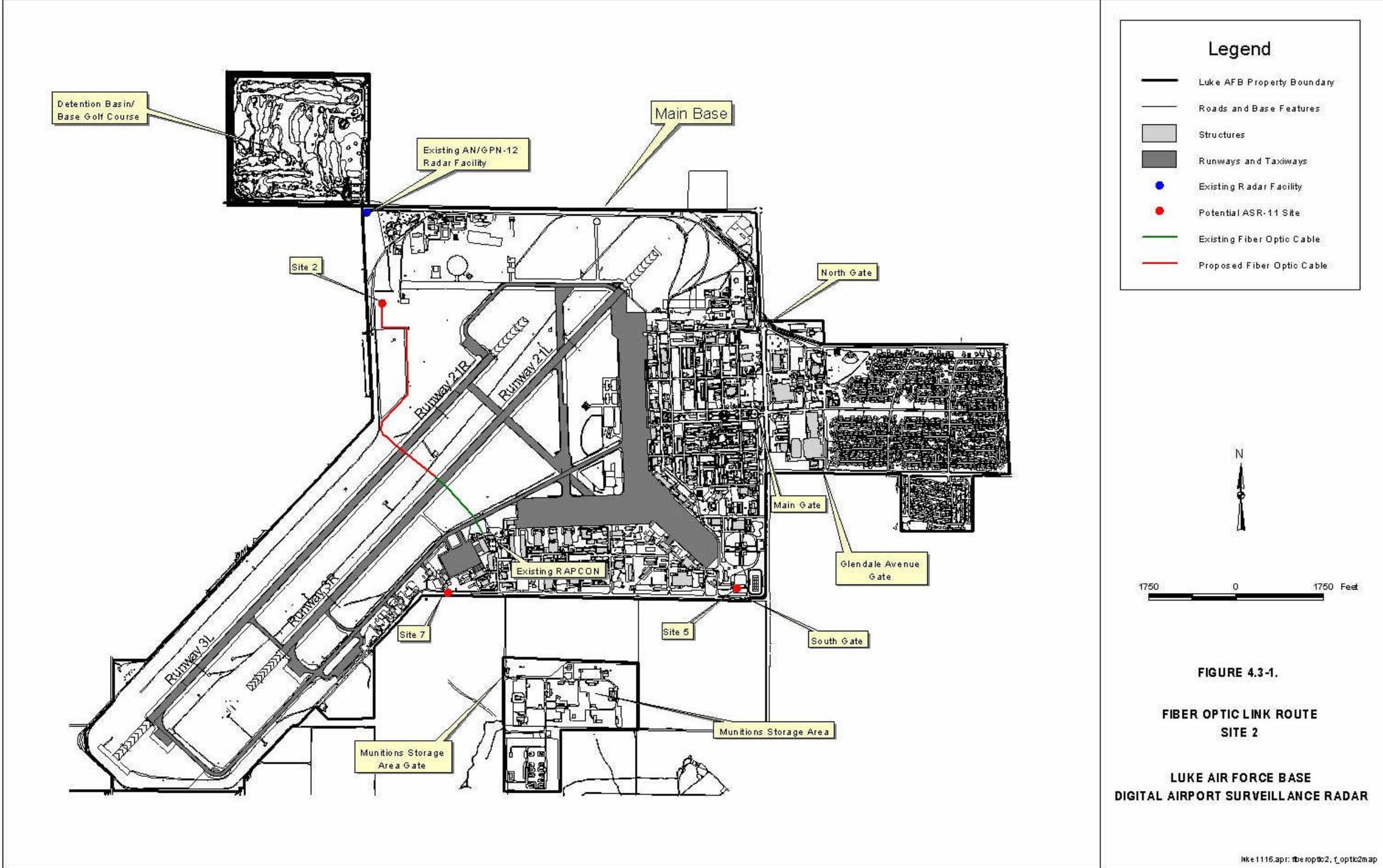
Census Block 061006-3, which abuts all three sites, includes a higher percentage of persons below the poverty level than the main base and is slightly higher than the average for the state of Arizona. Census Block 061006-3 is characterized by a higher percentage of white persons and lower percentage of black persons than either the main base or the state of Arizona. The numbers of other ethnic populations in Census Block 061006-3 are consistent with statistics for the main base and the state. Thus, it is unlikely that a unique minority population would be located within this off-base block group. It should also be noted that Census Block 061006-3 represents a rural, sparsely populated area more than five times the size of the main air force base, but home to only slightly over 2,000 people. A review of USGS topographic mapping indicates that no residences within Census Block 061006-3 are within 2,000 feet of either Sites 2, 5, or 7 (USGS, 1992).

Census Block 1006-2, which abuts only Site 5 in the southeastern corner of the base, is generally characterized by a population with a much lower black population, but a much higher Hispanic population, than either the main base or the state of Arizona. However, the percentage of persons below the poverty level within Census Block 1006-2 is similar to the main base, and somewhat lower than the averages for Maricopa County and Arizona. The nearest residences in Census Block 1006-2 are located approximately 1000 feet to the southeast, based on a review of USGS topographic mapping.

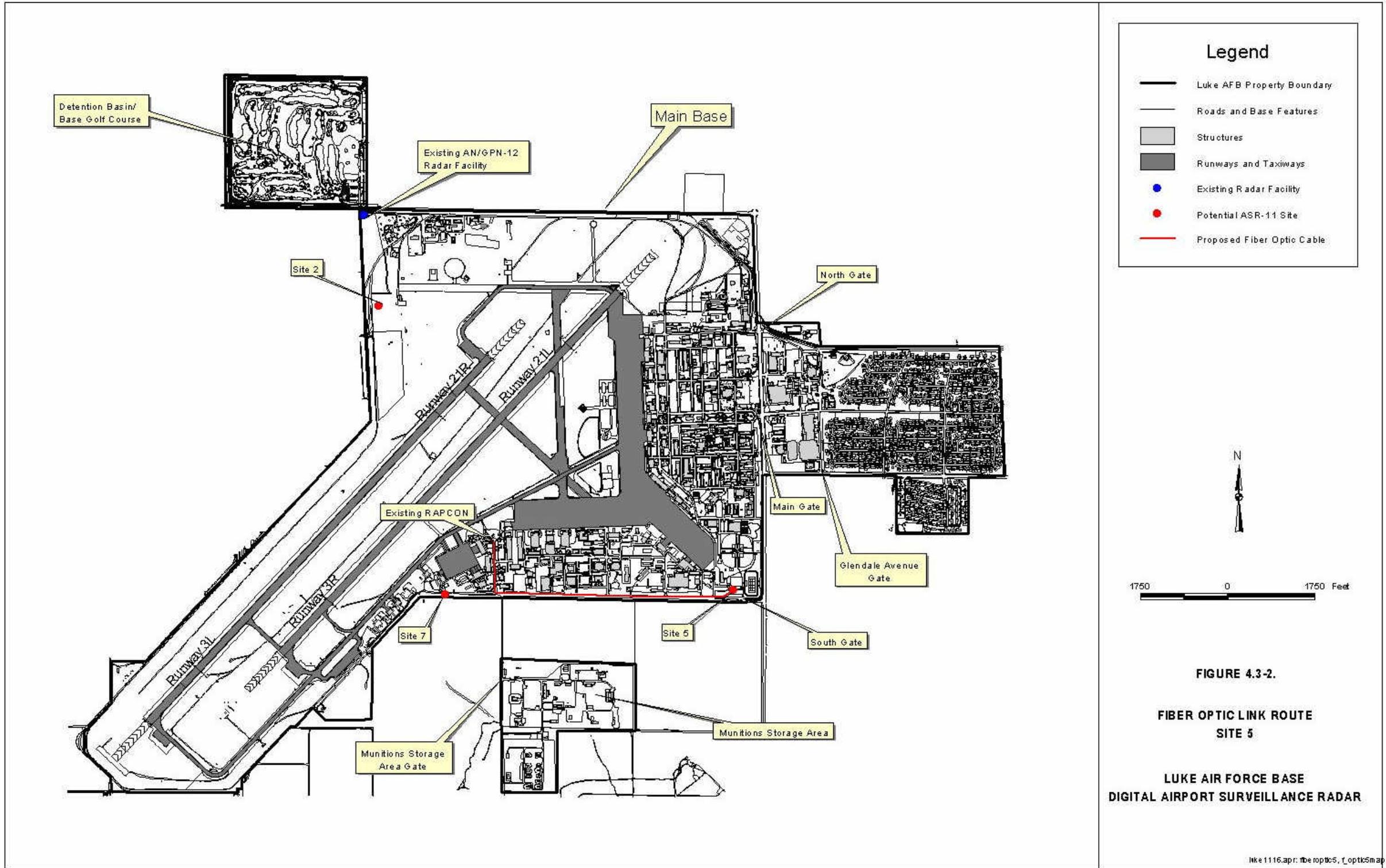
As described throughout Section 4.0, the proposed DASR installation is not expected to have significant human health or environmental impacts. Therefore, the proposed project is not expected to pose adverse health or environmental impacts to residents of adjacent neighborhoods, regardless of income or ethnicity. Thus, the proposed project is consistent with the objectives of Executive Order 12898.

4.3 UTILITIES AND TRANSPORTATION

The following describes potential short- and long-term effects to utilities as a result of the installation of DASR system at the three alternative sites. Connections to existing electrical and telephone service can be made in close proximity to each of the proposed sites. Fiber optic cable connections, which must be made from each alternative site to the existing RAPCON, are depicted in Figures 4.3-1, 4.3-2, 4.3-3.



Source: Luke AFB



Source: Luke AFB

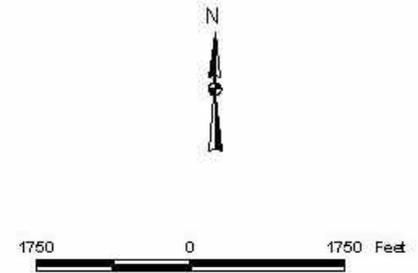
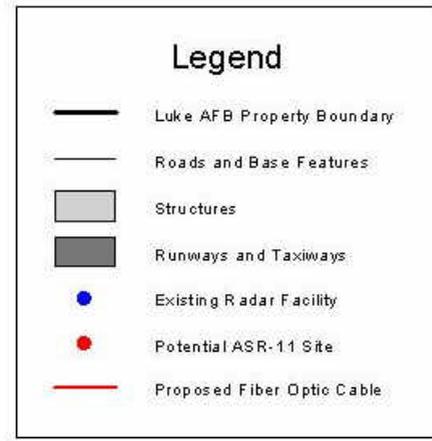
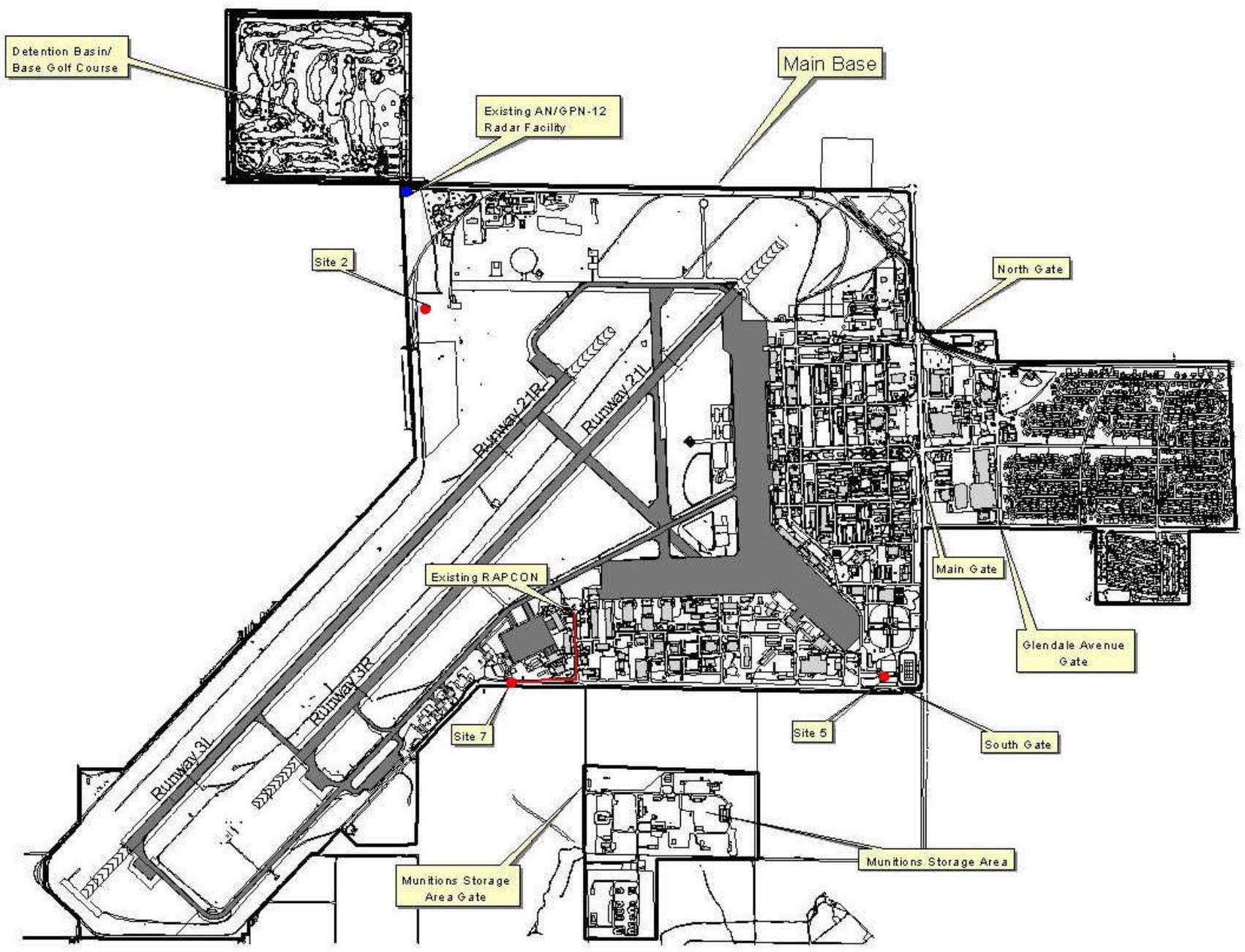


FIGURE 4.3-3.
FIBER OPTIC LINK ROUTE
SITE 7
LUKE AIR FORCE BASE
DIGITAL AIRPORT SURVEILLANCE RADAR

lke 1116.apr.r: fbe ropk07, _f_optk07 map

Source: Luke AFB

4.3.1 Short-term Impacts

Various lengths of open trench excavation would be needed to provide utility connections, such as electrical, telephone, and fiber optic for the ASR-11 future operation (Table 4.3-1). The ASR-11 would not require water or wastewater services for operation, although these utilities will be required, to a limited extent, during construction.

Table 4.3-1. Required Lengths of New Utility Connections

ASR-11 Alternative Site	Length of Electric Power Conduit Required	Length of Telephone Cable Required	Length of Fiber Optic Cable Required
Site 2	540 feet	500 feet	7,925 feet (1.5 miles)*
Site 5	100 feet	100 feet	6,250 feet (1.2 miles)
Site 7	50 feet	400 feet	1,900 feet (0.4 miles)

Source: USAF, 2000b

* for Site 2, approximately 3,700 feet of the fiber optic cable will be installed within an existing conduit connecting the middle of the airfield to the RAPCON, thus surface disturbance is likely to be limited to the first 4,225 feet of the run.

4.3.1.1 Water Supply and Distribution. A temporary increase in water demand would occur during construction. A water source would be supplied on site by mobile water tanks. Due to the limited number of construction workers, short construction period, and the adequate water supply of the underlying aquifer, it is not anticipated that the water demand (both for workers' personal need and dust control) during construction of the ASR-11 would adversely impact the water supply at Luke AFB.

4.3.1.2 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 waste would be transported to the nearby treatment facility.

4.3.1.3 Solid Waste. As the existing AN/GPN-12 is dismantled, material that is not suitable for reuse or recycling would need to be removed. All solid waste would be handled in accordance with standard base procedures. Any hazardous materials would be disposed of following Luke AFB policies and protocols and relevant state and federal regulations (see Section 4.11 on hazardous waste).

4.3.1.4 Electricity. Adequate electrical power is available to each of the alternative ASR-11 sites. Underground power lines would be run from existing underground electrical lines to **Site 2**, at a distance of 540 feet. Electrical power can be routed via underground ducts to **Site 5** from the existing distribution lines along Super Sabre Street, at a distance of 100 feet. **Site 7** would be supplied with electricity from the existing distribution lines that run along the perimeter of the base, at a distance of approximately 50 feet. Short-term impacts causing disruption of power to the immediate area around the alternative ASR-11 sites may occur while connections are made.

4.3.1.5 Telephone. Telephone lines would be extended from the existing locations identified in Section 3.3.1.5. The final route and distance to the new ASR-11 site will be determined when the final site and design are selected. Telephone line connections for **Site 2** can be made to the line currently running along Super Sabre Street to Building 1309, at a distance of 500 feet. Telephone line connections for **Site 5** can be made from existing dial-up lines along Super Sabre Street, at a distance of 100 feet. Telephone line connections to **Site 7** would also be made from existing dial-up telephone lines along Super Sabre Street, at a distance of approximately 400 feet. No disruption to telephone service in the immediate area of the alternative ASR-11 sites is expected.

4.3.1.6 Fiber Optic Cable. Fiber optic cable will either be run through a newly built conduit or through pre-existing conduits. The fiber-optic cable connecting **Site 2** to the RAPCON would span a total distance of approximately 7,925 feet. Approximately 4,225 feet of new conduit would be installed between the site and an existing fiber-optic duct bank located midfield between the two runways; drilling/boring may be necessary to advance the conduit beneath Runway 3L/21R. The remaining 3,700 feet of cable would be installed within the existing duct

bank beneath Runway 3R/21L, terminating at the RAPCON. The fiber optic run for **Site 5** would encompass a span of 6,250 feet from the site to the RAPCON; however, the least amount of cabling would be required for **Site 7**, which would only entail 1,900 feet of cabling.

4.3.1.7 Natural Gas. Natural gas is not required for the proposed ASR-11 radar. Therefore, no impacts are expected to occur with regard to natural gas on Luke AFB. Natural gas lines are located in Super Sabre Street within the vicinity of **Site 5**. The trenches required for the utility connections to Site 5 will be located north of Super Sabre Street and therefore are not anticipated to interfere with the natural gas line.

4.3.1.8 Transportation. Impacts to transportation systems at Luke AFB during construction would be minimal. Increased activity in the vicinity of the ASR-11 site, including connection of the ASR-11 to existing utilities, could temporarily disrupt local traffic. 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. **Sites 2** and **7** are located on the alternative munitions convoy route and therefore, minimal impacts are anticipated; however, **Site 5** is located near the incoming explosive shipment route and may potentially impact the transport of munitions.

4.3.2 Long-term Impacts

It is not anticipated that future utility and transportation conditions at Luke AFB would be affected as a result of operating the proposed ASR-11 radar system. The addition of electrical power, telephone lines, and fiber optic cable at any of the alternative radar sites would not have a significant effect on the utilities in the area. The operation of the ASR-11 radar system would not require water resources, wastewater treatment, collection of solid waste, or natural gas resources; therefore, no impacts to those utilities are anticipated. No long-term impacts to traffic

are anticipated. Neither **Site 5** nor **Site 7** require the construction of an access road, and **Site 2** requires only a 50-foot long gravel access road, which would not affect the existing transportation network on base. Discontinuing the operations at the existing AN/GPN-12 radar is not expected to affect area utilities or transportation.

4.4 NOISE

4.4.1 Short-term Impacts

Construction of the radar tower and supporting infrastructure, including connections to power and telephone, and installation of the fiber optic cable, would result in elevated noise levels as grading and minor excavation occur, and as construction of the tower proceeds. Noise impacts are expected to be minimal at any of the three alternative sites due to the existing elevated noise levels associated with base operations; however, noise intrusions may be more perceptible at **Site 5**, which is adjacent to an outdoor recreational area, where ambient noise levels are approximately 10 dBA lower than at either **Sites 2** or **7**. Typical construction equipment noise levels may be reduced by using well-maintained equipment and by installing mufflers and engine jackets. Construction of the tower and supporting infrastructure is anticipated to take approximately three weeks; therefore, any elevated noise levels would be restricted to this short-term period.

Dismantling of the existing **AN/GPN-12** would also result in a localized, temporary elevation of noise levels. The southeast portion of the base golf course, which is located within close proximity to the existing AN/GPN-12, could potentially experience elevated noise levels during the dismantling activity. However, due to the existing noise levels and the expected short duration of the dismantling activity, noise impacts are expected to be minimal.

4.4.2 Long-term Impacts

No long-term noise impacts are anticipated to result from operation of the proposed 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 ASR-11 equipment located in operational areas would be designed not to exceed 55 decibels at any time. Noise from the ASR-11 system equipment located in general work areas should not exceed 65 decibels, including periods when the cabinet doors are open. The antenna pedestal with its drives, mounted on the tower, will be designed not to produce noise levels in excess of 55 decibels outdoors on the ground at a distance of 100 feet from the tower. The contribution to noise in the surrounding areas is expected to be negligible, especially considering the persistent nature of existing noise produced from the surrounding aircraft operations.

4.5 AIR QUALITY

4.5.1 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. Due to the lack of vegetation and arid conditions of the area, a dust suppressant should be applied to the site during the construction activities. The disturbed area at any of the three ASR-11 alternative sites would be minimal. Only Site 2 would require an access road of approximately 50 feet. This road would be fairly short and improved with either gravel or crushed stone, and thus should not create a significant dust impact.

As noted above, the distance to nearest service for electrical and telephone connections and fiber optic cable installation varies by site. The amount of dust generated during construction is expected to vary in proportion to the length of new conduits required for the different utilities. Both **Sites 2** and **7** are not located near any sensitive receptors, but **Site 5** is located near an outdoor recreation area, including a playground and baseball field. All three sites are located along the perimeter of the base property; however, off-base land uses adjacent to the base are primarily agricultural with some residential areas located at greater distances. All dust would be minimized by applying dust suppressant as needed during construction. Consequently, no substantial adverse short-term dust impacts are anticipated at any of the sites.

All construction vehicles and some equipment would produce emissions that could temporarily affect air quality. However, because the number of vehicles and duration of construction required to perform the work is limited, emissions are not anticipated to cause an exceedence of NAAQS or MC AQS in the vicinity of the selected ASR-11 radar site. 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 either the federal or county air quality standards. Because the proposed activities to install the ASR-11 radar would disturb greater than 1/10 of an acre, a dust control plan will be required as part of Maricopa County Earth Moving Construction Permit.

4.5.2 Long-term Impacts

Operation of the ASR-11 radar station at any of the three alternative sites would produce identical emissions, which are not anticipated to have adverse impacts on air quality. Sources of emissions 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 above-ground storage tank at 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 threshold, which requires 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 above-ground storage tank (AST) is also expected to be minimal, and to have no adverse impact on air quality. At all three of the alternative sites, minimal fugitive dust is expected to be generated by maintenance vehicles, due to the location of these sites along improved base roadways.

Luke AFB is approaching its state-allotted capacity for diesel generators. The AST associated with the new ASR-11 would need to be added to the base's Title V permit. However, the corresponding removal of the existing AST and generator at the AN/GPN-12 site should result in

no net increase in emissions from generator operation. Assuming the new generator is more efficient than the existing generator, the base may be able to receive credit for a slight reduction in emissions from the active diesel generators on the current permit (USAF, 2000b).

4.6 GEOLOGY AND SOILS

4.6.1 Short-term Impacts

The construction of the ASR-11 radar station would have similar effects on the soil at each of the alternative ASR-11 sites. Excavation for the footings of the radar tower typically does not exceed seven or eight feet in depth; however, Site 2 may require additional construction considerations due to the subsidence in the area. Excavation for the utility trench is typically four feet deep and may be up to 10 feet wide. The underlying halite deposits of the Luke Salt Body are approximately 790 feet below the surface. Therefore, the excavation activities would not reach the deposits.

The temporary construction staging area would be removed upon project completion and would not be anticipated to substantially impact geology or soils. 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.

4.6.2 Long-term Impacts

Soils in the vicinity of Site 2 have been reported to be subject to subsidence, dropping as much as 19.5 feet in the last fifty years. A continued loss in ground elevation could have long-term detrimental effects on both the stability and operational coverage of the radar, and thus represents a potential disadvantage for the selection of this site. No long-term impacts to the existing soils or geology are anticipated if the ASR-11 were constructed at any of the alternative sites.

4.7 SURFACE WATER AND GROUNDWATER

4.7.1 Short-term Impacts

No natural surface water features exist on Luke AFB, therefore, it is anticipated that installation of the ASR-11 radar station at any of the three alternative sites would not adversely impact surface water. The temporary construction activities at any of the three alternative sites are not anticipated to impact stormwater runoff; however, during construction, all activities will follow the base best management practices (BMP) guidelines to minimize sedimentation and erosion during storm events.

Neither the excavation for the radar tower footings (approximately 7 to 8 feet deep) nor the excavation for the utility conduits is expected to penetrate the water table at **Sites 2, 5, or 7**; therefore, no impacts resulting from contact with contaminated groundwater are expected.

4.7.2 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. Final design of the DASR facility will accommodate surface drainage. 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 not anticipated to have an impact on stormwater runoff or groundwater.

4.8 BIOLOGICAL RESOURCES

The following describes potential short- and long-term effects of the installation of the DASR system on biological resources. The biological resources addressed in this section consist of vegetation, wetlands, wildlife, and threatened and endangered species.

4.8.1 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 possess similar biological characteristics.

4.8.1.1 Vegetation. The construction of the ASR-11 (i.e. the installation of the antenna foundation and tower, utilization of a temporary construction staging area, and other site improvements and grading) will require the clearing of vegetation in the immediate areas of the facility, within the temporary construction staging area, and within the corridor of the short access road (only required for Site 2). The anticipated total area of clearing will be approximately three-quarters of an acre for **Site 2** and approximately one-half acre for **Site 7**. These sites are relatively devoid of vegetation due to the arid desert conditions. These sites are also adjacent to main base roads. **Site 5** is located within a paved parking area and therefore will not require the removal of vegetation. The temporary construction staging area will be selected based primarily on the alternative ASR-11 site's existing suitability for staging activities, therefore clearing of vegetation is expected to be minimal.

The vegetation found at Sites 2 and 7, as well as in the vicinity of the paved parking area at Site 5 is typical of the rest of the base and elimination of unique plant communities is not anticipated to occur as a result of the proposed project. Due to the arid conditions of the desert region, minimal vegetation is present at these sites. Although individual mesquite trees are located along the drainage channel near Site 5, it is anticipated that no tree removal will be necessary.

4.8.1.2 Wetlands. There are no wetlands in the vicinity of **Site 2**, **Site 5**, or **Site 7**; therefore, no impacts to wetlands are anticipated to result from the construction of the ASR-11 facility. Dismantling of the existing **AN/GPN-12** is not anticipated to impact the Dysart Ditch located approximately 200 feet north of the AN/GPN-12.

As noted earlier, Luke AFB is currently investigating the FEMA 100-year floodplain boundary in the vicinity of Site 7. If Luke AFB is unsuccessfully in revising the floodplain boundary, and Site 7 were to be constructed within an area identified as 100-year floodplain by FEMA, siting approval would be required from Air Education Training Command Headquarters (HQ AETC).

4.8.1.3 Wildlife. Construction of the ASR-11 would require disturbing approximately three-quarters of an acre for **Sites 2** and **5** and one-half acre for **Site 7**. Due to the relatively limited

area proposed for disturbance, the construction of the ASR-11 facility is not anticipated to substantially impact wildlife in the area. Since Site 5 is a paved parking lot, little wildlife would be anticipated to occur within the site itself, although some species may utilize areas adjacent to the site. Wildlife populations found in the areas of Site 5 and Site 7 are likely to be accustomed to periodic noise intrusions, because of the persistent nature of the airfield operations. Although Site 2 is located further from base ground operations, the site is still within a relatively noisy environment. Some brief displacement of wildlife populations may occur in the area of each site during construction.

The dismantling of the **AN/GPN-12** may have minor adverse impacts on wildlife habitat in the vicinity, such as temporary displacement. However, the disturbance is anticipated to be of short duration.

4.8.1.4 Threatened and Endangered Species. Thirteen federally-listed species have been identified as potentially occurring in Maricopa County, many favoring riparian habitat not found within Luke AFB. Given the disturbed nature of the three alternative DASR sites, it is not anticipated that any rare species would utilize the low-quality upland habitat at either **Sites 2, 5, 7**, or the existing **AN/GPN-12**. Thus, no impacts to threatened or endangered species are anticipated from the construction of the ASR-11 and ancillary facilities.

Although a number of candidate species, such as the California leaf-nose bat, Arizona pocket mouse, and Western burrowing owl may utilize habitats proximate to each of the sites, the construction would generally be confined to a limited footprint within previously disturbed areas; thus, construction of the DASR facilities is not anticipated to harass or displace these candidate species. As a precaution, the Wildlife Services Technician working at Luke AFB should be consulted prior to any ground disturbance for ASR-11 installation at any of the three alternative sites. As noted earlier, the lowland leopard frog, a state species of special status which has been noted to historically occur within a five-mile radius of the project site, is not anticipated to occur in the immediate vicinity of any of the alternative ASR-11 sites or the existing **AN/GPN-12**, given its preference for wetland habitat; therefore, construction of the DASR facilities is also not anticipated to impact the lowland leopard frog.

4.8.2 Long-term Impacts

Operation of the ASR-11 at any of the three alternative sites has the potential to result in limited long-term impacts on biological resources, as noted below.

4.8.2.1 Vegetation. Installation of the ASR-11 facility at **Sites 2 and 7** would result in clearing of the minimal vegetation of approximately three-quarters of an acre and one-half acre, respectively. Site 2 would also require clearing in the location of the proposed access road from Super Sabre Street to the site. **Site 5** is located within a paved parking lot and would therefore not require any clearing of vegetation. Upon project completion, disturbed areas outside of the permanently cleared areas, including the temporary staging area, would be landscaped. Due to the paucity of vegetation at the alternative sites, it is anticipated that the construction of the ASR-11 at any of the three sites would not significantly impact vegetation on Luke AFB.

4.8.2.2 Wetlands. Due to the absence of wetlands from the proposed ASR-11 sites and the existing AN/GPN-12, no long-term impacts to wetlands are anticipated.

4.8.2.3 Wildlife. Given the relatively small area required for the DASR facility, as well as the general paucity of vegetation or other suitable habitat indicators in the vicinity of the three sites, the presence and operation of a 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 antenna is not anticipated to pose a substantial threat to birds flying through the area.

4.8.2.4 Threatened and Endangered Species. Due to the specific habitat conditions for each of the federally-listed or state species of concern as indicated in Section 4.8.1.4, it is anticipated that the siting and operation of the ASR-11 at any of the alternative sites would not significantly impact the potential habitat of the aforementioned species.

4.9 AESTHETIC RESOURCES

4.9.1 Short-term Impacts

In general, the aesthetic value of each of the three alternative sites is linked to the military function of the base; thus, views of radar facility construction activity associated with installation of the ASR-11 and removal of the AN/GPN-12 would not significantly alter the aesthetic resources at the sites. However, the potential for aesthetic impacts as a result of construction activities at **Site 5** is greater than the other alternative sites due to the proximity of recreational land uses to this alternative site. For **Site 7**, the location of the buildings on the north side of Super Sabre Street, such as the neighboring 944th Fighter Wing reserve unit facility, would be associated with a somewhat lesser potential for aesthetic impacts. **Site 2** is located on the opposite side of the runway from the more heavily developed portions of the base, therefore, the construction of the ASR-11 at Site 2 would be the least likely to adversely impact the aesthetic resources at Luke AFB. However, due to the short expected duration of ASR-11 construction (approximately three weeks), the impacts associated with construction activities at any of the three alternative sites are not expected to be substantial.

4.9.2 Long-term Impacts

The long-term presence and operation of the ASR-11 at either **Site 2** or **Site 7** would be consistent with the aesthetic character of the military structures and facilities in the vicinity. The proposed radar at Site 2 would be approximately 2,200 feet south of the southern portion of the base golf course; the existing AN/GPN-12 is located just 100 feet south of the southern portion of the base golf course. Construction of a new radar at a further distance from the golf course than the existing radar would not additionally impact the aesthetics of the area. Likewise, removing the existing AN/GPN-12 would not significantly impair the aesthetic resources of the base, and may actually benefit the overall aesthetics of the golf course.

However, the presence and operation of the ASR-11 at **Site 5** may result in a long-term impact on the aesthetic character of the surrounding recreational area. The presence of a radar facility in such close proximity to the playground or baseball field may represent an undesirable change in

the visual character of the immediate vicinity. In addition, a radar tower at Site 5 would be immediately visible to entrants at the South Gate, as well as commuters utilizing Litchfield Road as a north-south arterial. The radar may also be visible to some residents located in the development off Litchfield Road, to the southeast of the base.

Operation of the ASR-11 facility at any of the alternative sites would require the installation of security lighting. The lighting fixtures to be installed at the ASR-11 facility would generally consist of the following: two red, steady burning, 116-watt obstruction lights on top of the antenna; 200-watt area lights on each stair landing of the tower to provide illumination for authorized personnel; two 1,000-watt outdoor area lights to be projected downward to illuminate the area within the fenced footprint; and fluorescent indoor area lighting installed in the two buildings on the site. The tower stairway lights and outdoor area lighting will be illuminated only when needed for nighttime maintenance activities. Impacts associated with lighting at Site 5 and Site 7 are expected to be minimal due to their location within the functional areas of the base. Although Site 2 is located in a more remote portion of the base, the additional lighting may be somewhat more obtrusive, but would not be dissimilar to the existing lighting on the AN/GPN-12, located in the same general area. Since the existing AN/GPN-12 would be dismantled, the overall impact would remain essentially unchanged.

4.10 CULTURAL RESOURCES

4.10.1 Short-term Impacts

Based on cultural resource surveys for Luke AFB, cultural resources are not likely to be present within the proposed project areas for the three alternative sites or the existing AN/GPN-12 facility. Neither the construction activities associated with the installation of the ASR-11 nor the dismantling of the existing AN/GPN-12 is anticipated to impact any cultural resources. In addition, trenching that will be required for utility connection at any of the three potential ASR-11 sites is not anticipated to impact cultural resources, although the base has indicated a somewhat greater potential for displacing cultural artifacts associated with the fiber optic trenching for Site 2. While no known historical, archaeological, or cultural resources exists at

the sites, the base has requested that environmental personnel be on-site during the initial construction phase. The staff will monitor the installation of the fiber optic cable (trenching) to minimize the potential for displacement of cultural artifacts.

4.10.2 Long-term Impacts

No long-term impacts to cultural resources are anticipated to result from the operation of the ASR-11 at any of the three alternative sites or the removal of the existing AN/GPN-12.

4.11 POLLUTION PREVENTION AND HAZARDOUS WASTE

4.11.1 Short-term Impacts

4.11.1.1 Pollution Prevention. The construction of the ASR-11 radar system would comply with applicable Luke 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. A Safety Plan will be prepared in accordance with base procedures prior to the commencement of construction. This plan will address pollution prevention equipment needed during disturbances of Voluntary Environmental Mitigation Use Restrictions.

4.11.1.2 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 ASR-11 construction would be used, stored, transported, and disposed in accordance with base, military, state, and federal regulations.

No contaminated soils or groundwater are anticipated to be encountered at **Site 5**. There is the potential to encounter petroleum hydrocarbons, SVOCs, and VOCs above background levels in subsurface soils in the vicinity of **Site 7**. There is a greater potential of encountering chromium and lead in surface and subsurface soils at **Site 2**, in excess of ATSDR comparison values. The contamination at Sites 2 and 7 has been determined to not pose a public health hazard, based on the assumption that the contamination is buried, which effectively blocks potential exposure pathways. However, construction of the radar at either Site 7 or Site 2 has the potential to disturb contaminated soil, leading to possible exposure (primarily to the construction workers) either through dermal contact of contaminated media or inhalation of fugitive dust laden with contaminants. Construction at either of these two sites would require monitoring for potential contaminants to determine the level of personal protective equipment to be worn by the construction workers, the potential alteration of construction methods, and the proper disposal of contaminated materials.

The existing AN/GPN-12 radar may have been 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 Luke AFB policies and procedures.

4.11.2 Long-term Impacts

4.11.2.1 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 ASR-11 radar system would comply with all applicable Luke 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 ASR-11 facility.

4.11.2.2 Hazardous Waste. Operation of the radar facility at any of the three alternative sites will include the installation of a 1,000-gallon AST for the storage of diesel fuel to be used for emergency generation. The fuel tank will be affixed with the National Fire Protection Agency Fire Diamond label to indicate the presence of hazardous material/chemicals. The tank will 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.

4.12 ELECTROMAGNETIC ENERGY

4.12.1 Short-Term Impacts

Construction at any of the ASR-11 alternative sites on Luke 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 AN/GPN-12 would occur only after operation of the radar has ceased. Consequently, there should be no RFR hazard to workers involved in the AN/GPN-12

dismantling. Similar to the ASR-11 construction, dismantling activities at the AN/GPN-12 site could generate low levels of RFR from commonly used devices; however, these are not anticipated to be harmful to human health.

4.12.2 Long-Term Impacts

Operation of the ASR-11 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 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 and recreational areas that the radar operation would not pose a RFR hazard to personnel within the general vicinity of any of the ASR-11 sites. To advise personnel in the area of the RFR hazard at close ranges, signs would be posted at the perimeter of the ASR-11 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 from the October 1997 *Radiofrequency Impact Analysis for Airport Surveillance Radar-11* (FAA, 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 300,000 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 the 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/cm², less than the 1,000 mW/cm² 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/cm², 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/cm² 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/cm², 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. 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.

Site 2 is located approximately 450 feet north of a demolition area; however, Weapons Safety has indicated that no conflicts are anticipated between radiation emitted from the proposed radar and the explosive devices located at the demolition area (USAF, 2000f). **Site 5** is located within a paved parking lot adjacent to recreational areas including a playground and baseball field. These areas are located greater than 75 feet from the ASR-11 signal and therefore will be below the MPE for peak power density established by the IRPA. Due to the location of **Site 7** between Super Sabre Street and the base property, the RFR from the ASR-11 would extend beyond the site to include Super Sabre Street and a portion of the area north of Super Sabre Street; however, no buildings are located within the 75 foot distance.

5.0 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AND SELECTION OF ENVIRONMENTALLY PREFERRED ALTERNATIVE

The three alternative sites are located along the perimeter of Luke AFB and share some similar existing conditions. All sites are characterized by similar socioeconomic, air quality, hydrologic, and archaeological and cultural resource conditions. Site 2 is characterized by industrial land use; Site 5 is a paved parking lot located in an area characterized by outdoor recreation; and Site 7 is in an uncharacterized land use. Sites 2 and 7 support minimal desert vegetation, while Site 5 is located within a paved area. Sites 2 and 7 also share similar ambient noise levels, while Site 5 is characterized by somewhat lower noise levels, due to its distance from the runways and proximity to quieter land uses, such as recreation. All three sites have been identified as within an area of estimated habitat for the lowland leopard frog, a state species of concern; however, none of the sites exhibit habitat conditions favored by these amphibians. Site 2 is located in an area of known ground subsidence, having dropped nearly 20 feet in the last 50 years; thus, additional engineering considerations may be required. Site 2 is also located in proximity to an IRP site having elevated metals concentrations. Site 5 is located in the southeastern corner of the base, near a playground and recreational fields. Site 7 is constrained on the north and south of the site, therefore, the footprint of a DASR facility at this location would be squeezed by the limits of Super Sabre Street and base property. Site 7 is located in proximity to a remediated IRP site, although concentrations of petroleum hydrocarbons, VOCs, and SVOCs may remain above background levels. No surface water resources or wetlands are present at any of the sites. However, since Site 7 is within the 100-year floodplain, as identified by FEMA (and currently being investigated by Luke AFB), authorization would be required from HQ AETC.

No short-term impacts are expected at any of the three sites for socioeconomic, utilities, geologic, hydrologic, archaeological and cultural resources, and hazardous waste. Also, no construction activities for Site 5 will occur within or near existing IRP sites. While both Site 2 and Site 7 are located in areas known to contain subsurface contamination, Site 7 has undergone remediation to remove most of the contaminants. Construction activities would not be anticipated to encounter contaminated groundwater at any of the sites, although elevated concentrations of metals may be encountered in the surface soils at Site 2. Installation of the DASR facility, regardless of the site chosen, has the potential to result in short-term impacts to

land use, air quality, noise, and biological resources, either at the ASR-11 site itself, the nearby staging areas, or along utility connection routes. The three alternative sites are at relatively similar distances from existing electric and telephone lines; however, the distance for the connection to fiber optic lines would vary between 1,900 and 7,925 feet, depending on the site chosen. The longer length of trench required for conduits would lead to potentially greater short-term impact on adjacent land uses due to increased dust and noise levels. Construction in the vicinity of Site 5 would have a somewhat greater potential to result in noise impacts, given the proximity to recreational land uses and the lower existing ambient noise levels in the southeastern corner of the base. Construction at Site 5, however, would require the clearing of less vegetation, since the site is paved and thus devoid of vegetation. But given the arid conditions, the loss of limited vegetation as Sites 2 and 7 is not anticipated to be substantial. Construction at any of the three sites would result in the generation of fugitive dust and similar levels of emissions from construction vehicles. Base personnel have indicated that trench construction of the fiber optic cable to connect Site 2 to the RAPCON has a somewhat greater potential to encounter cultural artifacts than the other alternative ASR-11 sites.

No long-term impacts are anticipated at any of the three sites for socioeconomic, utilities, noise, air quality, geologic, hydrologic, and archaeological and cultural resources. The three sites have relatively different aesthetic characteristics. Site 2 is located in a somewhat remote portion of the base approximately 2,200 feet from the base golf course. Site 7 is located on the south side of Super Sabre Street within the vicinity of the 944th Fighter Wing reserve unit. The siting and operation of an ASR-11 at either Site 2 or 7 would be consistent with the military aesthetic value of the base. However, an ASR-11 facility at Site 5 would have the potential for aesthetic impacts due to the proximity of the playground and baseball field, near the south gateway to the base; base personnel have indicated an ASR-11 would be an incompatible use, given the adjacent outdoor recreation surrounding Site 5. Although installation of the radar facility at either Site 2 or 7 would result in a loss of a vegetated area, the area to be cleared is small, and the density of vegetation is sparse. No rare, threatened, or endangered species are anticipated to be impacted by the operation of an ASR-11 at any of the three alternative sites. Although the radar would generate RFR while operating, persons at ground level would not be exposed to RFR levels exceeding the maximum permissible exposure (MPE) levels for the general population, since the

ASR-11 will be mounted on a tower greater than 47 feet in height. 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. 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 Luke 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 at Sites 2 and 7. Site 2 does pose some engineering challenges, due to the recent subsidence, and Site 7 would require additional design work, due to the siting constraints between the existing roadway and perimeter fence. Given the proximity to the recreational area, selection of Site 5 would be somewhat less favorable from an environmental perspective. Due to operational and other base considerations, the Air Force has selected Site 7 as the preferred ASR-11 location.

6.0 MITIGATION

Most of the impacts that may occur at any the sites during construction and operation of the DASR system are minor in nature and few mitigation measures would be required. Prior to construction, a Wildlife Services Technician should be consulted, to reduce potential impacts to burrowing owls. 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. Sheeting or supports of some kind may be used in the areas excavated for tower footings and utility trenches in order to prevent collapse of these excavations. The small area (approximately 140 feet by 140 feet; less for Site 7) 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. In addition, all other areas disturbed outside of the 140 by 140-foot ASR-11 facility area, including surrounding area required for grading and the temporary staging area, will be seeded to restore the vegetative covering. Trench construction for the fiber optic cable would be monitored by Luke AFB personnel to minimize the potential for displacing cultural artifacts. All hazardous materials used during construction would be handled and disposed of in accordance with Luke AFB policies and protocols and all applicable state and federal regulations. Traffic management measures will be developed to facilitate traffic flow and pedestrian access.

During operation of the ASR-11, diesel fuel would be stored at an 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 Luke 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.

7.0 REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). 1997. *Evaluation of Potential Public Health Hazards Associated with the Installation Restoration Program Sites at Luke Air Force Base*. Available at http://www.atsdr.cdc.gov/HAC/PHA/luke/luk_p4.html
- Arizona Department of Economic Security (ADES), 2000. Maricopa County Labor Statistics. Available at <http://www.de.state.az.us/links/economic/webpage/eaweb/cescty00.html>
- Arizona Department of Environmental Quality (ADEQ), 1999. *Waste Programs Division: Superfund Programs: Site Info: Phoenix Area Sites*. <http://www.adeq.state.az.us/environ/waste/sps/phxsites.html>
- ADEQ, 2000. Air Quality Division: Permits: Title V. <http://www.adeq.state.az.us/environ/air/permit/titlev.html>
- Arizona Department of Commerce (AZ DOC), 2000. Arizona Economy. <http://www.commerce.state.az.us/datapages/economy.html>
- Arizona Department of Water Resources (ADWR), 1999. Available at <http://www.water.az.gov/AZWaterInfo/InsideAMAs/amaphoenix.html>
- Arizona Game & Fish Department (AZ G&F), 2000. Personal communication between AZ G&F (A. MacIlroy) and URS Greiner (K. Mantay), Re: Special Status Species. February 8, 2000.
- AZ G&F, 2000b. Personal communication between AZ G&F (A. MacIlroy) and M&E (C. Hoffman), Re: Potential Presence of Lowland Leopard Frog in Vicinity of Luke AFB. November 17, 2000.
- Belden, S. J., 1999. Air Surveillance Radar (ASR) Siting Worksheet, Interference Prediction for Collocation of ASR-11 and Existing ASR Assets. September, 1999.
- Bureau of Labor Statistics (BLS), 2000. Arizona Labor Statistics. Available at <http://stats.bls.gov/eag/eag.az.htm>
- Code of Federal Regulations (CFR), 1999. *Environmental Impact Analysis Process. Department of the Air Force, DoD. Final Rule*. Federal Register July 15, 1999 (Volume 64, number 135, pp 38143). Effective Date July 6, 1999.
- Council on Environmental Quality (CEQ), 1978. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. 40 CFR Parts 1500-1580. November 28, 1978 (and as updated through July 1, 1998).

REFERENCES (continued)

- United States Department of the Air Force (DAF), 1997. Environmental Quality Non-Industrial Category Luke Air Force Base, Arizona. Available at <http://www.denix.osd.mil/denix/Public/News/Eartday97/Awards/Luke-AFB/luke-AFB.html>
- Environmental Protection Agency (EPA), 1998. *National Primary and Secondary Air Quality Standards*. 40 CFR 50.
- EPA, 2000. Aerometric Information Retrieval System (AIRS). Available at <http://www.epa.gov/airsdata/info.htm>
- Federal Aviation Administration (FAA), 1992. *Primary/Secondary Terminal Radar Siting Handbook*. FAA Order 6310.6, Change 1. June 22, 1992.
- FAA, 1997. Radio Frequency Impact Analysis for Airport Surveillance Radar-11. Prepared by SRI International. Final Report, October 1997.
- Food and Drug Administration (FDA), 1996. Annual Report, Fiscal Year 1996; section on *Electromagnetic Interference (EMI) Testing of Medical Devices*. FDA Center for Devices and Radiological Health, Office of Science and Technology. Available at <http://www.fda.gov/cdrh/ost/section4.html>
- Glendale, 1997. Economic Development. Available at <http://www.ci.glendale.az.us/localgov.html>
- Glendale, 2000. Labor Statistics. Available at <http://www.glendaleaz.org/economic/CommunityInfoSheet.pdf>
- Institute of Electrical Electronics Engineering (IEEE), 1998. *Radiofrequency Interference with Medical Devices; IEE Engineering in Medicine and Biology Magazine* 17(3):111-114. Available at <http://www.seas.upenn.edu/ffoster/inter.htm>
- Luke Air Force, 56th Civil Engineer Squadron, 2000. On-Base Military Family Housing. Available at <http://www.luke.af.mil/ces/Housing/Housing.htm>
- Maricopa County, Planning and Development Department, 2000a. Available at <http://www.maricopa.gov/planning.html>
- Maricopa County, Planning and Development Department, 2000b. Available at <http://www.maricopa.gov/planning/whitetank2.1>

REFERENCES (continued)

- MITRE, 1997. Personal communication via email between MITRE (David C. Miller) and ESC-TG (Holly Arbaczawski), Re: DASR Radar Parameters. August 21, 1997.
- National Academy of Science (NAS), 1996. *Possible Health effects of Exposure to Residential Electric and Magnetic Fields*. October 31, 1996; as cited by VTDPs, 1996.
- National Safety Council (NSC), 1979. *Fundamentals of Industrial Hygiene*, Second Edition.
- New Mexico Game and Fish (NMGF), 2000. *Biota Information System of New Mexico*. Available at http://www.fw.vt.edu/fishex/nmex_main/species/020030.htm
- United States Air Force (USAF), 1991. Air Force land use compatibility guidelines are documented in the *Air Installation Compatible Use Zone (AICUZ) Program Handbook*.
- USAF, 1994. Department of the Air Force Program Management Directive for Air Traffic Control and Landing Systems Integrated Weapons System Management. January 14, 1994.
- USAF, 1995a. *Department of Defense National Airspace System Final Programmatic Environmental Assessment*. Prepared by Metcalf & Eddy.
- USAF, 1996a. *General Plan, Luke Air Force Base, Arizona*. 56th Fighter Wing Environmental Flight, Luke AFB, Arizona.
- USAF, 1996b. *Final Environmental Impact Statement to Construct and Operate a Golf Course*. 56th Fighter Wing Environmental Flight, Luke AFB, Arizona.
- USAF, 1996c. *Final Environmental Assessment for the Continued Use of and Increased Environmental Management of Luke Air Force Base Auxiliary Field #1 (AUX-1) for Military Field Deployment Training Activities*. 56th Fighter Wing Environmental Flight, Luke AFB, Arizona.
- USAF, 1997. *Final Integrated Natural Resource Management Plan for Luke Air Force Base, Auxiliary Field 1, Gila Bend Air Force Auxiliary Field*. Prepared by CDM Federal Programs Corporation.
- USAF, 1998. *Integrated Cultural Resources Management Plan for Luke Air Force Base, Auxiliary Airfield No. 1, and the Fort Tuthill Recreation Area*. Prepared by Dames & Moore.
- USAF, 1999. Final Record of Decision, Operable Unit 1, Luke AFB, Arizona. Prepared by ARCADIS Geraghty, & Miller, Inc. 20 January 1999.

REFERENCES (continued)

- USAF, 2000a. Environmental Impact Analysis Process (EIAP). Federal Register. Vol 64, No.135 38127. AFI 32-7061. July 15, 1999.
- USAF, 2000b. *Digital Airport Surveillance Radar (DASR), Integrated Site Survey Report – Final, Luke Airforce Base, Arizona*. Prepared by Raytheon Systems Company, Transportation Systems, Sudbury, MA.
- USAF, 2000c. Personal communication between Luke AFB (Sgt. Diehl) and Metcalf & Eddy (C. Hoffman), Re: Characteristics of Existing AN/GPN-12. 11/07/00.
- USAF, 2000d. Personal communication between Luke AFB (R. Isaac) and Metcalf & Eddy (C. Hoffman), Re: Updates to General Plan.
- USAF, 2000e. Personal communication between Luke AFB (C. Christoffer) and Metcalf & Eddy (C. Hoffman), Re: Groundwater Table. 11/06/00
- USAF, 2000f. Personal communication between Luke AFB (R. Isaac) and Metcalf & Eddy (C. Hoffman), Re: Demolition Area.
- USAF, 2000g. Personal communication between Hanscom AFB (C. Freeman) and Metcalf & Eddy (J. Petras). October 2, 2000.
- USAF, 2000h. Personal communication between Luke AFB (B. Matthews) and Metcalf & Eddy (J. Doyle-Breen), Re: Hazardous materials and ground subsidence in vicinity of Site 2. January 5, 2000.
- USAF, 2000i. Personal communication between Luke AFB (C. Christoffer) and Metcalf & Eddy (C. Hoffman), Re: Herpetologist assessment that lowland leopard frog not present at Luke AFB. November 27, 2000.
- USAF, 2001. Personal communication between Luke AFB (TSgt. Vincent Bain) and Metcalf & Eddy via electronic mail. Comments on the Preliminary Draft Environmental Assessment. January 30, 2001.
- United States Bureau of Census (USBC), 1990. State and County QuickFacts. Data derived from Population Estimates, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates
- USBC, 2000. State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, Small Area Income and Poverty Estimates

REFERENCES (continued)

United States Geological Survey (USGS), 1992. Topographical Quadrangle, El Mirage.

Vermont Department of Public Services (VTDPS), 1996. *Radiofrequency Radiation: Health Effect and Interference; Status of Current Research and Regulation*. December 1996. Available at <http://www.cit.state.vt.us/psd/rfrpt.htm>

ACRONYMS AND ABBREVIATIONS

A/C	Alternating current
ADEQ	Arizona Department of Environmental Quality
AFB	Air Force Base
AICUZ	Air Installation Compatible Use Zone
AM	Amplitude modulation (radio)
AN/GPN-12	(airport surveillance radar designation)
ANSI	American National Standards Institute
ASR-11	(airport surveillance radar designation)
AST	above-ground storage tank
ATSDR	Agency for Toxic Substance & Disease Registry
CFR	Code of Federal Regulations
DASR	Digital Airport Surveillance Radar
dBa	decibel, A-weighted
DNL	Day-night (noise) level
DoD	(U.S.) Department of Defense
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	(US) Environmental Protection Agency
°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

ACRONYMS AND ABBREVIATIONS (continued)

kW	kilowatts
L_{eq}	equivalent sound level
m	meters
MCL	Maximum Concentration Level
m/sec	meters per second
mg/m^3	milligrams per cubic meter
MHZ	megahertz
MPE	Maximum Permissible Exposure
MSA	Munitions Storage Area
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
nmi	nautical miles
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OSHA	(U.S.) Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbons
PCBs	polychlorinated biphenyls
PM-2.5	Particulate matter below 2.5 microns
PM-10	Particulate matter below 10 microns
POL	petroleum, oil, lubricants
ppm	parts per million (by volume in air)
PRG	Program remediation goal

ACRONYMS AND ABBREVIATIONS (continued)

psi	pounds per square inch
RAPCON	Radar Approach Control
RCRA	Resource Conservation and Recovery Act
RFR	Radiofrequency radiation
SAGE	Semi-Automatic Ground Environment
SHPO	State Historic Preservation Officer
SVOC	semi-volatile organic compounds
TSP	total suspended particulates
USAF	United States (Department of the) Air Force
USFWS	United States Fish & Wildlife Service
UST	Underground storage tank
VOC	Volatile Organic Compound
WSRV	West Salt River Valley

APPENDIX A: LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

LISTING OF AGENCIES AND INDIVIDUALS CONTACTED

Luke AFB, Dr. Chris Christoffer

Luke AFB, (56 CS), TSgt. Guy Wells

Luke AFB, (56 CEVE), Robert Maxwell

Luke AFB, Al Regal

Luke AFB, (56 CES/CEC), Richard Isaac

Luke AFB, W. Oberle

Luke AFB, Nick Durlinger

Luke AFB, Dr. Belle Matthews

Luke AFB, Yvonne Newel

Tinker AFB, Norman Brewer

Luke AFB, Lawrence Reiss, Superintendent of Planning and Implementation

Luke AFB, Lloyd Abrams

ARCADIS Geraghty & Miller, Jon R. Sherrill

APPENDIX B: PRELIMINARY SITE SCREENING CRITERIA FOR LUKE AFB

PRELIMINARY SITE SCREENING CRITERIA FOR LUKE AFB

EXCLUSIONARY CRITERIA

These criteria consider the essential environmental, constructional, and operational constraints that could eliminate a site from further consideration as a potential site for the ASR-11 System. These criteria relate to environmental parameters that could lead to unmitigable significant impacts and physical parameters regarding a site's suitability for construction.

Criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Impacts occupied existing structures	No	No	No	No	No	No	No	No
Within railroad ROW	No	No	No	No	No	No	No	No
Within highway ROW	No	No	No	No	No	No	No	No
Within runways and/or taxiways	No	No	No	No	No	No	No	No
Within power line ROW	No	No	No	No	No	No	No	No
Impacts wilderness areas	No	No	No	No	No	No	No	No
Impacts national natural landmarks	No	No	No	No	No	No	No	No
Site less than 160 by 160 feet	No	No	No	No	No	No	Yes ¹	No
Lacks coverage of aircraft targets within 1 nmi of the takeoff runway ends	No	No	No	No	No	No	No	No
Within 1,500 feet of any above ground screening object	No	No	No	No	No	No	No	No
Cone of silence location impacts visibility of air routes or navigational fixes	No	No	Yes ²	Yes ³	No	No	No	Yes ³
Airport specific exclusions	No	No	No	No	No	No	No	No
Violates FAR Part 77 requirements	No	No	No	No	No	No	No	No

No = Meets Criteria

Yes = Does Not Meet Criteria

- 1 Site 7 occupies a narrow strip of land between Super Sabre Street and the base boundary fence; as a result, the standard size of 160 feet by 160 feet would not be feasible. The cost of redesigning the site layout to fit on a 75-foot wide site would need to be considered.
- 2 The cone of silence location impacts Site 3 for Fix 11 above 6,600 ft MSL
- 3 Sites 4 and 8 are located adjacent to the runway at Luke Aux-1; as a result, the cones of silence resulting from these sites will affect part of the air space above the surface of the runway. Since Luke Aux-1 is used only to practice approaches and does not have a runway to land aircraft, however, Sites 4 and 8 should not be excluded due to this criterion. The cone of silence location impacts Site 4 for Fixes 5 and 16. The cone of silence location impacts Site 8 for Fix 16 above 5,000 ft MSL.

Source: U.S. Air Force, 2000a

RESTRICTIVE SCREENING CRITERIA

These criteria could eliminate a site from further consideration due to the extensive mitigation required to offset potentially significant impacts. Many of these criteria originate from Federal law. In these cases, the law has been noted. Additionally, many of the criteria are covered by state and local laws, which were consulted as appropriate.

Criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Ecological or wildlife refuges	5	5	5	5	5	5	5	5
Wild and scenic rivers	5	5	5	5	5	5	5	5
Prime farmland	5	5	5	5	5	5	5	5
National, state, and municipal parks and recreation areas	5	5	5	5	3 ¹	5	5	5
Historical, archeological, and cultural sensitive sites	5	5	5	5	5	5	5	5
Wetlands	5	5	5	5	5	5	5	5
Endangered and threatened species habitat	5	5	5	5	5	5	5	5
Non-airfield or non-federal land	5	5	5	5	5	5	5	5
Hazardous waste site	5	3 ²	3 ²	5	5	5	5	5
Capped landfill	5	5	5	5	5	5	5	5
Scenic highways	5	5	5	5	5	5	5	5
Coastal zones	5	5	5	5	5	5	5	5
Steep terrain	5	5	5	5	5	5	5	5
Floodplain	5	5	5	5	5	5	5	5
Within 2,500 feet of existing electronic facilities or power lines that could interfere with operation	3 ³	3 ³	5	5	5	5	5	5
Primary radar coverage to the threshold of runways	5	3 ⁴	5	3 ⁴	5	3 ⁴	5	3 ⁴
Secondary radar coverage, on the surface, over the entire length of runways	5	3 ⁵	5	3 ⁵	5	3 ⁵	5	3 ⁵
Within 2,500 feet of industrial operations that could interrupt or contaminate the site	5	5	5	5	5	5	5	5
Within 0.5 nmi of edges of any operational runways and approach and departure paths	5	3 ⁶	5	5	5	3 ⁶	5	5

5 = No Adverse Impacts/Meets Criteria

3 = Partially Impacted/Marginal

1 = Significantly Impacted/Does Not Meet Criteria

1 Site 5 is located adjacent to recreational fields

2 Site 2 is adjacent to an area contaminated with lead and chromium. Site 2 is located within a DRMO site with Radioactive Waste Disposal.

3 Site 1 is located 1000' from existing GPN-12. Site 2 is located approximately 2100' from existing GPN-12

4 Site 2 is located within 0.5 nmi of Runway 21r's threshold. Sites 4 and 8 do not provide primary radar coverage to the threshold of Runway 3L. Site 6 is located within 0.5 nmi of Runway 3R's threshold.

5 Sites 2, 4, and 8 do not provide secondary radar coverage, on the surface, over the entire length of Runway 3L/21R. Site 6 does not provide secondary radar coverage, on the surface, over the entire length of Runway 3R/21L.

6 Site 2 is within 0.5 nmi of runway 3L/21R. Site 6 is within 0.5 nmi of Runway 3R/21L

Source: U.S. Air Force, 2000a

SELECTIVE SCREENING CRITERIA

These criteria provide positive or negative considerations that will form the basis for comparison of candidate sites. Much of the information required is obtained/confirmed during site visits.

Criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Visual sensitivity	- ¹	+	o ¹	+	- ¹	o ¹	+	+
Accessibility to roads	+	+	+	+	+	+	+	+
Soils	+	+	+	o ²	o ²	+	o ²	o ²
Geology	+	+	+	- ³	+	+	+	- ³
Proximity to power	+	+	+	+	+	+	+	+
Proximity to telephone lines	+	+	+	+	+	+	+	+
Zoning	+	+	+	+	+	+	+	+
Subsurface rights	+	+	+	+	+	+	+	+
Unique habitat	+	+	+	+	+	+	+	+
Utilities	+	+	+	- ³	+	+	+	- ³
Planned use of site	+	+	o ⁴	o	o ⁴	+	+	+
Roadways	+	+	+	+	+	+	+	+
Water resources	+	+	+	+	+	+	+	+
Recreational use	+	+	+	+	- ⁵	+	+	+
Bodies of water	+	+	+	+	+	+	+	+
Underground cable routing	+	+	- ⁶	- ⁶	+	+	+	- ⁶
LOS visibility to air traffic coverage requirements	+	+	o	-	+	+	o	-
	21 of 26	21 of 26	20 of 26	15 of 26	21 of 26	21 of 26	20 of 26	15 of 26

+ = Positive

- = Negative

O = Neutral

- 1 Sites 1 and 6 are located near a golf course. Site 3 is located near a church. Site 5 is located near recreational fields.
- 2 Sites 4, 7, and 8 are located on moderate soils, having moderate shrink-swell potential. Site 5 is located on severe soils, having less than 20 inches of hardpan. Soils information was attained from the Soil Survey of Maricopa County, Central Part September 1977.
- 3 Sites 4 and 8 would require power upgrades to handle the additional load of the ASR-11.
- 4 Site 3 is a DRMO facility. Site 5 is a parking lot.
- 5 Site 5 is adjacent to recreational fields.
- 6 Site 3 is 2 statute miles east of Luke AFB. Sites 4 and 8 are located at a remote site 13 statute miles away.

Source: U.S. Air Force, 2000a