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DRAFT ENVIRONMENTAL ASSESSMENT

MISSION REALIGNMENT
OF
GOODFELLOW AIR FORCE BASE,
TEXAS

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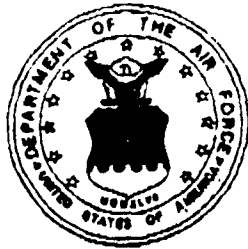
HEADQUARTERS AIR TRAINING COMMAND
RANDOLPH AFB, TEXAS
DECEMBER, 1989



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DRAFT
FINDING OF NO SIGNIFICANT IMPACT

Mission Realignment of Goodfellow Air Force Base

The United States Air Force, Air Training Command, is transferring the fuel and fire fighting training from Chanute Air Force Base, Illinois, to Goodfellow Air Force Base, Texas, in compliance with Public Law (PL) 100-526, the Defense Authorization Amendments and Base Realignment and Closure Act. The Base Closure and Realignment Act requires the implementing actions to conform to the provisions of the National Environmental Policy Act of 1969 (NEPA), PL 90-190, as implemented by the President's Council on Environmental Quality (CEQ) regulations. However, PL 100-526 states that the Air Force does not have to address the purpose and need for closure actions, or identify alternative military installations to those selected by the Commission. A discussion of alternatives and identification of the impacts of the location of the Fuel and the Fire Training facilities at Goodfellow Air Force Base (AFB) is necessary.

The following alternatives to the proposed action were initially considered:

The "No Action" alternative was excluded from consideration under the National Environmental Policy Act by PL 100-526, therefore, this alternative was not considered further.

Alternative 1 was developed in an Air Force Planning Assistance Team Report completed in March 1989. This alternative has the least adverse environmental impacts of the alternatives. This alternative uses the eastern half of Goodfellow Air Force Base where the existing, abandoned runways are located. The alternative would involve the relocation of the Department of Transportation (DOT) tire test track and the construction of the fuel and fire fighting training facilities to the northern portion of the base. A satellite communications facility (SATCOM) is proposed to be located on the southern portion of this area. Other existing facilities would not be affected. No conflict between facility uses exists with this alternative.

Alternative 2 would require relocation of the DOT tire test track as discussed in Alternative 1. The proposed SATCOM facility would be moved to the northern portion of the base immediately south of the DOT tire test track. The fire training facilities would be relocated south and west of the intersection of the the two runways. This alternative would provide a greater visual buffer distance from the residential area located immediately adjacent to the northern boundary of the base. However, this would require the fire fighting training facility to utilize the existing northeast-southwest runway, causing severe traffic conflicts. Optimal distance between the fuel storage area and the fire training burn area could not be achieved with this alternative.

Alternative 3 would involve locating both the fuel and fire fighting training facilities off-base. This would allow the SATCOM facility to be constructed on-base without any interference from the fuel and fire fighting training facilities. Also the DOT track could remain in it's present location which would eliminate construction costs. There are, however, significant negative impacts associated with this alternative. This alternative would require additional land acquisition, construction of drinking water facilities, a change building with showers, and dining facilities. Since the area would be isolated, there would be a need for an additional security system. An off site alternative would require that students be transported to and from the remote facilities which would increase transportation costs and decrease training efficiency. Finally, in case of an accident involving injury, there would be no immediate access to medical facilities.

Based on the Environmental Assessment (EA) and results of coordination, the site selection of alternative 1 has the least environmental impact and will not have any adverse impacts on public, Federal or state environmentally sensitive areas, natural resources, or any Federally listed threatened or endangered species. This EA concludes there should be no significant adverse environmental impacts associated with Alternative 1, the preferred alternative. The proposed action will not have a significant adverse effect upon the natural or manmade environments and, therefore, will not require preparation of an Environmental Impact Statement.

COVER SHEET

Draft Environmental Assessment

Responsible Agency: United States Air Force
Air Training Command

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Action: Realignment of Goodfellow Air Force Base, Texas

Designation: Draft Environmental Assessment (DEA)

Abstract: By Public Law 100-526, the Defense Authorization Amendments and Base Realignment and Closure Act, dated June 1988, it is necessary for the fuels and fire fighting training courses, presently located at Chanute Air Force Base, Illinois, to be relocated to Goodfellow Air Force Base, Texas. The Base Realignment and Closure Commission determined that there is a need for this realignment in order to help reduce government military spending. This Environmental Assessment (EA) presents the existing conditions, describes the site selection process, and evaluates the available alternative actions. It also identifies environmental impacts of the proposed action on cultural resources, vegetation, wildlife, water resources, and socioeconomics of the area.

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EXECUTIVE SUMMARY

DRAFT ENVIRONMENTAL ASSESSMENT

MISSION REALIGNMENT OF GOODFELLOW AIR FORCE BASE, TEXAS

1. Purpose and Need

In accordance with Public Law (PL) 100-526, the Defense Authorization Amendments and Base Realignment and Closure Act of June 1988, it is necessary to relocate the fire fighting and fuel training facilities, presently at Chanute Air Force Base to Goodfellow Air Force Base, San Angelo, Texas. The Base Realignment and Closure Commission determined that there is a need for this realignment in order to help reduce government military spending.

2. Summary of Alternatives

PL 100-526 exempted this action from the requirement of the National Environmental Policy Act (NEPA), PL 91-190, as amended, for discussion of alternatives to the actions of the Secretary of Defense (SECDEF) Commission on Base Realignment and Closure and for the SECDEF decision to accept the Commission recommendation. PL 100-526 also states that the Air Force does not have to address the purpose and need for closure actions or identify alternative military installations to those selected by the Commission. However, a discussion of alternative sitings and identification of the impacts for the location of the Fuel and the Fire Training facilities at Goodfellow Air Force Base (AFB) is necessary to be in full compliance with NEPA.

The "No Action" alternative was exempted by PL 100-526 from consideration under the National Environmental Policy Act; therefore, this alternative was dropped from further consideration.

Three alternative locations for the fuel and fire fighting training facilities were initially considered:

Alternative 1 was developed in an Air Force Planning Assistance Team Report completed in March 1989. This alternative has the least adverse environmental impact compared to the other two alternatives. This alternative uses the eastern half of Goodfellow Air Force Base where existing, abandoned runways are located. This alternative would involve the relocation of the Department of Transportation (DOT) tire test track and the construction of fuel and fire fighting training facilities to the northeastern quarter of the base. A satellite communications facility (SATCOM) is proposed for location in the southern portion of this area. The Air Force has determined that the smoke generated from the fire fighting training would not interfere with the SATCOM facility, or other existing facilities. All alternatives considered would include new construction of unaccompanied enlisted personnel housing (UEPH), a dining hall, a troop issue facility, a vehicle impound lot, kennel, drafting pit, wash rack, vehicle maintenance building, fire training building, burn area with a change building, burn house, hose pad, burn pad, hazardous materials training area, an aircraft drive around and spray facility, liquid oxygen training building, liquid fuels training building, fuel storage area, a C-130 pad, and utilities. No conflict between facility uses exists with this alternative (Figure 2-6).

Alternative 2 would require relocation of the DOT tire test track as discussed in Alternative 1. The proposed SATCOM facility would be moved to the northern portion of the base immediately south of the DOT tire test track. The burn areas would be relocated south and west of the intersection of the the two runways. This alternative would provide a greater visual buffer distance from the residential area which is located immediately adjacent to the northern boundary of the base. This would allow the fire fighting training facility to use the existing northeast-southwest runway while enroute to the aircraft drive around spray facility, which would be located at the northeast end of the northeast-southwest runway (Figure 2-7).

The fire truck acceleration distance required for the aircraft approach and spray down facility is not suited for placement at the end of the northeast-southwest runway. This placement might cause conflicts with smaller vehicle traffic patterns at the fuel training facility. Those activities that occur at the vehicles approach, hose area, and refueling area can not efficiently operate on the same roadway at the same time due to the different vehicles being used and the rate of speed at which they must operate.

The fuel storage facility is proposed to be located at the southern apex of the fuel training area. This location could be in conflict with the burn area since the fuel storage facility should be located as far as possible from the burn areas while remaining within site limitations.

Alternative 3 would involve locating both the fuel and fire fighting training facilities offbase. This would allow the SATCOM facility to be constructed on-base without any interference from the fuel and fire fighting training facilities. Also the DOT track could remain in its present location which would eliminate construction costs.

There are significant negative impacts associated with this alternative. For example, this alternative would require additional land acquisition, construction of drinking water facilities, a change building with showers, and dining facilities. Since the area would be isolated, there would be a need for an additional security system. An off site alternative would require that students be transported to and from the remote facilities which would increase transportation costs and decrease training efficiency. Finally, in case of an accident involving an injury, there would be no immediate access to medical facilities.

Alternatives 1 and 2 have no significant environmental impacts. If implemented, Alternative 3 could have significant environmental impacts, depending on where the facilities would be located.

3. Summary of Environmental Impacts.

Direct, adverse environmental impacts of the construction of the fuel and fire fighting training facilities would include fugitive dust and noise during the construction phase. However, these impacts would be temporary and localized. After construction there would be direct effect of air pollution as a result of burning jet fuel (JP-4) which would cause plumes of smoke. The smoke would contain suspended particulates, nitrogen oxides, carbon monoxide, hydrocarbons and sulfur oxides. Nitrogen oxides and sulfur oxides are irritants, however, the quantities contained in the smoke are insignificant.

Based on the laws, regulations, design, location and other information contained in this EA, no significant adverse air quality impacts are predicted to result from the fire

fighting training. The removal of approximately 300 acres of disturbed mesquite-grassland habitat would occur with the proposed action, however these impacts are not significant. There is a potential for accidental fuel spills but, should they occur, Goodfellow AFB has an existing contingency plan, a spill prevention team, and equipment to handle such an emergency. The detention system, where the fuel would be burned, would be lined and have leak detectors to prevent percolation of liquids into the sub-surface strata. Adverse impacts to water quality are not expected to occur. There would be no significant adverse impacts to existing water supplies since the City of San Angelo has more than the capacity needed to supply the water for the fuel and fire fighting facilities. There is no indication that a Federal air quality permit would be required from the Environmental Protection Agency (EPA). The State of Texas does not require fire fighting installations to obtain an state air quality permit as long as certain procedures are followed. Written communication with the state must follow procedural requirements prior to any fire training action. The Air Force intends to meet these requirements. The realignment at Goodfellow AFB would have a positive impact on the socioeconomics of the base, San Angelo, and Tom Green county area. These impacts would include additional purchases of goods and services in the local community which would recirculate dollars and help create secondary jobs and wages.

4. Conclusions

Goodfellow AFB and the City of San Angelo are socioeconomically dependent upon one another. The addition of incoming personnel and training should show a positive impact on the local economy. Any negative environmental effects at Goodfellow AFB on noise, air, water, soil erosion, and solid waste from the expansion of facilities are considered minimal and controllable under existing laws and regulations, the designs, and other information as described in this EA.

5. Unresolved Issues

All known environmental issues have been addressed and resolved with the exception of impacts to cultural resources. Prior to construction in previously undeveloped areas, a cultural resource survey must be conducted. After this inventory, and if important archeological sites are located, mitigation measures will be considered in coordination

with the Texas State Historic Preservation Officer and the National Advisory Council on Historic Preservation. Also, the Texas Air Control Board must be contacted prior to the start of any construction regarding the requirements for operating the fire fighting training facility.

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1.0 PURPOSE AND NEED

1.1 Background.

The Defense Secretary's Commission on Base Realignment and Closure was chartered on 3 May 1988 by the Secretary of Defense to recommend military installations within the United States, its commonwealths, territories, and possessions for realignment and closure. Subsequently, the Base Closure and Realignment Act (Public Law 100-526, 24 October 1988) endorsed the Secretary's Commission and required the Secretary of Defense to implement its recommendations unless either he rejected them in their entirety or the Congress passed (and the President signed) a Joint Resolution disapproving the Commission's recommendations.

The primary criterion used by the Commission for identifying candidate bases was the military value of the installation. However, cost savings were also considered, as were the current and projected plans and requirements for each military service. Lastly, the Commission focused its review on military properties and their uses, not military units or organizational/administrative issues.

On 29 December 1988, the Commission recommended the realignment and closure of 145 military installations. of this number, 86 are to be closed fully, 5 are to be closed in part, and 54 will experience a change (either an increase or decrease) as units and activities are relocated.

On 8 January 1989, the Secretary of Defense approved those recommendations and announced that the Department of Defense would implement them. The Congress did not pass a Joint Resolution disapproving the recommendations within the time allotted by the Act.

Therefore, the Act now requires the Secretary of Defense, as a matter of law, to implement those closures and realignments. Implementation must be initiated by 30 September 1995. Thus, this Environmental Assessment (EA) for realignment of Goodfellow Air Force Base is by law a final one.

The Base Closure and Realignment Act requires the implementing actions to conform to the provisions of the National Environmental Policy Act of 1969 (NEPA), as implemented by the President's Council on Environmental Quality (CEQ) regulations. In addition, this EA also follows Air Force Regulation (AFR) 19-2, which implements both NEPA and the CEQ regulations within the Air Force system. However, the Act also modified NEPA to the extent that the environmental analysis need not consider:

- (i) the need for closing or realigning a military installation selected for closure or realignment by the Commission;
- (ii) the need for transferring functions to another military installation which has been selected as the receiving installation; or
- (iii) alternative military installations to those selected.

1.2 Purpose and Need.

The purpose of the realignment is to transfer the fire fighting and fuels training mission from Chanute AFB, Illinois to Goodfellow AFB, Texas. The need for this action is to comply with the requirements of the Base Closure and Realignment Act (Public Law 100-526).

2.0 ALTERNATIVES

2.1 General.

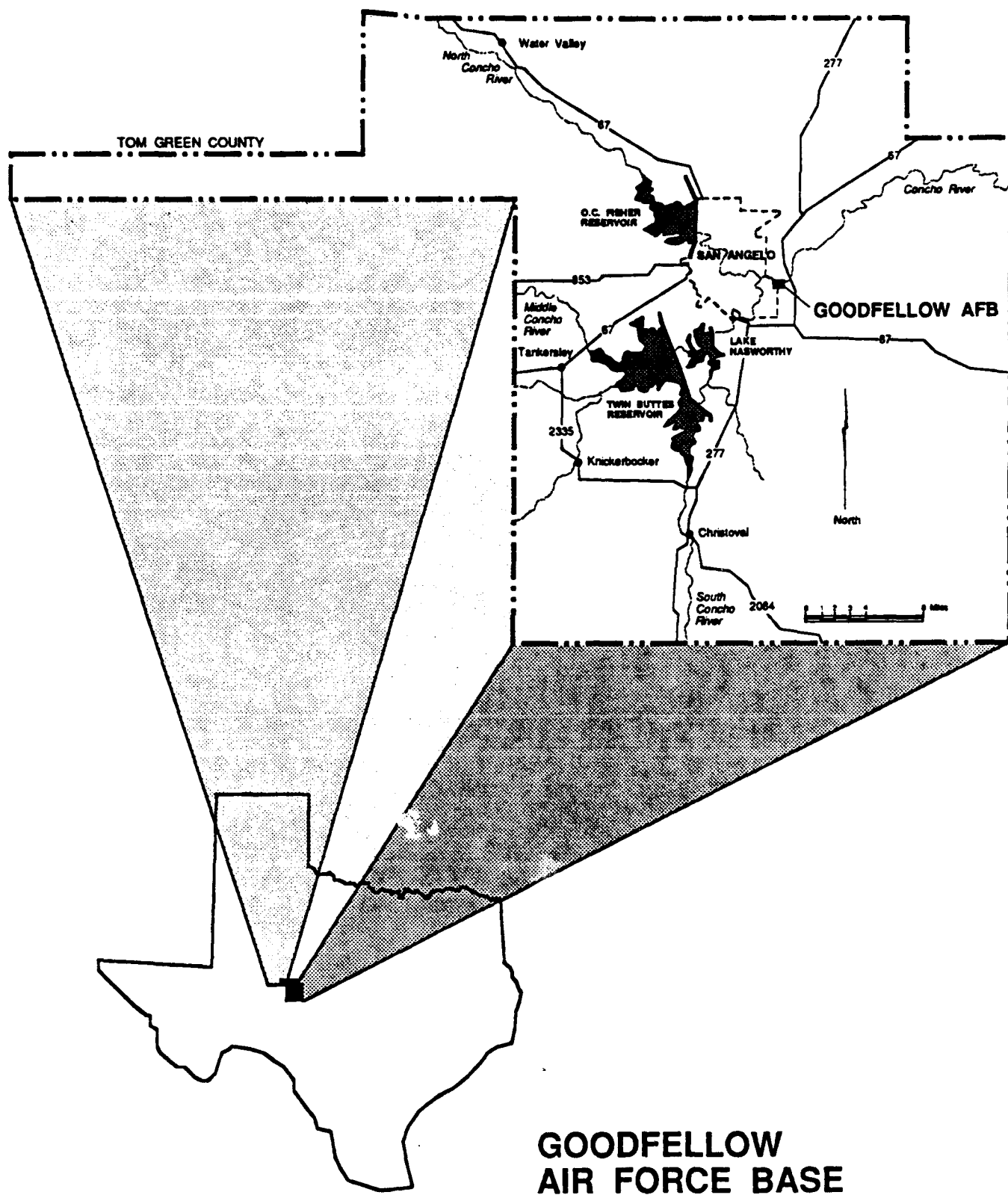
The Base Closure and Realignment Act requires this action to conform to the provisions of the National Environmental Policy Act of 1969 (NEPA), and implementing regulations. In addition, this EA is also in compliance with Air Force Regulation (AFR) 19-2, which implements both NEPA and the CEQ regulations within the Air Force system. However, the Act also modified NEPA to the extent that the environmental analysis need not consider:

- (i) the need for closing or realigning a military installation selected for closure or realignment by the Commission;
- (ii) the need for transferring functions to another military installation which has been selected as the receiving installation; or
- (iii) alternative military installations to those selected.

Provisions of the Base Closure and Realignment Act preclude the examination of any alternative actions to relocation of fire fighting and fuels training to Goodfellow AFB. The Act requires implementation of the relocation; therefore, the "No Action" alternative is not considered further.

2.2 Background.

Goodfellow AFB is located in San Angelo, Tom Green County, Texas (Figure 2-1). The base was opened in 1941 for aviation training. This basic mission continued until October 1958 when jurisdiction was transferred from Air Training Command (ATC) to USAF Security Service. The base was redesignated as an ATC facility in 1978. The mission of the installation since 1978 has been to train military personnel for the worldwide cryptologic mission.



**GOODFELLOW
AIR FORCE BASE**

TOM GREEN COUNTY, TEXAS

Figure 2-1

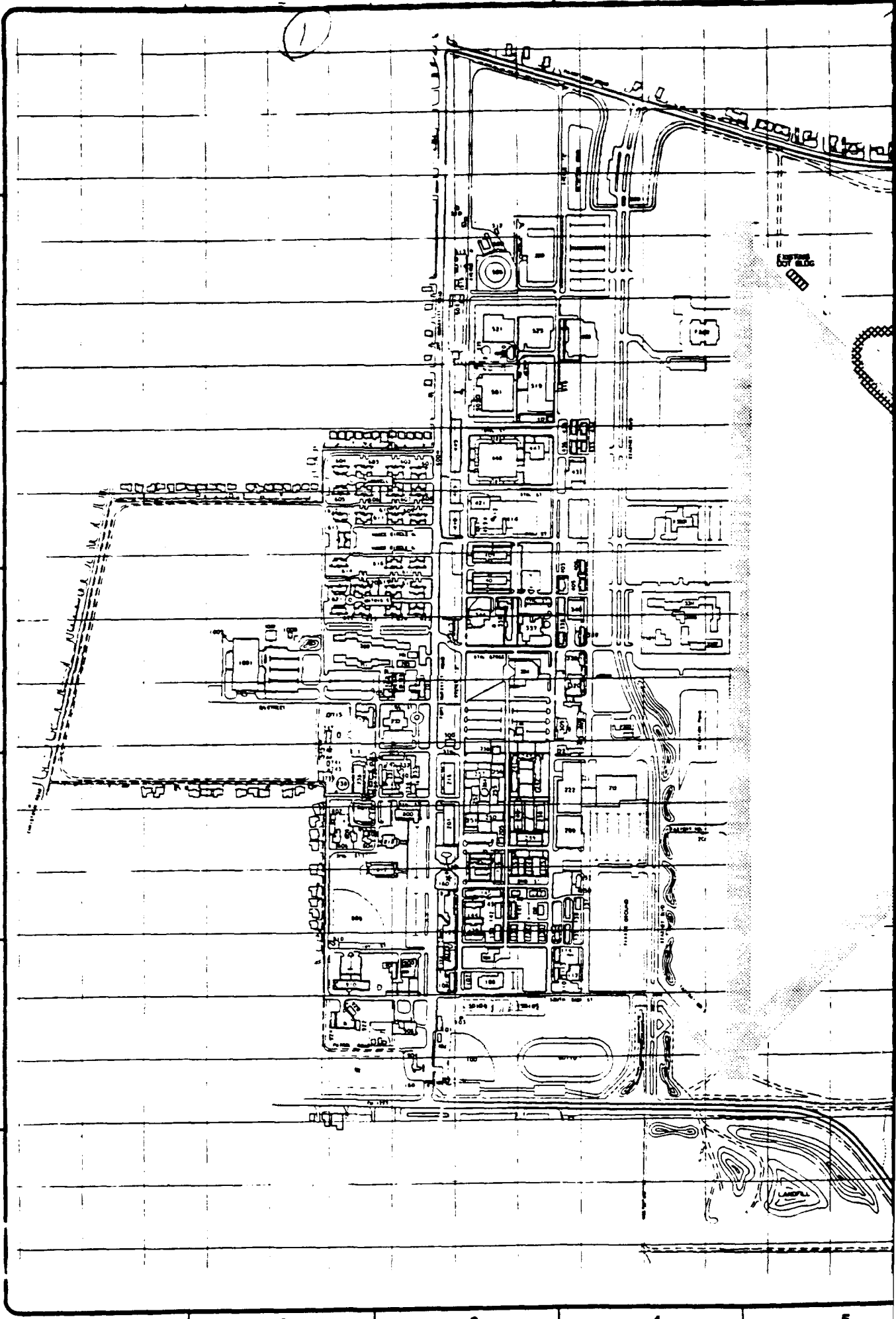
Goodfellow AFB is sited on 1,135 acres (459 hectares) of land in west central Texas approximately 3 miles (5 kilometers (km)) southeast of the City of San Angelo's central business district (Figure 2-1). The real estate and facilities of Goodfellow AFB are owned by the Air Force, with the exception of a 15 acre (6 hectare) off-base recreational site leased from the City of San Angelo (Fisher 1978). The runways at Goodfellow were deactivated in May 1975 and are currently used for tire testing by the Department of Transportation (DOT) as part of the Uniform Tire Grading Facility operation located at Goodfellow AFB. DOT also uses two additional base facilities adjacent to the runways in connection with this operation. These two existing buildings (buildings numbered 99 and 3527) are located at the end of the northwest runway adjacent to the DOT track. These buildings will not have to be relocated as a result of the realignment of fuel and fire fighting training.

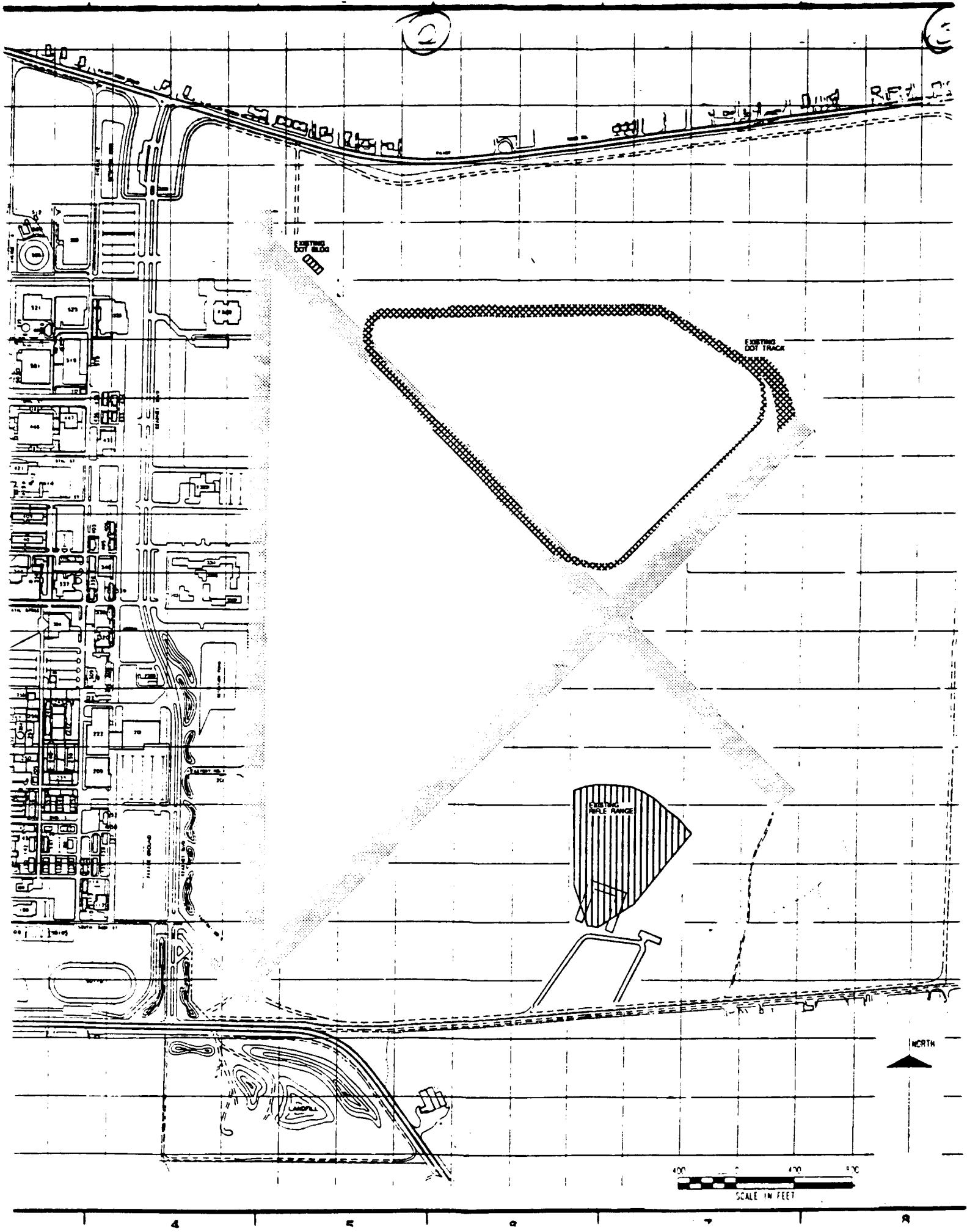
Goodfellow AFB is currently the home of the Goodfellow Technical Training Center, the 3498th Technical Training Wing, 3480th Air Base Group, and other Department of Defense units. Goodfellow AFB has approximately 1,950 active military and 1,300 civilian employees giving a permanent active base population total of 3,250. Average daily student load, which is a yearly average, is about 2,100.

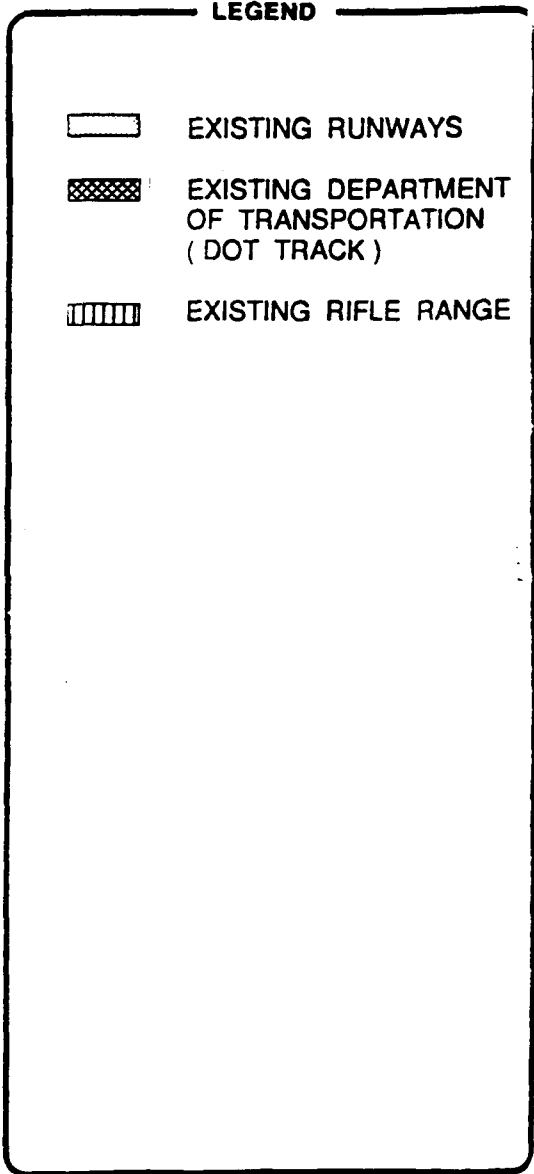
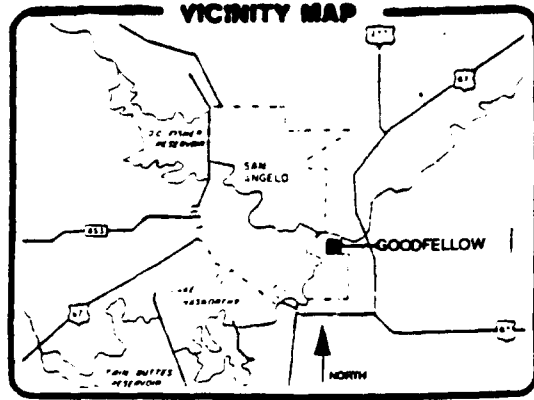
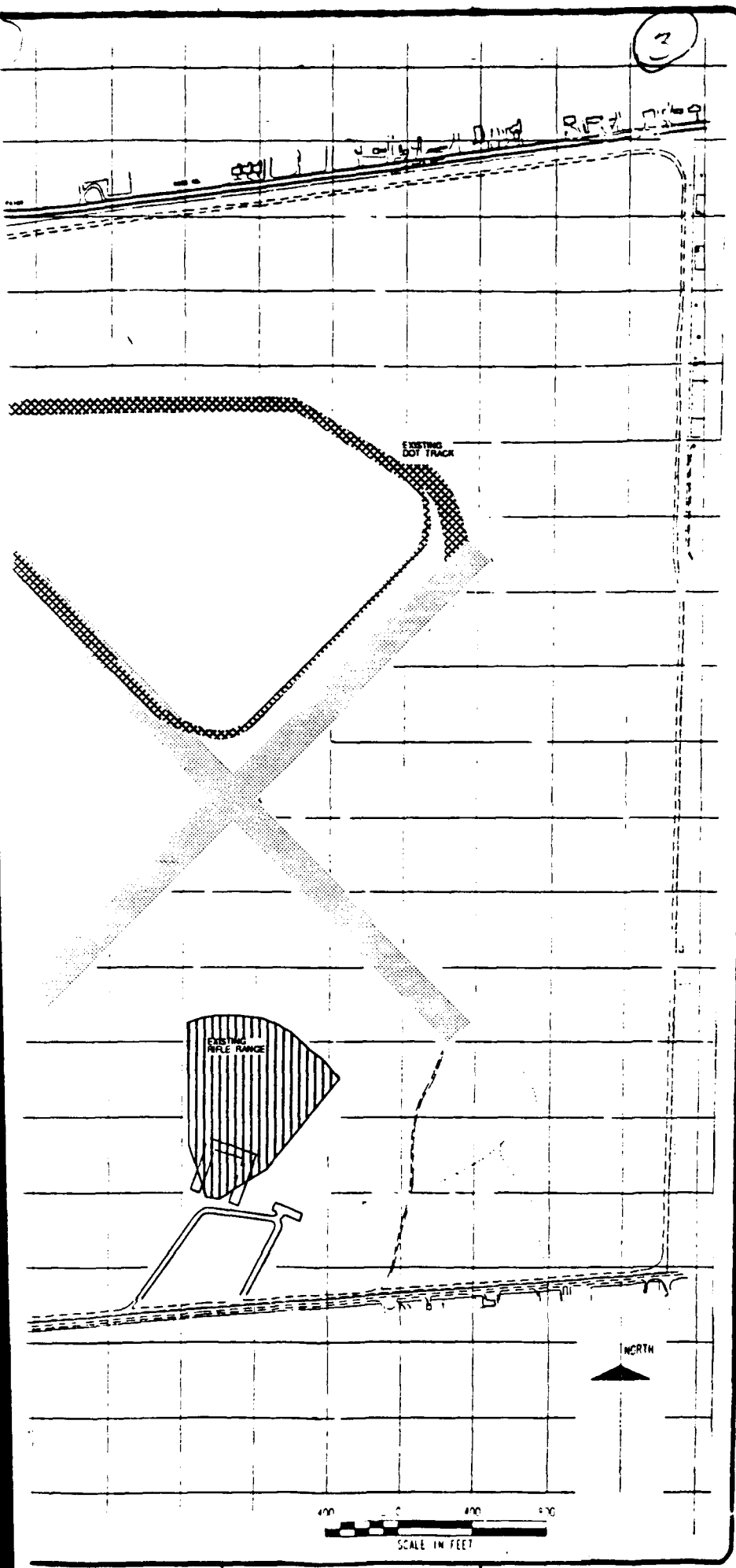
The existing buildings and recreational areas at Goodfellow AFB are located mainly on the western half of the base which leaves only the eastern half to be considered for the location of the fuel and fire fighting training facilities (Figure 2-2). The compactness of this base and clear zone requirements already severely limit the flexibility of locating new facilities adjacent to one another. A clear zone is the distance required by regulation, both vertically and horizontally, to separate incompatible facility uses. In the eastern portion of the base, a DOT test track is located immediately north of the intersection of the two abandoned runways and two DOT buildings are located on the north side near the end of the northwest runway. Additionally, a small arms firing range is located in the southeastern quadrant of the base near the southern boundary of the base. There is a small fire training structure located west of the intersection of the two abandoned runways.

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U. S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

GOODFELLOW AIR FORCE BASE
SAN ANGELO, TEXAS

EXISTING FACILITIES

SHEET 1 OF 1 FIGURE 2-2

PAGE 6

2.3 Description of Facilities to be Constructed.

The action is the relocation of both fuels training and fire fighting training/aircraft rescue from Chanute AFB, Illinois, to Goodfellow AFB, Texas. The average daily student load (ADSL) will increase by 212 for fuels training and 287 for the fire fighting training. The permanent party at Goodfellow AFB will increase by 295.

New construction will include Unaccompanied Enlisted Personnel Housing (UEPH), a dining hall, a troop issue facility, a vehicle impound lot, kennel, drafting pit, wash rack, vehicle maintenance building, fire training building, relocation of the DOT tire test track, burn area with a change building, burn house, hose pad, burn pad, hazardous materials training area, an aircraft drive around and spray facility, liquid oxygen training building, liquid fuels training building, fuel storage area, a C-130 pad, and utilities.

The new training facilities will require water, sanitary sewer, storm sewer, gas and electric service, and non-potable water for landscaping. The fire training function will require approximately 21,000 gallons/day of water including vehicle washing, burn areas and domestic use. The other facilities will not have a significant impact on normal water usage, but fire protection capability will be needed for all facilities. The demand on the sewer system will almost equal increased water demand since water used in fire training drains to the sewer after oil/water separation. Storm water run-off will increase due to additional paved areas. Two storm drains running under the proposed SATCOM Facility will have to be cut and relocated. Natural gas will be used for heating new facilities and for hot water. Electric service will be needed for lighting, ventilation, and for training equipment. Water will be needed for watering grass and other plants. Also, a considerable extension of the base telephone network into the schools and SATCOM Facility compounds will be necessary.

The fire fighting training requires burning of approximately 20,000 gallons of jet fuel (JP-4) per month, with 8 - 10 fires per day. The quantity of JP-4 used depends on the type of fire simulated. A test to simulate a wheel fire uses as little as 50 gallons of JP-4 while a test to simulate a major fire uses as much as 750 gallons of JP-4. On the average, two of the daily fires would burn 300 gallons of JP-4 each. The other daily fires burn on a much smaller scale. The prevailing winds vary widely. Smoke from the large fires may climb approximately 2,000 feet above the ground on calm days.

Experience from other Air Force fire fighting facilities indicates that, on the average, the smoke usually dissipates within 12 minutes.

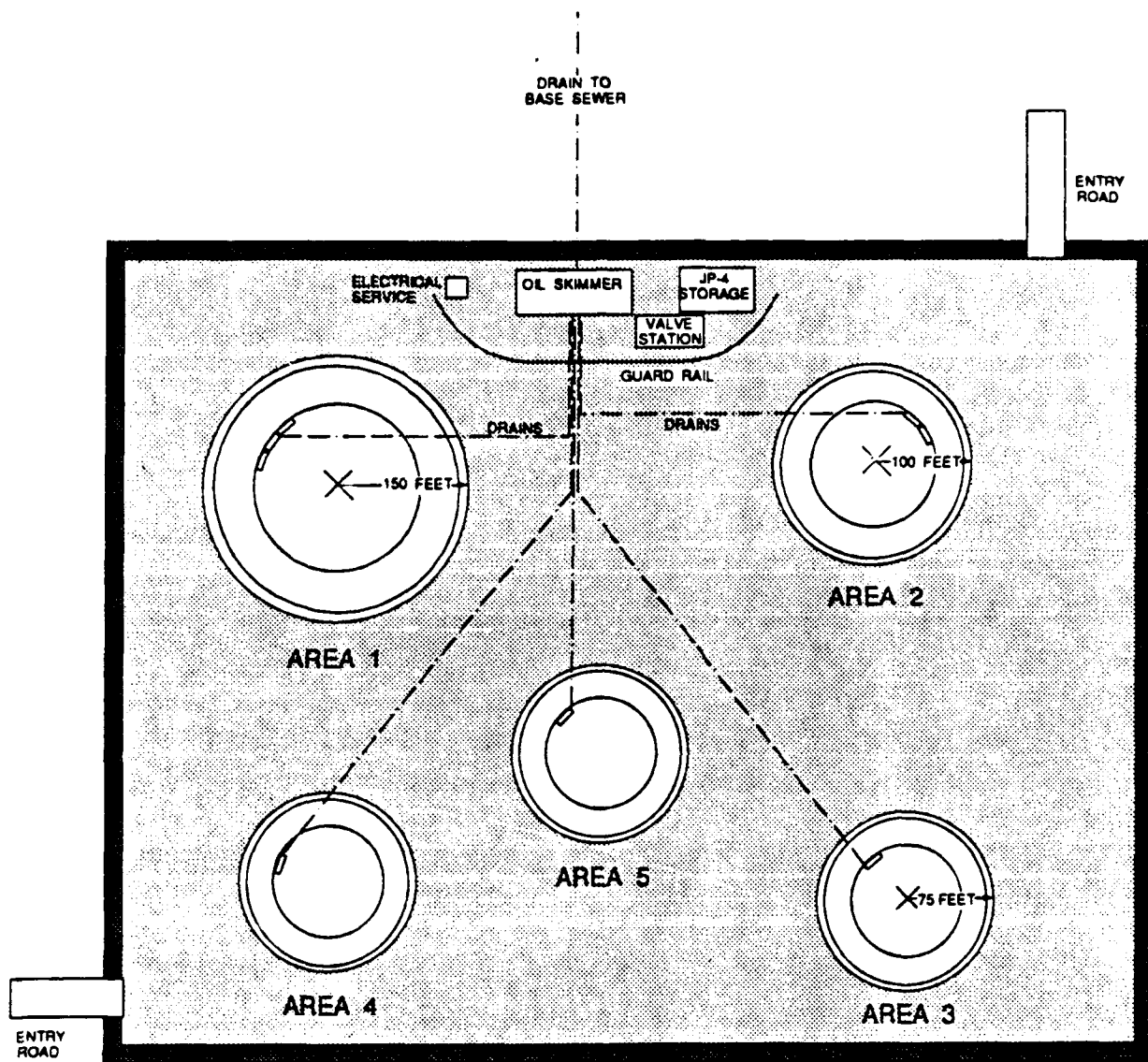
New Construction

Fire Training Complex	139,000 sq. ft.
Fuel Training Complex	58,000 sq. ft.
UEPH facility	134,000 sq. ft.
Dining Facility	14,000 sq. ft.
Troop Issue Facility	7,000 sq. ft.

The fire fighting training facility will consist of five burn areas, a vehicle maneuvering pad, fuel storage and supply system, and a waste handling system. This facility will occupy approximately 3.2 acres. The burn areas will involve the construction of two areas of 150 and 100 ft. in diameter, and three areas of 75 ft. in diameter (Figure 2-3). The burn areas consist of the following layers (bottom to top): (1) a double-liner, consisting of two 80-mil, high-density polyethylene (HDPE) plastic sheets with a plastic mesh sandwiched between them for leak detection; (2) a 6-inch layer of sand to protect the liners; (3) a geotextile filter fabric to separate the sand from the overlying coarse stone and prevent surface settling; and (4) a layer of graded, crushed stone, providing a non-slippery, stable surface for fire fighters to walk on during exercises (Figure 2-4).

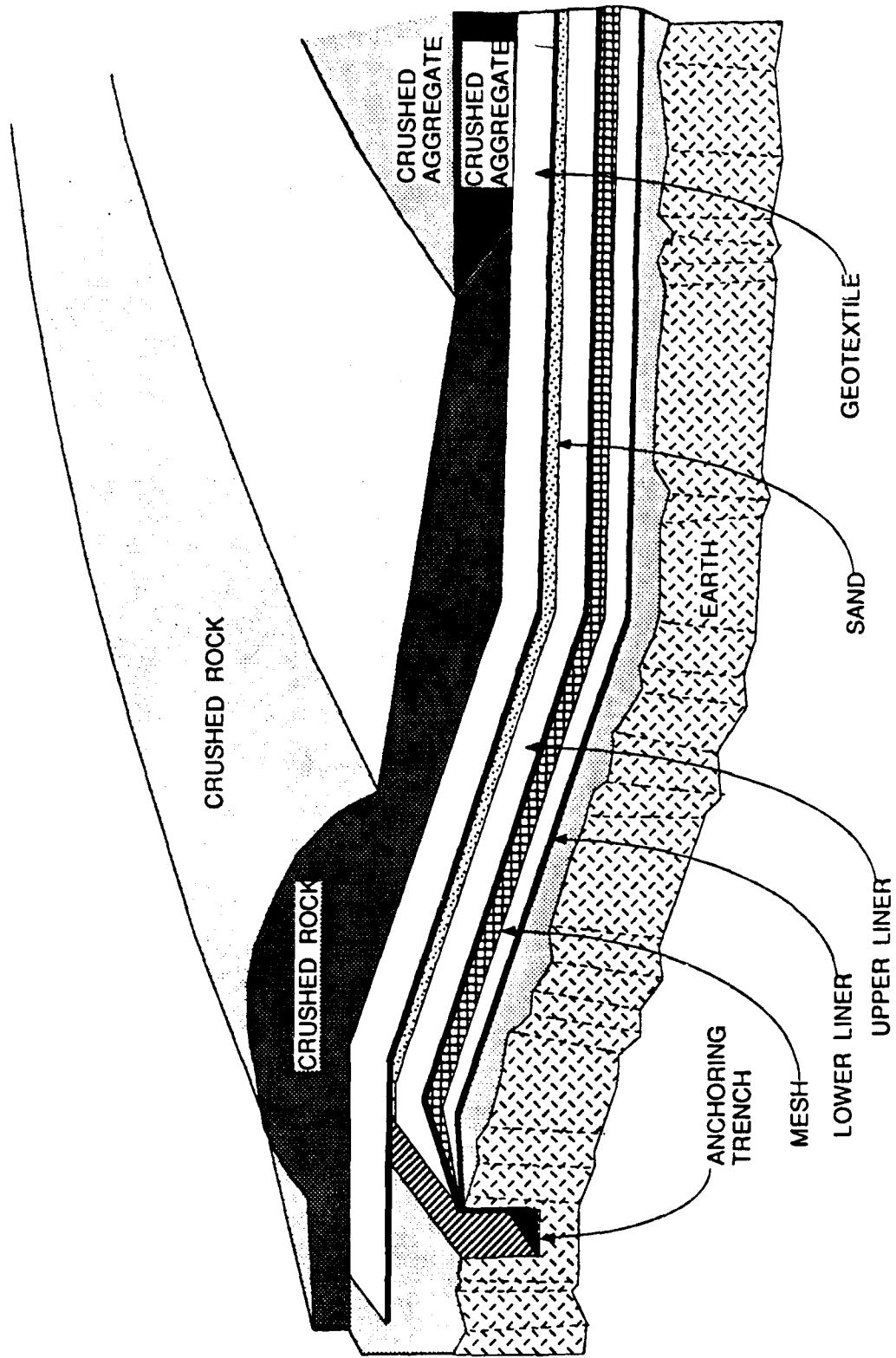
The edge of the burn areas will slope gently upward (an 8 percent slope), allowing fire fighters to enter and exit the areas easily. This perimeter will consist of fine, uniformly-graded, crushed aggregate. Crushed aggregate will also be used to construct a perimeter berm between the edge of the burn areas and the vehicle maneuvering area.

If any water leaks through the upper HDPE liner, it will flow through the plastic mesh to a monitoring sump located at the end of the utility access trench. In the event that a leak develops in the upper liner, facility operations will be halted until the source of the leak is located and repairs made. Also, Goodfellow AFB has a trained spill prevention



LAYOUT OF THE FIRE TRAINING FACILITY

Figure 2-3



CROSS SECTION OF THE BURN AREA

Figure 2-4

team, spill prevention equipment, and a spill response vehicle. They also have a designated hazardous waste accumulation facility under construction, which is approximately 50 percent complete.

The JP-4 fuel for training fires will be supplied from a 2,000-gallon above-ground storage tank. A three-horsepower electric pump will deliver up to 100 gallons per minute (gpm) of fuel to the burn areas. Fuel flow will be metered, providing both the instantaneous flow rate and cumulative flow. The two-inch diameter steel pipe used to deliver fuel to the burn area will be laid in a lined utility trench that will also accommodate the electrical conduits and wastewater drainage pipe. Relief valves that vent back to the storage tank will be installed to prevent excess pressure build-up in any section of the fuel supply system. In the burn areas, fuel will be distributed through a network of pipes laid out in five zones. Each zone will be equipped with igniters, individually valved, and could receive up to 100 gpm of fuel. Fuel could be fed to any one zone, to all zones simultaneously, or to any number of zones between one and five.

The burn areas of the fire fighting facility will normally be flooded with water. As fire fighters extinguish a fire they will add 600 to 1,000 gallons of a mixture of water and aqueous film forming foam (AFFF). Excess fluid will overflow the burn area through a drain box. This waste water will contain a mixture of water, unburned fuel, soot particles, and AFFF. Waste water will flow through a 6-inch drain pipe to a gravity oil/water separator. The utility trench that will house the drain pipe will have a double lining and leak detection system and be backfilled in a manner similar to the burn area (sand, geotextile fabric, crushed stone). The oil/water separator can treat up to 250 gpm of wastewater, producing aqueous effluent with 25 parts per million (ppm) total oil and grease or less. The recovered oily waste will be stored in an 80-gallon tank and disposed of by a licensed contractor. Aqueous effluent will be routed to a drain leading to the base sewer main.

The burn areas will be designed to allow complete draining so that maintenance or repair operations can be performed. Wastewater from draining the burn areas will be handled in the same manner as the overflow from fire training exercises.

The hazardous materials training area consists of training by simulation with no actual toxic or hazardous materials located or used in the training area. This area is constructed to simulate an industrial site which includes a 40 ft. trailer, a large ammonia cylinder, steel drums, and a propane tank, all of which are used to simulate an accidental leak or spill.

The Liquid Oxygen facility would be constructed to primarily produce liquid oxygen used for training or fueling Air Force missiles. When in use the LOX facility would be operated 24 hours a day because it takes approximately half a day to start production and even longer to produce the quantity of liquid oxygen needed. Therefore, when needed the facility may operate more than 24 hours and it would be impracticable and time consuming to shut down and start up every day.

The liquid fuels facility and training area is used to teach fuels supply management, chemical testing, formulation, how to store and transfer fuels to aircraft and vehicles, and safety aspects of fuel transfers. The courses use a closed hydrant system with storage tanks. In addition, training is provided for fuel truck drivers and dispensing systems. This facility uses only two types of fuel during training exercises; diesel fuel and JP-4 aircraft fuel.

The C-130 fuels training pad would be constructed in order to teach the students procedures of loading and unloading fuels. This facility consist of a pad and a mock aircraft.

The construction of the maintenance and training compound would serve several functions. This facility supports the fuel and fire fighting training by providing maintenance of the equipment used at the facilities. They include a vehicle maintenance area, a vehicle wash rack, and a drafting pit. The drafting pit, is used to simulate drawing water out of a surface reservoir and would be used to fill the fire fighting vehicles for training exercises. The wash racks would be used to clean vehicles after training exercises. The rescue training area would be used to teach students proper procedures during rescue operations. Classrooms required for this training would be located in the fire training facility building.

A hose pad would be constructed to allow students to practice hand line activities. Also, a burn house would be constructed which would be used for structural fire fighting training.

A change facility will be constructed for the students to don their fire fighting clothing.

The vehicle maneuvering area will completely encircle the burn areas, allowing fire protection equipment to approach the burn area from any angle. The vehicle maneuvering area for the largest burn area will be 150 ft. wide to accommodate the turning radius of the largest anticipated vehicle. The surface of the area will consist of fine crushed aggregate (Figure 2-5).

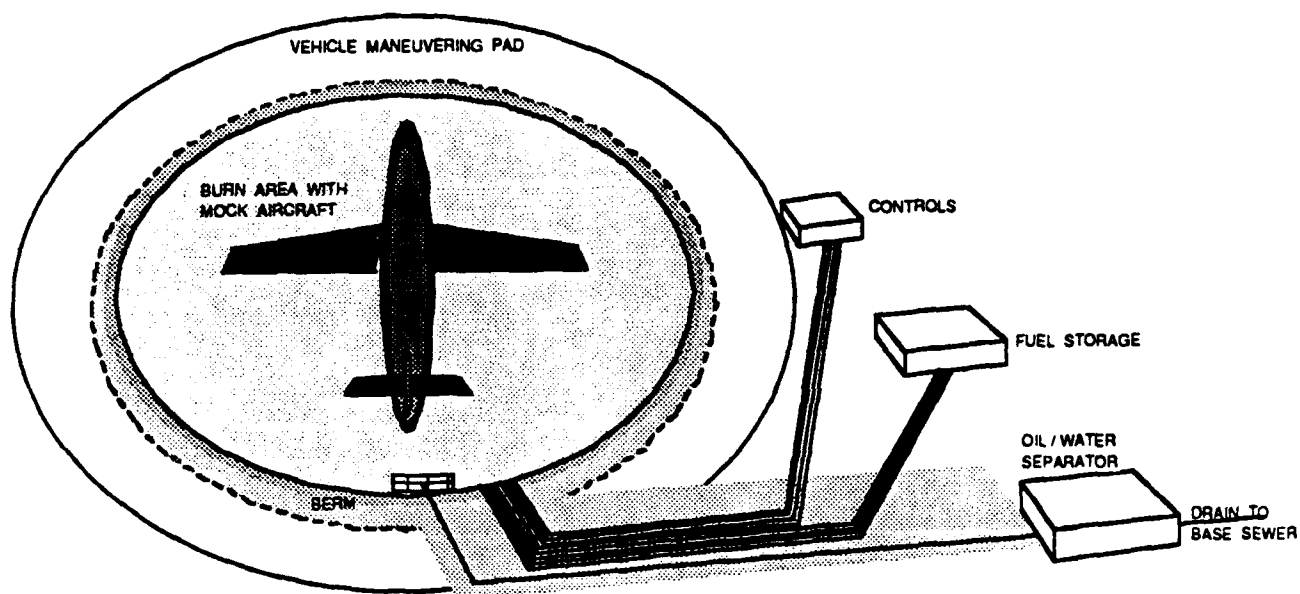
This realignment action also includes the construction of three additional buildings; a UEPH, a dining hall facility, and a troop issue facility. The UEPH will accommodate 650 unaccompanied enlisted personnel. The dining hall facility would accommodate 585 personnel and the troop issue facility will be used to issue fuel and fire fighting training equipment and supplies.

Other proposed construction will include a storm water detention area, a proposed SATCOM facility, and explosive storage facility which will be addressed by a separate environmental assessment.

Provisions of the Base Closure and Realignment Act precludes the examination of any alternative actions to relocation of fire fighting and fuels training to Goodfellow AFB. The Act requires implementation of the relocation; therefore, the "No Action" alternative is not discussed.

2.4 Alternative 1.

The Air Force has completed a Planning Assistance Team Report for locating the incoming training facilities at Goodfellow AFB. This study also included siting of a satellite communications (SATCOM) facility, an explosive storage facility, and a storm water detention area which are proposed for construction in the future. The impacts of these facilities will be discussed in a separate environmental document, and, therefore, these will not be directly considered in this EA.



MAJOR COMPONENTS OF THE LIVE
FIRE TRAINING FACILITY

Figure 2-5

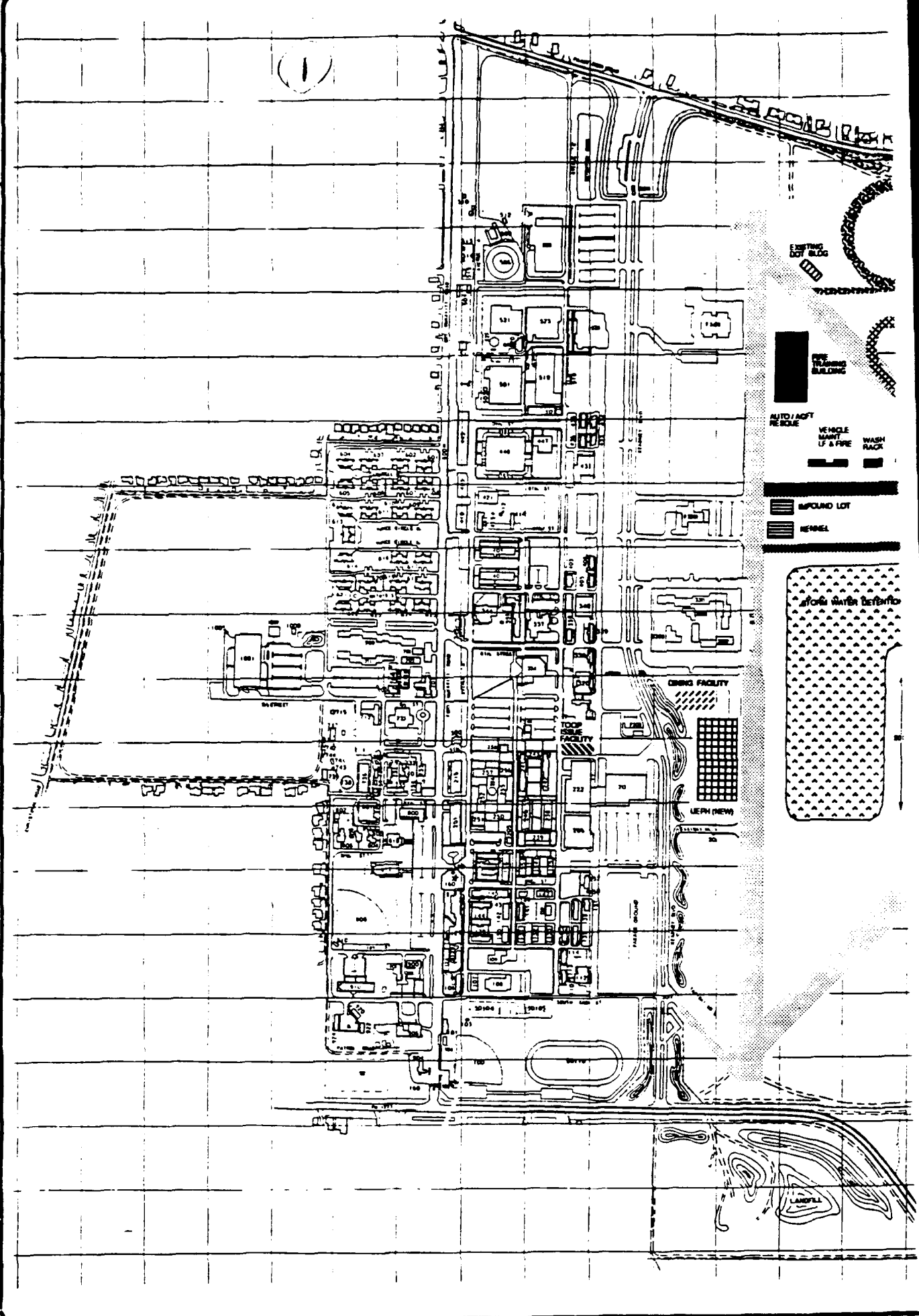
Optimization of the available space for location of the proposed SATCOM facility, an explosive storage facility, and a storm water detention pond necessitate locating the fire training functions on the northern portion of the base. However, these facilities will be discussed in separate documentation and will not be discussed in this EA. The clear zone requirements for the SATCOM facility is 900 ft. by 1300 ft. and for the proposed explosive storage facility is 1250 ft. from any of the other facilities (Figure 2-6). A clear zone is the distance required by regulation, both vertically and horizontally, to separate incompatible facility uses. The reason for the large clear zone requirements for the SATCOM facility is security. Because of potential smoke problems, the burn areas should be separated as far as possible and downwind from both from the SATCOM facility and the base perimeter. On March 16, 1989, the Air Force conducted smoke test at the Chanute AFB fire fighting training school to determine if the smoke would have any adverse effects on the SATCOM facility. The test results revealed that there are no adverse impacts from the fire fighting training generated smoke on the SATCOM facility. The potential smoke impacts on the SATCOM facility associated with the fire fighting training would be visibility impacts. This would be minimal since the fire fighting training would not be conducted during periods of high winds which could cause the smoke to blow toward the SATCOM facility. The Planning Assistance Team determined that the best location for the fire fighting facilities is as close to the center of the eastern half of the base as possible without crossing clear zones for the SATCOM facility. However, this location is already in use by the Department of Transportation (DOT) tire test track. Due to the anticipated problems with the smoke, the existing access routes for traffic on the base, and internal traffic patterns for the fire training facilities, it would be most advantageous to relocate the DOT track to the northeastern edge of the base. This would serve the purpose of providing a visual and sound buffer for the fire training facilities. A line of shrubs and trees will be planted along the base fence line to further buffer the area (Figure 2-6).

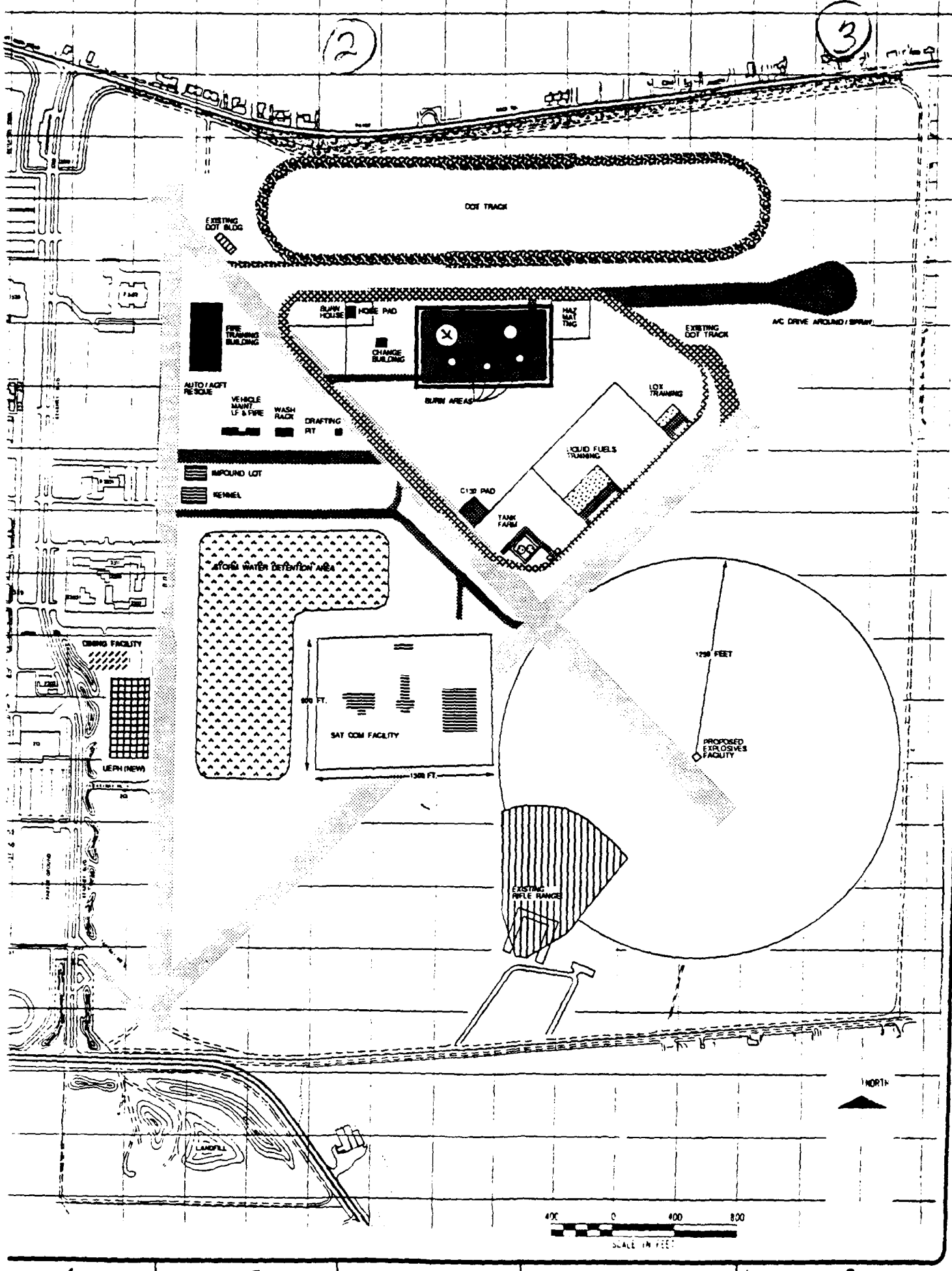
The proposed detention pond shown in Figure 2-6 is to be constructed for the purpose of catching base storm water run-off only and is not associated with other facilities to be constructed. This pond will be constructed without an impervious liner so that rainwater can percolate into the ground.

The facilities to be constructed include three associated yet distinctly different functional areas. The vehicle maintenance and fire fighting activities would be located

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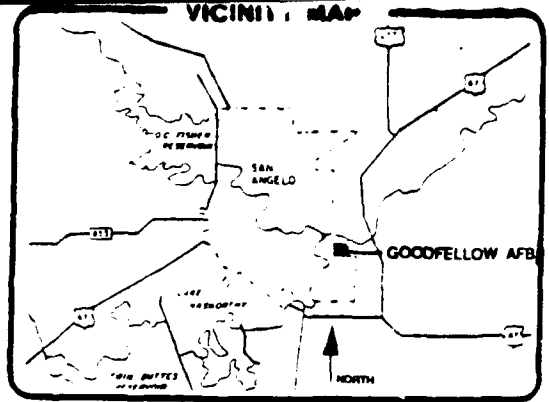
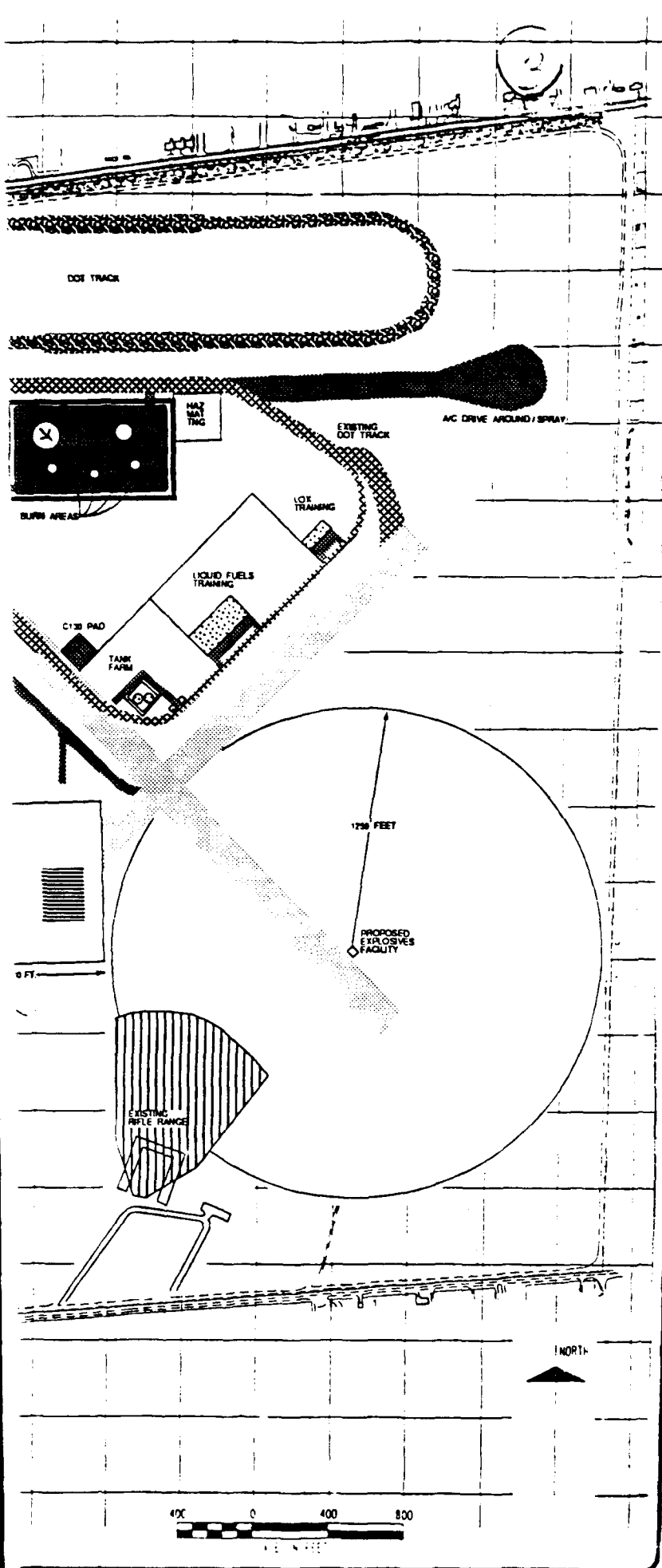
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- LEGEND**
- EXISTING RUNWAYS
 - EXISTING DEPARTMENT OF TRANSPORTATION (DOT TRACK)
 - EXISTING RIFLE RANGE
 - PROPOSED FIRE TRAINING FACILITIES
 - PROPOSED FUELS TRAINING FACILITIES
 - PROPOSED ROADS FOR FUEL HANDLING AND FIRE FIGHTING
 - PROPOSED UNACCOMPANIED ENLISTED PERSONNEL HOUSING AND SERVICE FACILITIES
 - PROPOSED DINING HALL
 - PROPOSED TROOP ISSUE FACILITY
 - PROPOSED SATELLITE COMMUNICATIONS FACILITIES (SAT COM)
 - PROPOSED DEPARTMENT OF TRANSPORTATION TRACK
 - PROPOSED BERMS AND LANDSCAPING
 - PROPOSED STORM WATER DETENTION AREA

U. S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

GOODFELLOW AIR FORCE BASE
SAN ANGELO, TEXAS

**FACILITY LOCATIONS
ALTERNATIVE NO. 1**

SHEET 1 OF 1 FIGURE 2-6

at the extreme western portion of available area, and the fire training activities would be located in the middle of the area. The liquid oxygen (LOX) and fuels activities would be sited in the southern and south eastern portion. The Liquid Oxygen facility (LOX) would be located at the southeastern portion of the DOT track to maximize internal traffic patterns. When in use the LOX facility would be in operation 24 hours a day and would produce a significant amount of noise within the immediate area of the facility. Since the noise would be localized, it would have no significant impacts that would affect other facilities or persons located on or off the base.

The proposed burn areas would be placed at the center of the fire training facility to maximize efficiency and minimize the impact on the adjacent functional areas. The hazardous materials training area would work well in this location because it would allow the Air Force to minimize the required total acreage within an already defined traffic loop (the existing DOT tract).

The hazardous materials training area would be located adjacent to the burn areas and is described in section 2.3 of this EA. The location of this facility is shown in Figure 2-6.

The fire truck acceleration distance required for the aircraft approach and spray down facility is suited for placement at the northern portion of the existing DOT track. This location allows the Air Force to keep the rapidly moving (40 MPH) 33 ton trucks from conflicting with smaller vehicle traffic patterns within the training facility. The acceleration of these trucks range from 0 to 55 miles per hour (mph) in 60 seconds with a top speed of 60 mph.

The liquid fuels facility and training area would be located adjacent to the LOX facility in order to allow administrative services to be shared by both facilities rather than having separate offices. Additionally classes for liquid fuels and refueling hydrant training would be held in the open area immediately behind the liquid fuels building.

The C-130 fuels training pad would be located at the edge of the fuel storage facility in order to eliminate conflicts between fire fighting and fuel activities. Those activities that occur at the vehicle approach and hose area and refueling area can not efficiently operate on the same roadway at the same time because of the different vehicles being used and the rate of speed at which they must operate.

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The maintenance and training compound would be located southeast of the fire training building and serves several functions. They include a vehicle maintenance area, a vehicle wash rack, and a drafting pit. These facilities would be placed at the southern portion of this area in order to facilitate easy access of all types of vehicles without conflicting with the internal traffic patterns of the maintenance and training compound.

Wastewater from the wash racks and fire fighting facilities would be discharged to the base sewer system. The vehicles maintenance facilities for the fire fighting equipment and the fuels maintenance equipment would be combined to maximize efficiency and minimize redundant aspects of the building. It should be noted that, due to functional requirements, fire fighting and fuels maintenance are placed on opposite ends of the building with a fire wall separation. The rescue training area would be located immediately west of the vehicles maintenance area for easy access of emergency vehicles. Classrooms required for this training are located immediately north in the fire training facility building. The building would be sited at the extreme north western portion of the site adjacent to the existing ramp to allow the ramp to be used for additional parking and to link it to the rest of the base.

The hose pad would be located east of the fire training building. The students will work in the training building and burn areas immediately to the east of the hose pad during exercises. By locating the hose pad between the two activities it would allow the students to walk only a short distance to practice hand lines activities. Also located in this area is the burn house which would be used for structural fire fighting training.

The change facility would be located immediately west of the burn areas and east of the hose pad. This gives the students ready access to the burn area and the hose pad activities.

This alternative includes the construction of three additional buildings, a UEPH, a dining hall facility, and a troop issue facility. The location of these facilities are shown in Figure 2-6. The UEPH will provide accommodations for 650 unaccompanied enlisted personnel, the dining hall facility would accommodate 585 personnel, and a troop issue facility used to issue fuel and fire fighting training equipment and supplies.

2.5 Alternative 2.

This proposed alternative would allow the DOT Track, Kennel, impound lot, fuel training area and existing explosives facility to remain in their current location. The proposed Satellite Communications Facility would be moved to just south of the DOT Track (Figure 2-7). The burn areas would be located south and west of the intersection of the the two runways. This would provide a greater visual buffer from the residential area located immediately adjacent to the northern boundary of the base. This would allow the fire fighting training facility to utilize the existing northeast-southwest runway while enroute to the drive around spray, which would be located at the northeast end of the northeast-southwest runway. The fire training building, drafting pit, wash rack, and vehicle maintenance building would be located just southeast of and adjacent to the burn area. A line of shrubs and trees would be planted along the northern base fence line to further buffer the area from the residential area. This would serve as a visual and sound buffer for the fuel and fire training facilities.

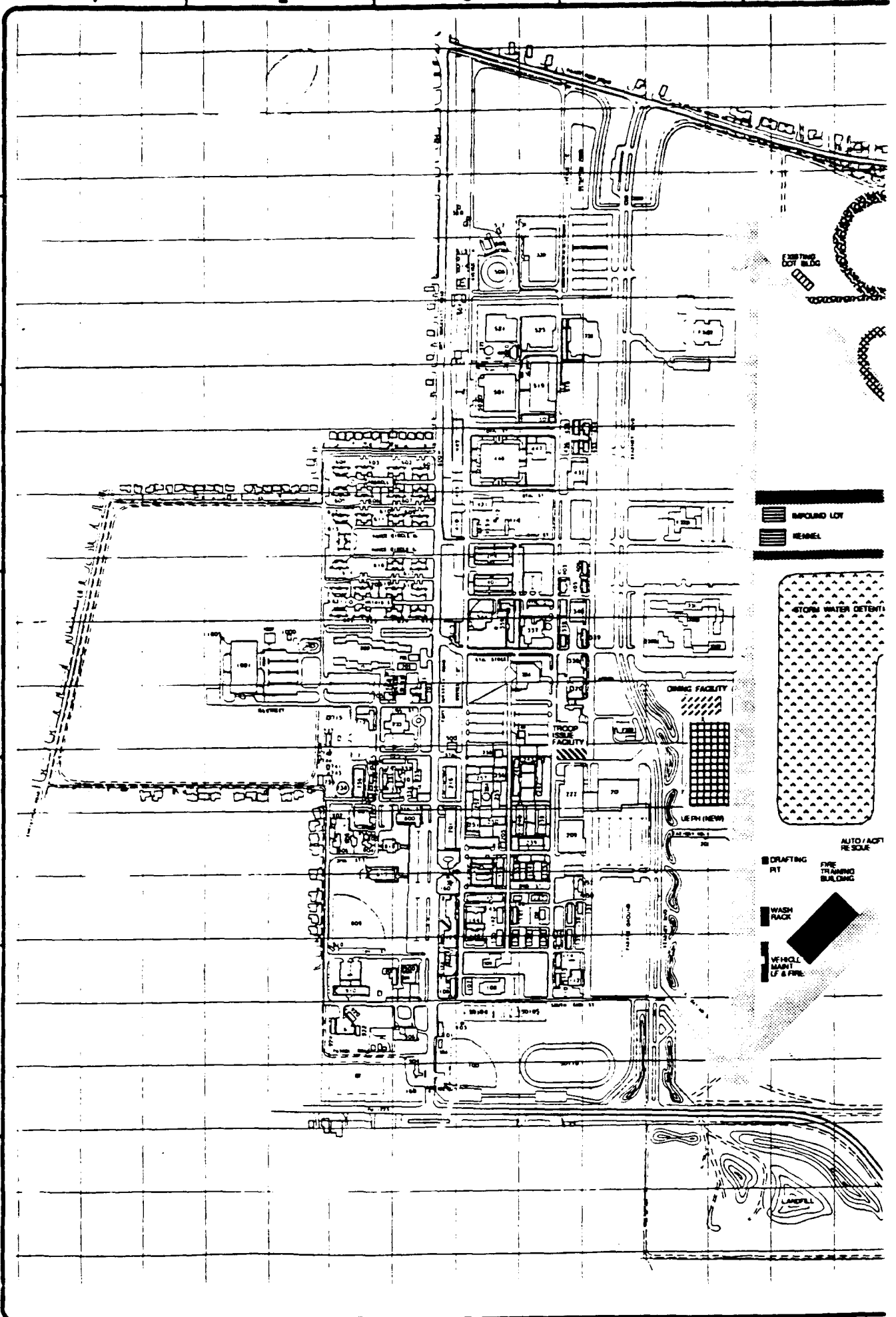
The fire truck acceleration distance required for the aircraft approach and spray down facility may not be suited for placement at the end of the northeast-southwest runway, because this placement may cause conflicts with smaller vehicle traffic patterns at the fuel training facility. Those activities that occur at the vehicle approach and hose area and refueling area cannot efficiently operate on the same roadway at the same time because of the different vehicles being used and the rate of speed at which they must operate.

The Liquid Oxygen facility would be located at the north portion of the fuel training facility which would optimize internal traffic patterns. As discussed in Alternative 1, the LOX facility is in operation 24 hours a day and it produces noise. This proposed location would allow the Air Force to keep the facility from becoming a noise problem to the base population and the community.

The fuel storage facility would be located at the southern corner of the fuel training area. This location could be in conflict with the burn area since the fuel storage facility should be located as far as possible from the burn areas while remaining within site limitations.

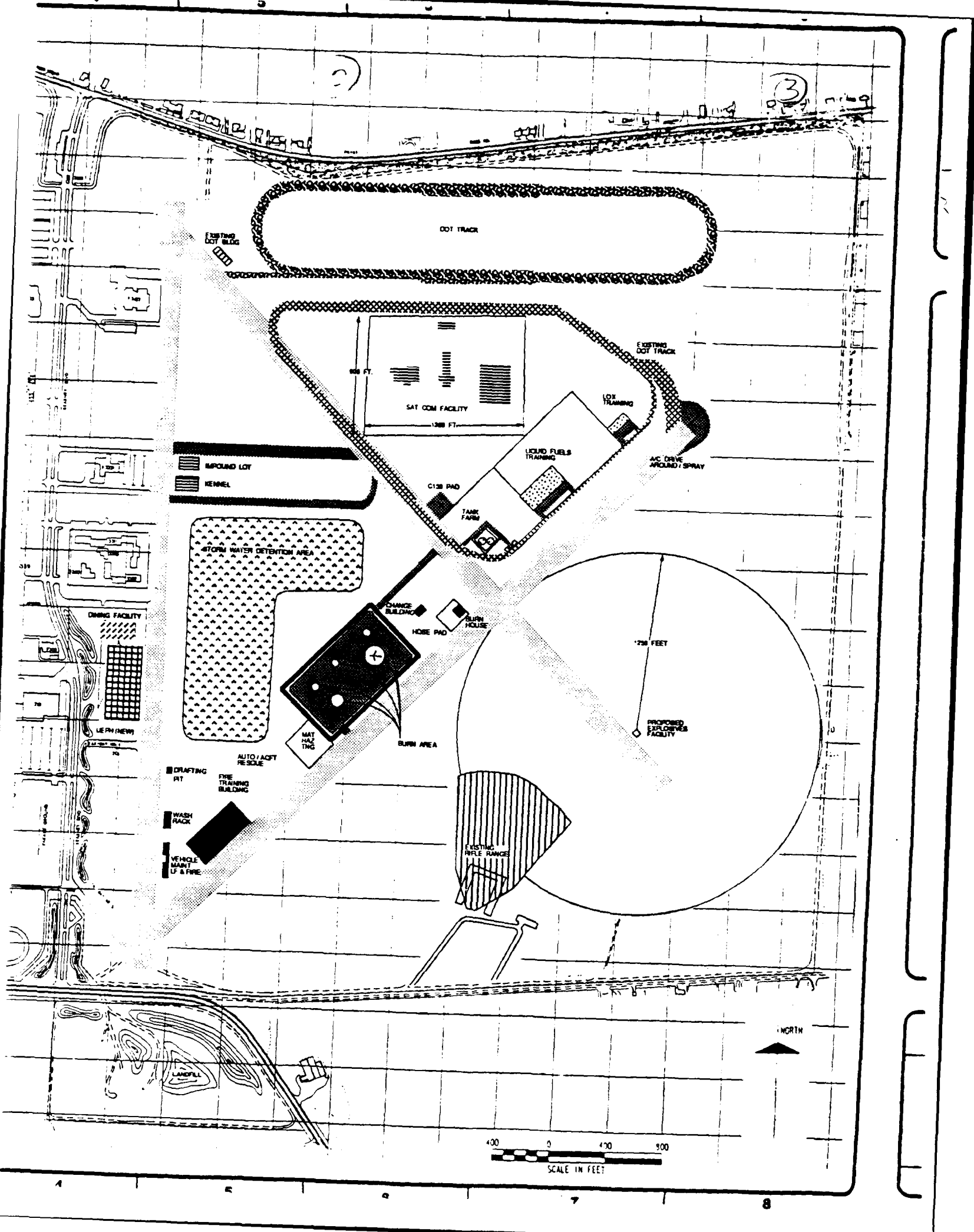
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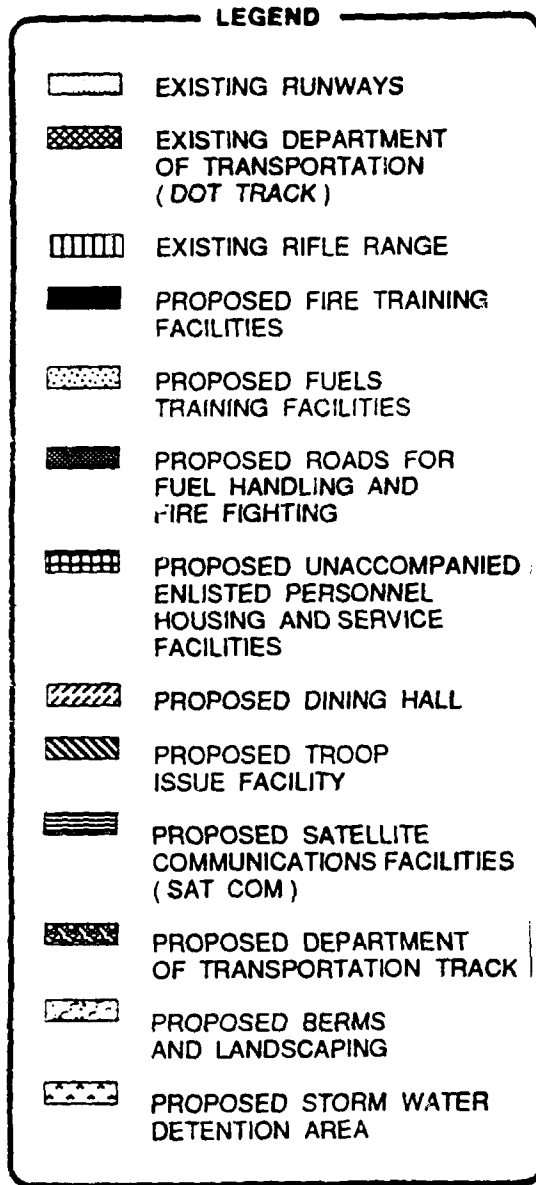
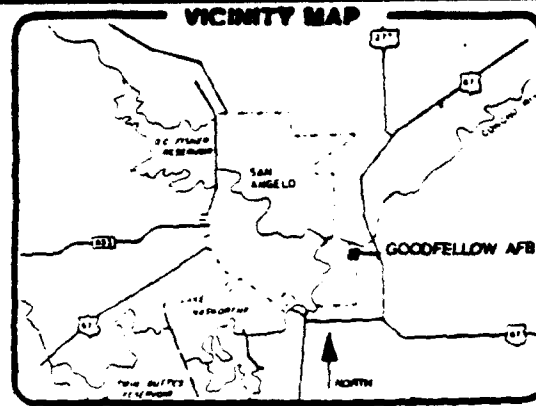
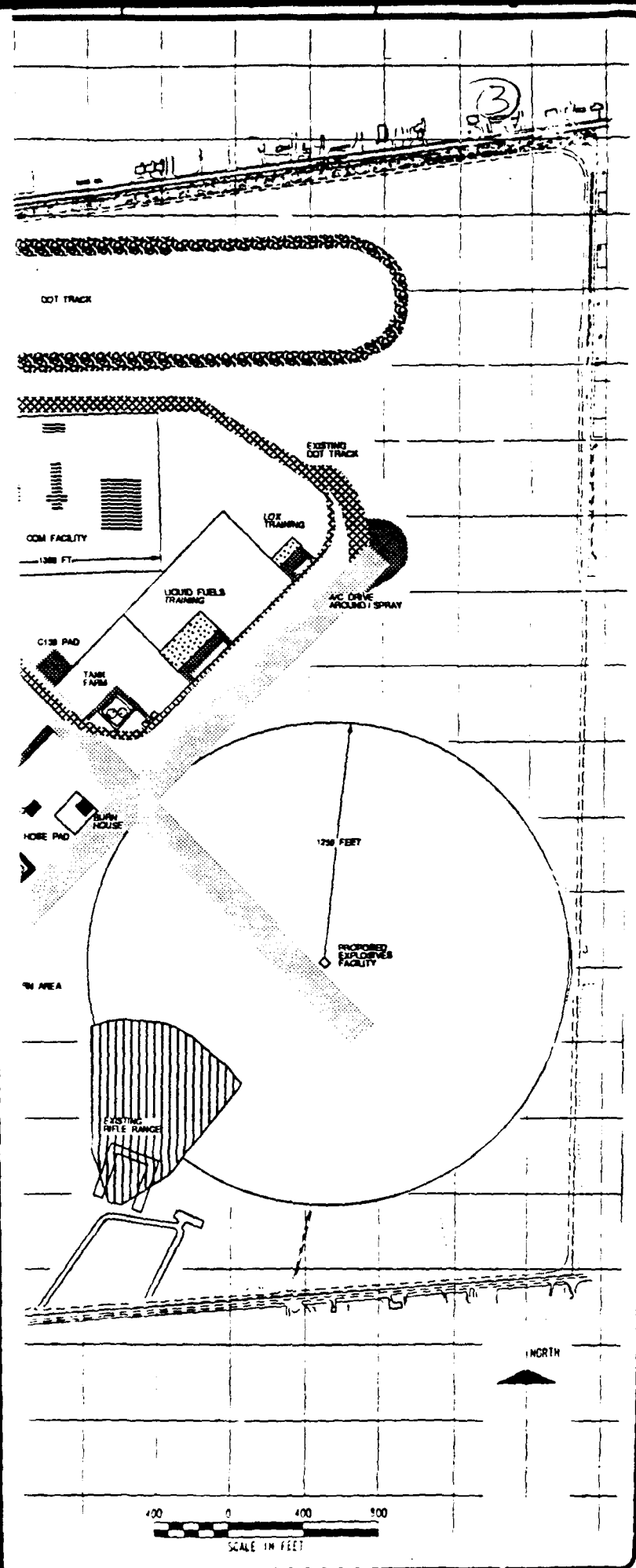
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LEGEND

- REINFORCED LOT
- RENNEL
- STOP WATER DETENT
- AUTO/ACFT RE SQ
- DRAFTING BLDG
- FIRE TRAINING BUILDING
- WASH RACK
- VEHICLE MAINT LP & FIRE





U. S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

GOODFELLOW AIR FORCE BASE
SAN ANGELO, TEXAS

**FACILITY LOCATIONS
ALTERNATIVE NO. 2**

SHEET 1 OF 1 FIGURE 2-7

The three additional buildings, a UEPH, a dining hall facility, and a troop issue facility would be constructed in the same location as mentioned in Alternative 1. The location of these facilities is shown in Figure 2-7.

2.6 Alternative 3.

This alternative involves locating both the fuel and fire fighting training facilities off-base, would require the purchase of additional real estate. The property purchased should be located in an area that is isolated from industrial and residential areas and preferably in an area that has little vegetation. This would reduce the visual (psychological) impacts of the smoke plumes associated with the fire fighting training. This would allow the SATCOM facility to be constructed on-base without any security interference from the fuel and fire fighting training facilities. Also the DOT track could remain in its present location which would eliminate construction costs.

There are, however, significant negative impacts associated with this alternative. This alternative would require additional expense to the Air Force for land purchase and utility construction. For example, this alternative would require construction of potable water facilities, a change building with showers, and dining facilities. Since the area would be somewhat isolated, there would be a need for a security system. The Construction of the three additional buildings, a UEPH, a dining hall facility, and a troop issue facility could be constructed in the same location as mentioned in Alternative 1 and Alternative 2. However, these buildings could also be constructed in the same area as the fuel and fire fighting training. This would require purchase of additional real estate and may require increased construction cost for utilities. An off site alternative would require students to be transported to and from the remote facilities, provided the student housing, dining hall facilities, and the troop issue facility were constructed on base, which increases transportation costs and decreases training efficiency. Finally, in the case of an accident involving injury, there would be no immediate access to medical facilities.

2.7 Preferred Alternative.

Alternative 1 is the preferred alternative based on both the site location and recommendation by the PAT team study, and the following sections of this Environmental Assessment (EA) which show it to have the least environmental effects of the alternatives.

3.0 AFFECTED ENVIRONMENT

3.1 Climate.

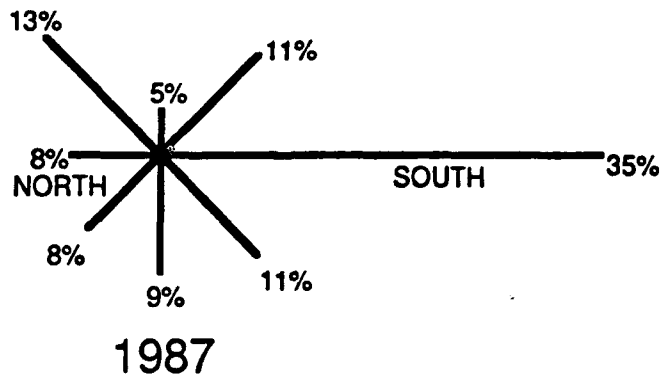
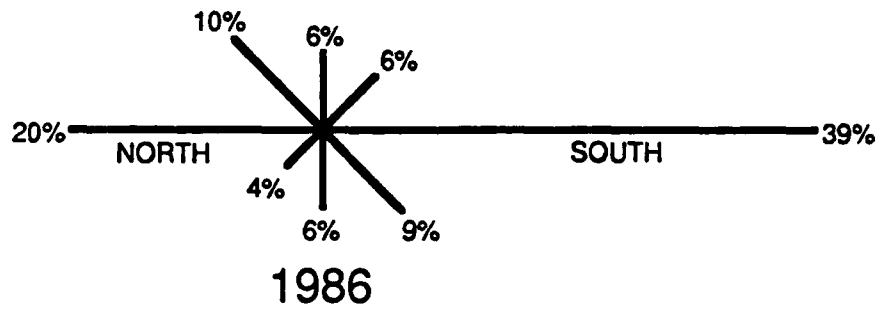
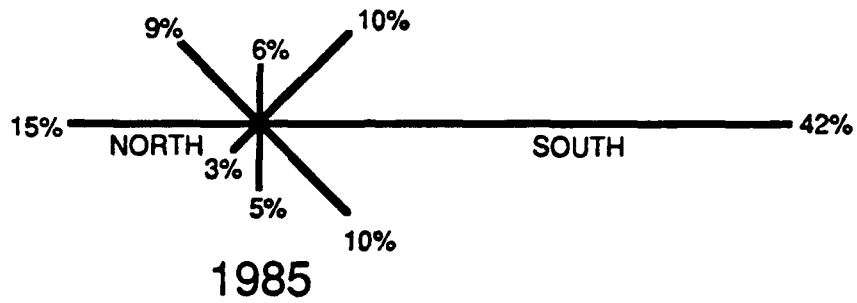
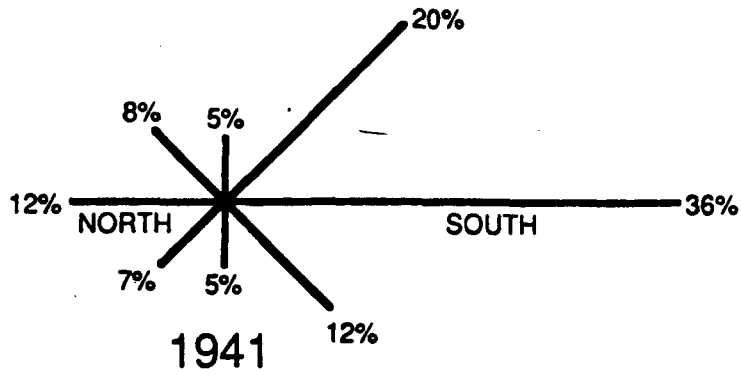
The climate of the area varies from humid subtropical, when southerly winds prevail, to semiarid, when westerly or northerly winds prevail. The area experiences generally hot summers and dry, mild to cold winters. Average monthly rainfall ranges from 0.97 inches in December to 2.84 inches in May, with annual average precipitation of 21.9 inches. Snowfalls in the amount of 1 inch (2.5 cm) occur only about once a year. Heavy snowfall for this region does occasionally occur (5.8 inches fell in a 24-hour period in November 1968). Sleet occurs about as often as snow; amounts and duration are generally small. The average annual wind speed is 9.9 mph, with the most frequent winds coming from the south (Figure 3-1). The average net evaporation for the area is approximately 45 inches (3.8 feet) per year based on 67 inches average annual evaporation and 22 inches average annual precipitation.

3.2 Soils.

According to the U.S. Department of Agriculture (USDA) Tom Green County, Texas, Soil Survey, the primary soil encountered in the vicinity of Goodfellow AFB is the Kimbrough-Mereta-Angelo association. This association consist of very shallow, shallow, and deep, nearly level to sloping and undulating, calcareous soils on outwash plains. The specific soil types encountered within the project area are: Angelo clay loam (AnA), Kimbrough, undulating (KmC), and Mereta clay loam (MeA). Permeability of this soil association varies. Angelo soils are well drained and have slow surface run-off. Permeability is moderately slow at 0.63 - 2.00 inches per hour. Mereta soils are well drained and have slow surface run-off. Permeability is slow to very slow at 0.20 - 0.63 inches per hour. Kimbrough soils are well drained and surface run-off is medium. Permeability is moderately slow at 0.63 - 2.00 inches per hour (Flores, 1976).

3.3 Geology.

The primary materials underlying San Angelo are of Permian age and consist of the San Angelo Sandstone underlain by the Choza formation. The Permian beds dip to the



GOODFELLOW WIND ROSE DIAGRAM

Figure 3-1

west at approximately 50 feet per mile. To the north, west, and south at distances of 5 to 10 miles, San Angelo is surrounded by Cretaceous erosional remnants which typify the Edwards Plateau area. These formations unconformably overlie the Permian beds and dip to the east.

Surface materials consist predominantly of thick, reddish-brown clay overburden of mostly low to medium plasticity, with caliche and sand. This material ranges from 15 to 20 feet in thickness. A weakly cemented conglomerate or gravel layer is usually encountered below the clay blanket. This formation, of Quaternary age consists of hard rounded to subangular, limestone and chert nodules in a limy clay and sand matrix. Cementation is usually calcareous. When encountered, the conglomerate varies from 10 to 20 feet in thickness.

3.4 Biological Resources.

3.4.1 General

The natural vegetation of Goodfellow AFB includes species of the Rolling Plains mixed or short grass prairie and is heavily influenced by forb (non-woody) species, particularly in areas of local disturbance. All of the vegetation on the base is mowed as a fire protection measure, with the exception of the areas around the runways which have not been maintained. Native grasses and mesquite trees have emerged as a result of the lack of maintenance of the runway areas.

The base has developed three management plans which include a Land Management Plan, a Fish and wildlife Management Plan, and an Outdoor Recreation Management Plan. These documents contain further detail on the base environment and are available for review at the installation.

3.4.2 Plants

Grasses include big, little, sand, and silver bluestems, Texas wintergrass, indiagrass, switchgrass, sideoats and blue gramas, wildryes, tobosa, and buffalograss on the clay soils. The sandy soils support tall bunchgrasses, mainly sand bluestem. Sand shinnery oak, sand sagebrush and mesquite are the dominant woody plants. The study

area at Goodfellow AFB includes the above mentioned native grasses and forbs dotted with mesquite trees ranging from 3 to 6 feet tall. (Appendix A table A-1). The introduced and landscape vegetation species are not present in the 300 acre tract which is being studied.

3.4.3 Animals

Species common to the region include the Texas slider and spiny softshell. The only terrestrial turtle in the area is the ornate box turtle which is a grassland inhabitant. Snakes include the diamondback water snake, blotched water snake, rough green snake, western hognose, western coachwhip, Texas night snake, prairie rattlesnake, western diamondback rattlesnake, racer, bullsnake, great plains rat snake, and desert kingsnake. Lizards include the collared lizard, Texas horned lizard, eastern tree lizard, Great Plains skink, ground skink, prairie racerunner, southern prairie lizard, Texas spiny lizard, and spotted whiptail. Frogs and toads found in the area include the plains leopard frog, chorus frog, cricket frog, woodhouse's toad, western spadefoot, and Couch's spadefoot toad. (Appendix A, Table A-2).

Birds common to the area (mesquite rangeland) are the cactus wren, Bell's vireo, Bewick's wren, scaled quail, bobwhite, horned lark, eastern meadowlark, and western meadowlark. Other species expected to be common breeding birds in the area include the turkey vulture, Mississippi kite, red-tailed hawk, Swainson's hawk, killdeer, common nighthawk, morning dove, hummingbird, roadrunner, scissortailed flycatcher, ash-throated flycatcher, ladder-backed woodpecker, mockingbird, red-winged blackbird, brown-headed cowbird, and cardinal. (Appendix A, Table A-3).

Mammals of this area include the badger, black-tailed prairie dog, plains harvest mouse, pallid bat, ringtail, hog-nosed skunk, white-ankled mouse, opossum, fox squirrel, eastern cottontail, hispid pocket mouse, Merriam pocket mouse, hispid cotton rat, black-tailed jackrabbit, and white tailed deer. (Appendix A, Table A-4).

No fish habitat is present on the project site. The closest habitat is the Concho River, located about a mile to the west of Goodfellow AFB.

The U.S. Fish and Wildlife Service latest list of threatened and endangered species was consulted to identify those plants and animals listed or proposed for listing as endangered or threatened which may occur in the project area.

The proposed facilities will be located about a mile away from the habitat of the Concho Water Snake which has been listed as a threatened species (U.S. Fish and Wildlife, 1987). Verbal communication with the Fort Worth office of the U.S. Fish and Wildlife Service indicates that the habitat that is required by the Concho water snake is not present at Goodfellow AFB. Endangered species which may occur in the area include the bald eagle and the peregrine falcon (Appendix A, Table A-5). Neither of these species nor any critical habitat would be adversely affected by the realignment activity.

The Texas Parks and Wildlife Department list of threatened and endangered species for Tom Green County was also consulted. The state endangered species include the bald eagle, Peregrine falcon, Concho water snake, and the Texas horned lizard. There were no species listed as threatened. (Appendix A Table A-6). These species are not expected to be affected by the transfer of facilities to Goodfellow AFB.

3.5 Water Resources.

San Angelo takes most of its water from O. C. Fisher Lake, Twin Buttes Reservoir, and Lake Nasworthy, since the groundwater resources are not abundant and are of poor quality. San Angelo does not use any ground water at this time. According to the City of San Angelo, the most dependable sources of ground water in the county are the Quaternary deposits which reportedly yield up to 500 gallons per minute (gpm) and the Bullwagon Dolomite member of the Vale formation which yields up to 1000 gpm. The Bullwagon Dolomite crops out in eastern Tom Green County and is the uppermost member of the Vale formation which directly underlies the Choza formation. Measured ground water levels range from 18 to about 34 feet in depth below the ground surface. A supplemental water supply to relieve future shortages is, however, being developed in the Hickory Sandstone Aquifer, in McCulloch County, Texas, about 60 miles southeast of San Angelo. According to the City of San Angelo, this well field will yield approximately 500 gallons per minute. In 1979 the annual average daily water consumption was about 10 MGD, of which Goodfellow used 0.2 MGD, or 2 percent.

The City of San Angelo has two water treatment plants. According to information obtained from the City of San Angelo in 1989, the current water treatment total capacity is 43 MGD. Current use by the city is 18,080,408 gallons of water per day and Goodfellow AFB uses 648,139 gallons per day.

Base sewage is discharged to the municipal treatment system and is permitted by the City of San Angelo. The City of San Angelo has no established pretreatment requirements applicable to discharges from Goodfellow AFB. Wastewater in the San Angelo area is treated by an 8.3 MGD activated sludge waste water treatment plant (WWTP) which the city is in the process of up-grading. This plant will have a total capacity of 13.2 MGD by 1992. San Angelo has been issued a permit (no. 10641) by the State of Texas to operate the treatment plant. Effluent limitations imposed by the permit are being met. Goodfellow is connected to this system and contributes 0.195 MGD, or about 3 percent of the average daily flow of 6.5 MGD.

In addition to the city water, Goodfellow AFB has a permit from the State of Texas authorizing diversion of water from the Concho River to an on-base storage reservoir. The storage reservoir is located immediately inside the north boundary of the base and west of the north entrance to the base. This water is non-potable and is used for irrigation of landscape vegetation and grasses on base. Total yearly diversion is not to exceed 27.7 million gallons. The irrigation water is obtained from the storm water detention pond and storage reservoir which has a total capacity of one million gallons.

3.6 Air Quality.

The San Angelo/Tom Green County area is in compliance with all applicable National Ambient Air Quality Standards (NAAQS). Dry conditions together with periods of high winds have contributed to occasional high particulate concentrations in West Texas. These levels were disregarded with respect to nonattainment of the NAAQS since they were attributed to dust storms (U.S. EPA 1978). Air pollution episodes have not occurred in the San Angelo area. Goodfellow AFB is currently in compliance with all state and Federal air emission standards. There are currently no major pollutant sources on base, and natural gas, a relatively clean fuel, is the primary fuel for heating.

3.7 Noise.

Goodfellow AFB is located in a suburban setting. The major noise sources at the base are automobile and truck operations on the streets running through it, the small arms firing range and shooting club, and the motor pool where all military vehicles are

serviced, stored, or repaired. These sources are localized and do not have a significant adverse effect on the surrounding area. The major noise sources off-base are automobile and truck traffic along Painted Rock Road which runs east and west along the north boundary of the base and Old Eola Road which runs east and west along the south boundary of the base.

3.8 Recreation.

Goodfellow AFB provides recreation opportunities for their personnel at the installation and at Goodfellow Recreation Camp located nearby at Lake Nasworthy. Facilities at the Recreation Camp include one softball field, one playground, boat dock slip rentals, boat rentals, one hardsurface multipurpose court, three group pavilions and 6 RV camping sites, and 9 picnic shelters. Recreation facilities at the base include two softball fields, running track, rifle range, gymnasium, pool, indoor physical fitness center, outdoor obstacle course, soccer/football field, gymnasium/fitness center, tennis courts, outdoor basketball court, 2 swimming pools, theater, bowling alley, 6 picnic shelters, arts/crafts/hobby shop, recreation center, and playground.

Additional facilities being programmed for construction at the Goodfellow Recreation Camp to meet existing needs include 15 picnic shelters, restaurant, swimming pool with change facilities, volleyball courts, 18 boat slips, 11 multi-use camping sites and a special events plaza. Additional programmed recreation facilities at the base include three softball fields, a 350 yard golf driving range, bathhouse and swimming pool, youth centers, gymnasium, and student activity centers.

A number of parks, reservoirs, and lakes, provided by the City of San Angelo, Tom Green County and Corps of Engineers, offer recreation opportunities for private and military users. Three lakes and 38 parks, within 12 miles of Goodfellow AFB, provide 293 campsites, 285 picnic sites, 23 boat ramps, 3 swimming pools, 12 playgrounds, 10 softball fields, and multi-use (tennis, volleyball, and basketball) courts.

3.9 Aesthetics.

Goodfellow AFB is located in a broad flat plains region covering the central portion of the county. This plains area, extending eastward from San Angelo and south of the Concho River is known as the Lipan Flat. The area where the training and burning facilities are to be built is characteristic of this Lipan Flat region. This area slopes to the north at 0-2 percent grade. Fuel handling and burning facilities will be located at the northern end of a 300 acre open grassland area. Most of this 300 acre open area is composed of unmowed native grasses and scattered young mesquite trees.

Residential single family and multi-family housing units are located north and east of the site and base development west of the site. Those residences which border the site to the east have unrestricted foreground and middleground views of the prairie and background views of the DOT building and other installation development. Most of the residences to the north have unrestricted foreground and middleground views of the site and unrestricted middleground and background views of the base buildings. The residential area to the north is separated from the installation by farm to market road 388. Those residences in the vicinity of the northern boundary drainage ditch, which connects to the Concho River, have unrestricted foreground views, and limited middleground views to the site. Installation maintenance buildings which border the site on the west have unrestricted foreground, middle ground and background views of the site.

3.10 Socioeconomics.

The City of San Angelo is located in the Concho Valley of west-central Texas in Tom Green County. It is situated 131 miles east of Odessa, 92 miles south southwest of Abilene, 200 miles southeast of San Antonio and 224 miles west northwest of Austin. Goodfellow AFB is surrounded by three highways and a farm road: Hwy 67 to the northwest, Hwy 87 to the north, Hwy 277 to the east and FM 2335 to the south. The entire installation encompasses approximately 1,137 acres of land in the southeast portion of San Angelo.

The City of San Angelo extends over an area of approximately 21,000 acres and represents only 2 percent of the 969,490 acres in Tom Green County. Vacant and

agricultural lands predominate the city's total acreage. Commercial development is centered in the downtown area and along the major traffic corridors radiating from downtown. The major industrial area is located near North Bell Street and the railroad tracks. Residential development is scattered throughout the city. Single family dwellings are most common. Two-family homes are located in older sections of the city, while multi-family dwellings are concentrated near major streets.

According to 1989 Census Bureau estimates, 100,107 persons reside in the county with about 85 percent or 85,400 living in the principal city of San Angelo. A summary of the historic and current population data for Tom Green County and the city of San Angelo is shown below.

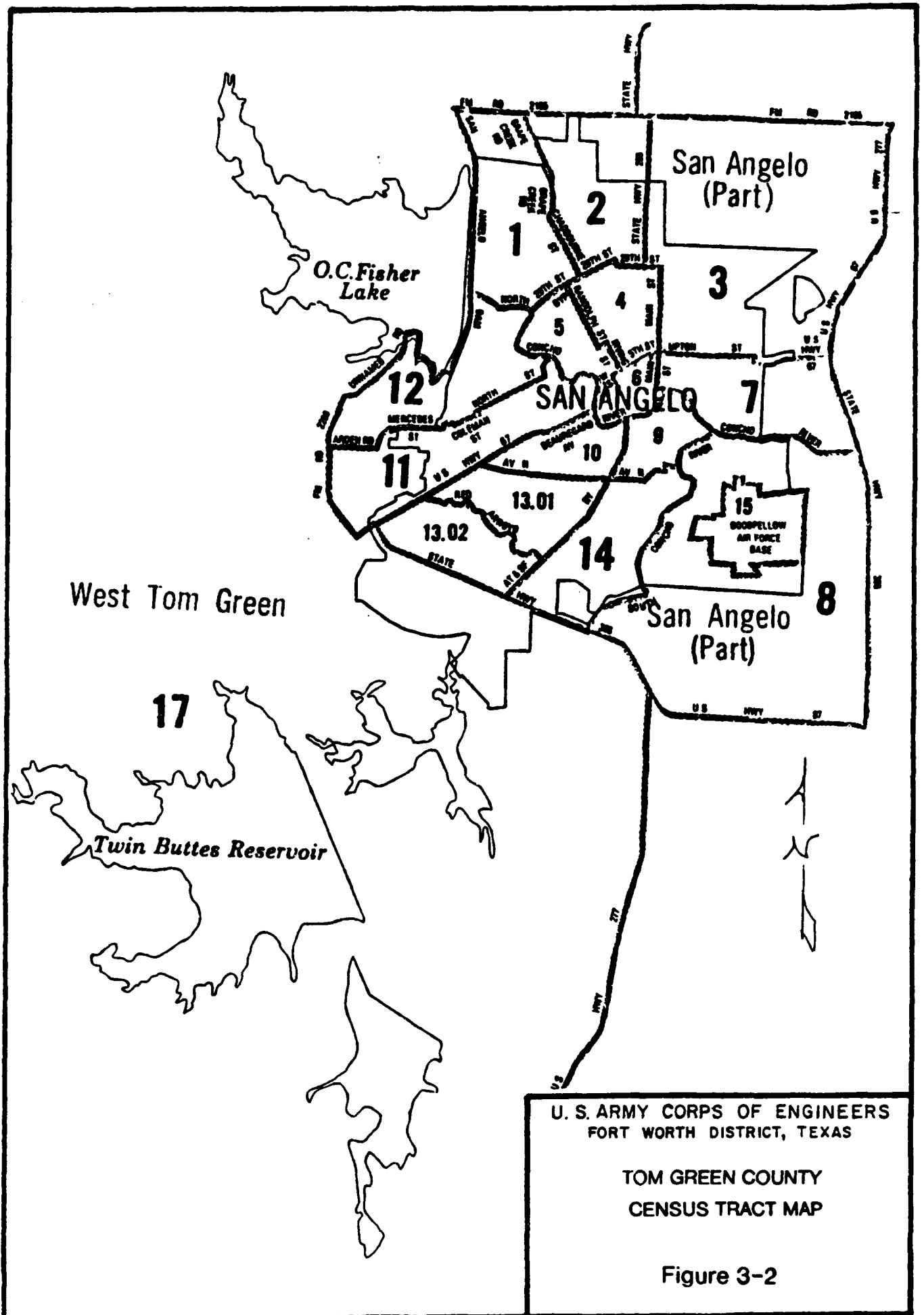
PLACE	1960	1970	1980	1989e
Tom Green County	64,630	71,047	84,784	100,107
San Angelo	59,374	64,793	70,726	85,400

e = estimated

As shown, population has increased steadily over the past 29 years, growing by 65 and 70 percent for Tom Green and the City of San Angelo, respectively, between 1960 and 1989.

Figure 3-2 displays a map of the Census tract areas (tracts 1 through 15 and 17) for the San Angelo Metropolitan Statistical Area (MSA) (tract 16 is outside of MSA and beyond the confines of this map). The largest population increase between 1980 and 1989 occurred in census tract 14, located just west of the installation, with an increase of 78 percent, from 3,125 to 5,554 persons. Goodfellow AFB is located in census tract 15 and experienced a 17 percent growth rate over the same time period. Census tract 8, which completely surrounds Goodfellow experienced a 25 percent growth rate between 1980 and 1989.

Government expenditures account for a significant portion of the Tom Green County economy. Total 1986 Federal expenditures in the county were about \$262 million. Goodfellow AFB is an important part of the area's economy. In Fiscal Year 1988, the



combined military and civilian payroll for Goodfellow totaled over \$77 million, and an additional \$33.5 million was paid to military retirees who reside within a 50 mile radius of Goodfellow. Local procurement of supplies, equipment, and construction work totaled over \$84 million in FY 88, with over \$46 million or 55 percent flowing into San Angelo and Tom Green County.

Agriculture is another important factor in the area's economy. In 1982 annual farm income for the county totaled about \$65 million with \$45 million or 73 percent from livestock and poultry production. San Angelo has been recognized as the "Sheep and Wool Capital" of the nation. It is the nation's largest wool market and a leading center for producing, processing and shipping wool and mohair.

San Angelo has varied agribusinesses; livestock feeding, 330 acres of fish hatcheries, and meat packing centers. It also has plants to make sportswear, footwear, surgical supplies, millwork, aircraft parts, oilfield equipment, and many other products. Despite recent economic conditions experienced by the entire State of Texas, the city lacks the empty office buildings, incomplete shopping centers, and bankrupt hotels found in many Texas cities.

Full-time employment by key industries for 1985 and 1986, as reported by the Bureau of Economic Analysis for Tom Green County, show that the county mirrors the state with over 58 percent of local employment occurring in three key industries: government, retail trade, and services.

Aggregate full-time and part-time employment for all industries in Tom Green County shows an increase in overall employment over the 1984 to 1986 time period. The Bureau of Labor Statistics reported the 1987 and 1988 annual average unemployment rate for Tom Green County as 6.3 and 5.94 percent, respectively. These figures are lower than the state average of 8.4 percent in 1987 and 7.3 percent in 1988.

Unemployment estimates for the first quarter of 1989 as reported by the Bureau of Labor Statistics show Tom Green County remaining below 6 percent, less than Texas' average of around 7 percent.

The 1989 estimated per capita income as provided by the Bureau of Labor Statistics for Tom Green County and the State of Texas is \$11,620 and \$12,473, respectively. Per

capita income for the county falls short of the State average by over \$800 and has lagged behind the state over the 30 year period between 1969 and 1989. The estimated 1989 average household income for the county and state is about \$31,694 and \$34,841, respectively. The figures show Tom Green County below the state with a difference of around 9 percent or \$3,147.

Housing characteristics reported by the Census Bureau in 1980 for the San Angelo MSA show a total year-round housing stock of 28,306 units. The housing stock consisted of 16,530 owner-occupied dwellings and 10,046 renter-occupied units. The overall vacancy rate for the MSA stood at about 6.1 percent or 1,730 units; well below the state vacancy rate of 10.9 percent. Approximately 87 percent of the total housing units in Tom Green County are urban and located in the City of San Angelo. In 1980, renters occupied over 30 percent of the housing units available in San Angelo. Between 1980 and 1986 building permits for 5,646 new private housing units were authorized; about a 20 percent increase over the 1980 housing stock.

A wide array of community services are available to provide area residents with essential facilities necessary to enhance the quality of life. A good public education system is available for their children; health care for their families can be readily obtained at any of four major hospitals; and fire and police protection is adequate. Public school enrollment has increased by over 1,500 students since 1980 to over 17,000 students. Per capita government expenditures for education is about \$342 based on the 1982 resident population. In 1985 San Angelo provided about 16 police officers per 10,000 residents. San Angelo is the home of Angelo State University and Texas A&M Research and Extension Center.

Numerous recreational opportunities exist throughout the area. The Concho River flows through the City of San Angelo, so water sports abound in the vicinity. There are also three lakes within a thirty minute drive of the city: O.C. Fisher Reservoir; Twin Buttes Reservoir; and Lake Nasworthy, located about seven miles southwest of the base.

The area is served by a well developed transportation network with truck and rail freight service, and limited connections to air transportation. Major highways serving the area include: US Highways 87, 277, and 67; and State Highways 306 and 208. The San

Angelo Transit Department operates a bus system and commercial bus lines provide intercity transportation, operating out of a downtown terminal. Air travel is also provided out of Mathis Field, and local non-passenger rail service is provided by the Santa Fe Railroad.

As of June 1989, Goodfellow AFB employed a total of 5,988 persons consisting of 1,950 permanent party military personnel, 2,100 students (average daily student load), 1,300 civilian personnel, and 638 contract employees (contracted for specific job and time limits). Based on these figures, 4,050 permanent party and student military personnel require housing. Currently Goodfellow AFB has 99 family housing units on-base and 200 off-base. Unaccompanied personnel housing units consist of 260 officer, 740 TDY student, 270 permanent party, and 1,224 permanent party student bed spaces for a total of 2,494 bedspaces for unaccompanied personnel. There are 1,964 student bedspaces, 530 permanent party spaces, and 99 family housing units for a total of 2,593 housing units. Approximately 31 percent of the total military population (1,350 permanent party personnel and about 136 students) reside off-base. Military dependents total 4,646 with 4,345 residing off-base. A waiting list for 280 enlisted and 7 officer housing units currently exists.

A child care center is operated on base and dependent children attend schools in the San Angelo Independent* School District. Recreational facilities include an arts and crafts hobby shop, auto hobby shop, recreation center, rod and gun club, gym, officer and noncommissioned officer (NCO) clubs, two swimming pools, a bowling center, and the Goodfellow Recreation Camp.

3.11 Installation Restoration Program.

In 1980 the Air Force began implementing the Department of Defense Installation Restoration Program (IRP). The IRP is designed to identify and fully evaluate suspected problems associated with past hazardous waste contamination, and to control hazards to health and welfare resulting from past operations. Goodfellow AFB is not on the Environmental Protection Agency National Priorities List. Regulatory oversight is provided by the Texas Water Commission. The first hazardous waste investigation activity under the IRP was conducted in 1985. A records search identified five potential disposal sites that required further study. A description of these sites is provided in Appendix B of this document.

Based on the results of public health evaluations, three of the sites identified by the IRP are recommended to be removed from further consideration. These sites include the South Landfill Site 1, Drum Storage Area Site 2, and the Southeast Landfill Site 3. A large fuel plume has been found at Fuel Storage Area Site 4. In an effort to determine the water movement required to design a pump-and-treat system for remediation of the site, pump tests will be performed. Upon completion of the pump tests, a Remedial Design will be developed which will be used to perform the remedial action required at this site. At Buried Tank Area Site 5, both tanks have been removed and disposed. Soil samples taken after the tanks were removed indicated the tanks had not leaked. When approved, this site will be removed from further consideration and no future investigation will be performed at the former Buried Tank Area (Figure 3-3).

3.12 Cultural Resources.

Cultural resources at Goodfellow AFB potentially could date to any time within the 12,000 years of human occupation recognized for this region of West Texas. In very general terms, this time span can be divided four stages which have both temporal and developmental connotations. These stages are:

Paleoindian	10,000 to 6,000 B.C.
Archaic	6,000 to A.D. 1000
Late Prehistoric	A.D. 1000 to Contact
Historic	post-Contact

While no intensive archeological survey has been conducted at Goodfellow AFB, several studies in the surrounding region are useful for identifying the kinds of cultural resources that could potentially be present. Prior to the construction of O.C. Fisher Lake, a survey identified 13 prehistoric archeological sites (Stephenson, 1949), seven of which had been discovered by J. Charles Kelly during a 1946 study of the area. No excavations were carried out at these sites prior to their flooding. Much later, however, limited investigations were conducted at two sites at the lake (Mayer-Oakes, 1977; Thoms, 1979). One of these was a prehistoric lithic workshop associated with rock art. The second was apparently the remains of a historic lime kiln.

G
F
E
D
C
B
A

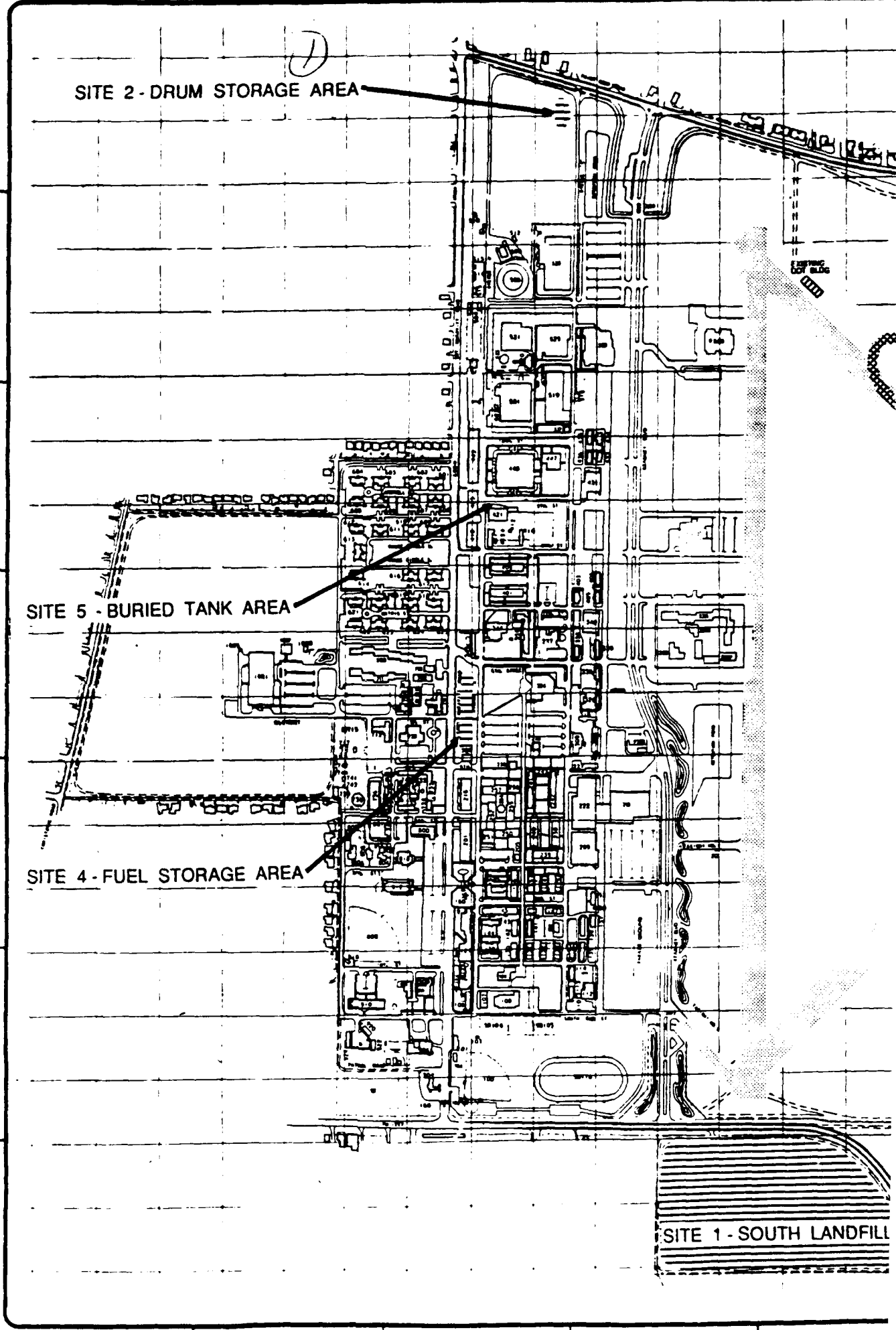
①
SITE 2 - DRUM STORAGE AREA

SITE 5 - BURIED TANK AREA

SITE 4 - FUEL STORAGE AREA

SITE 1 - SOUTH LANDFILL

1 2 3 4 5



REA

(2)

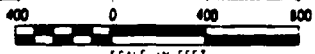
EXISTING LOT BLDG

EXISTING

EXISTING APPLE RANGE

SITE 3 - SOUTHEAST LANDFILL

SITE 1 - SOUTH LANDFILL



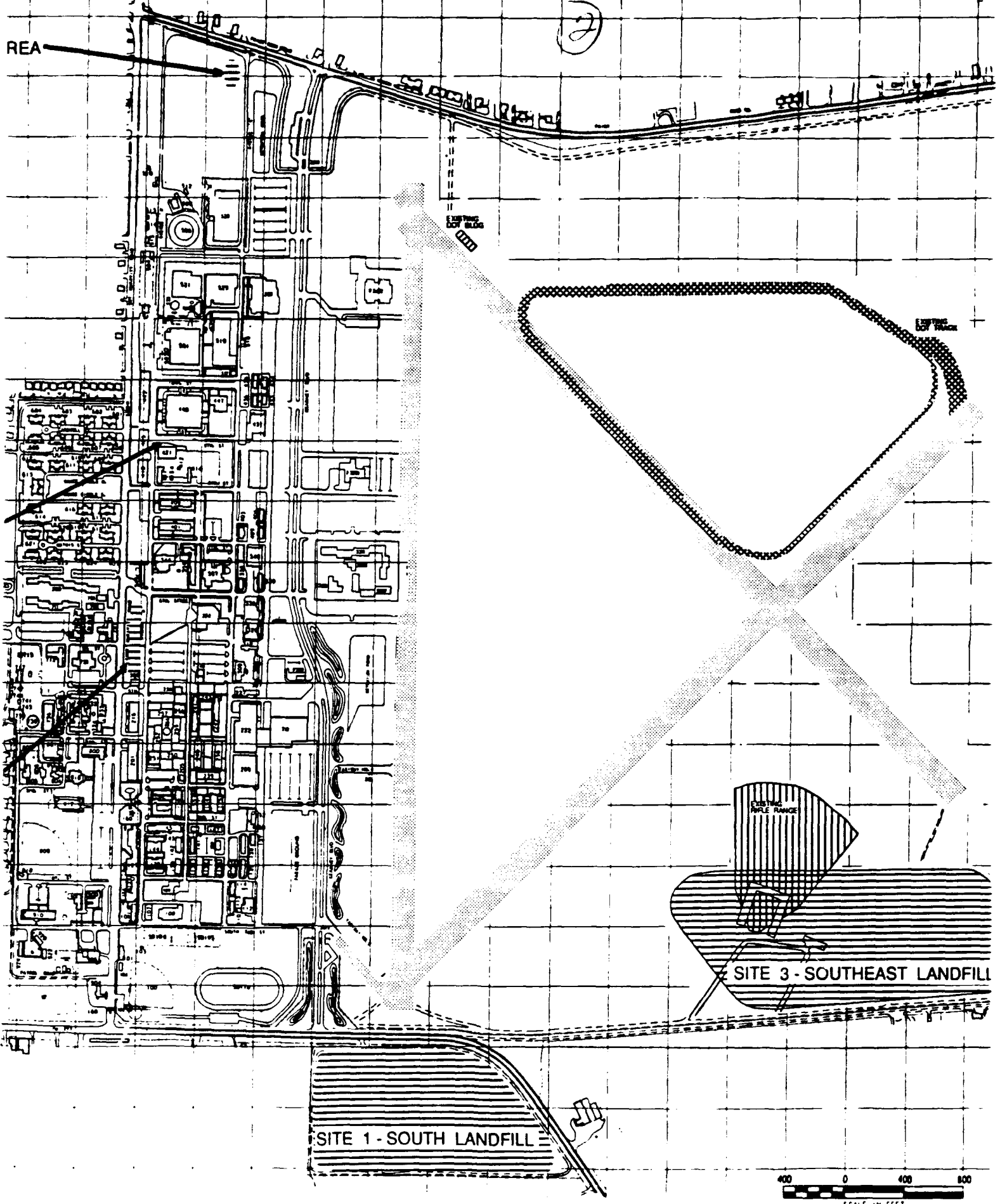
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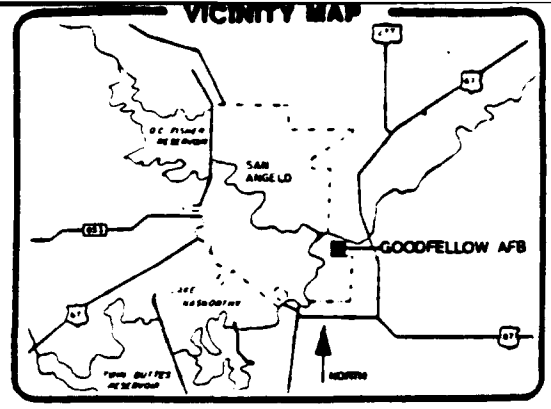
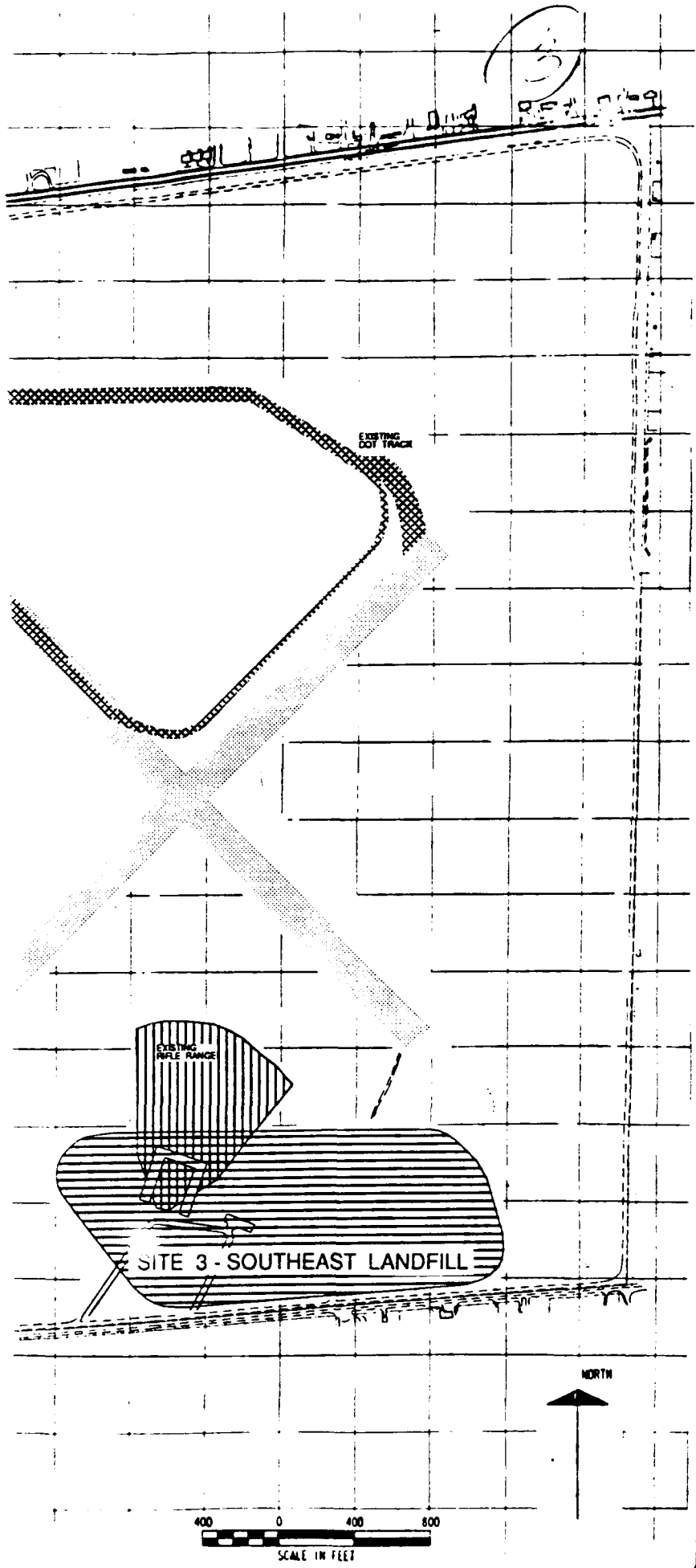
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LEGEND

-  EXISTING INSTALLATION RESTORATION MANAGEMENT AREAS
-  EXISTING RUNWAYS
-  EXISTING DEPARTMENT OF TRANSPORTATION (DOT TRACK)
-  EXISTING RIFLE RANGE

U. S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

GOODFELLOW AIR FORCE BASE
SAN ANGELO, TEXAS

INSTALLATION RESTORATION PROGRAM

SHEET 1 OF 1

FIGURE 3-3

Prior to construction of Twin Buttes Reservoir, salvage excavations were carried out at site 41TG5 (Green, 1961). The site was occupied during the late Archaic stage and contained a variety of lithic artifacts and burned rock features. A survey of an area along the South Concho River in Tom Green County recorded 49 prehistoric sites that, in combination, contained evidence of occupation from the late Paleoindian to the Late Prehistoric stage (Creel, 1978). A number of site types were identified, including burned rock middens, lithic scatters with burned rock, and lithic procurement sites. Of particular interest is the distribution of these sites with respect to three defined microenvironments: riparian; flatlands; and uplands. Almost all of the major occupation sites were in or adjacent to the riparian zone along the south Concho river. The uplands in the rolling limestone hills primarily contained sites associated with exploiting the abundant chert (a rock used by the Indians for tool production) outcrops. Sites were rare in the flatlands zone, which was defined as outwash plains where soils of the Angelo association are characteristic (Creel, 1978:259). The relative lack of resources important to prehistoric peoples made these flatlands much less attractive than the two other zones.

Although no intensive cultural resource surveys have been conducted for Goodfellow AFB, the installation's Historic Preservation Plan has identified three properties which may be of historical interest. These properties include two aircraft hanger structures that were constructed in 1943, and are architecturally unique for the base. Neither structure is considered eligible for the National Register of Historic Places. A 1980 study by the Air Force Regional Civil Engineer indicated that while the architectural style is unique for the base, it is not uncommon at other bases in the region.

The third property consists of the original gateposts of the entrance to a major ranch that was present when the installation lands were obtained by the Government in 1940. This property is located on Ft. McKavitt Road, in front of Building 734. Although the gateposts probably date to the early 1900's and are of local historical interest, they are not considered eligible for the National Register. Because of the gate's location near the center of the cantonment area, it is likely that any associated homestead probably has been destroyed by facilities construction.

No historic or prehistoric archeological sites have been identified at Goodfellow AFB. However, any land surfaces that have not been heavily disturbed by the construction of

base facilities have a potential for such sites. Based on previous work in the region, prehistoric site density is expected to be minimal within the confines of the base. The geographic situation and soil types of the base indicate that the outwash plain in this location is equivalent to the flatlands microenvironment identified by Creel (1978) as containing relatively few significant sites. Areas in the far north and west portions of the base which are closer to the river may have a somewhat greater potential for prehistoric sites. Any undisturbed areas of the base could also contain historic sites related to ranching activities that occurred prior to government acquisition.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 General.

No significant adverse environmental impacts are expected to occur due to this realignment. With or without this realignment, the base will remain a strategic element in the management of the Nation's military role. It can also support fire fighting and fuel training services and facilities that are of national and international importance.

Training fires have psychological benefits such as building fire fighter confidence, teamwork, and department cohesion. They also test and demonstrate unit execution effectiveness and fire fighting precision which can be related to potential lives saved and equipment or property losses averted.

Air Force aircraft fire incident information for 1982 and 1983 has revealed a significant savings in lives, equipment, and property. For example, in 1983, of the 105 aircraft fires recorded; trained fire fighters extinguished 71, maintenance personnel put out 21, and the remaining 13 were self-extinguished or extinguished by automatic systems. Actual fire loss and damage were estimated at \$38.2 million. Had the aircraft involved been total losses, over \$1.2 billion in equipment would have been lost. However, since the 1983 aircraft fires were extinguished, an estimated 96.8% of the value at risk was saved. With the increasing cost of new aircraft weapons systems, potential fire loss values are even greater (Brewer, 1987).

Fair weather year-round also makes Goodfellow AFB an ideal training installation, drawing personnel from a wide region. No significant physical or biological impacts result from the ongoing mission and military activities at Goodfellow AFB.

4.2 Climate.

Construction and operation in conjunction with the fire fighting and fuel training activities at any of the alternative sites would have no measurable impact on the local climate. The climate is not expected to be a concern since the overall region is suited for this type of training. There should be no significant adverse impacts on the climate as a result of these training activities.

4.3 Soils.

During the construction of Goodfellow AFB in the 1940's, the entire area was highly disturbed in order to construct the streets, buildings, runways, and other facilities. Since that time new facilities have been constructed which have caused additional disturbance of the soils. Soils in the fire fighting and fuel training areas will again be disturbed in order to construct these additional facilities. Due to previous disturbance of the soils, there should be no significant adverse soil impacts associated with the new construction. During and after construction, disturbed areas prone to erosion will be graded and reseeded to reduce sediment run-off and promote the re-establishment of vegetation.

The operations involving the storage, handling and burning of fuel will present the potential for soil contamination as a result of inadvertent release. This potential will be minimized by spill prevention measures incorporated into the facility design and by careful adherence with operating procedures intended to minimize the probability of accidental releases. In the event of an accidental release, prompt action to contain and clean up the material will minimize the potential for soil contamination. Goodfellow AFB already has a spill prevention team and equipment to handle this type of situation should an accident occur. In the event of a major spill, both the proper state and federal agencies will be contacted. Contingency Plans have been written to assure proper actions take place should they occur. These plans will be expanded to include the new facilities prior to the training taking place.

Construction of the UEPH, the dining hall facilities, and the troop issue facility should have no significant adverse impacts to the soils due to previous disturbance. Alternatives 1 and 2 should have no significant adverse impacts to soils. However, Alternative 3 could have significant adverse impacts to the soils since the construction may disturb soils which previously have not been affected.

4.4 Biological Resources.

Prior to May 1975, when the base conducted pilot training and used the runways, the area was mowed on a regular basis and therefore, provided very little habitat value for wildlife. During recent years this area has been allowed to revegetate naturally with

invader species such as native grasses and mesquite trees. These species now provide an improved habitat for wildlife.

Construction of the fire fighting and fuel training facilities, UEPH, dining hall facility, and troop issue facility would remove present vegetation and result in a direct loss of the existing habitat. However, the wildlife habitat is of low value due to human disturbance. Therefore, there would be no significant adverse effects expected to occur to the wildlife species or their habitats.

Noise generated by construction equipment and power generators would be temporary and should not cause any long term significant adverse effects to the wildlife species.

There are no threatened or endangered species that would be affected by the construction.

Alternatives 1 and 2 would have no significant adverse impacts on the biological resources. However, Alternative 3 could have a significant adverse impact on biological resources by removing wildlife habitat and disbursing the wildlife to other areas, if the area had not been disturbed prior to construction.

4.5 Water Quality.

The fire fighting training facility utilizes a variety of AFFF (aqueous film forming foam) in its training classes. There are several manufacturers of this material and its formulations are proprietary. However, most AFFF contains a number of similar chemical compounds with the following approximate composition:

<u>Constituent</u>	<u>% by wt.</u>
Water	75
Butyl Carbitol	15
Fluoroalkyl surfactant	<5
Synthetic detergent	5

Butyl carbitol is readily biodegradable and would be oxidized by any waste water treatment plant. The synthetic detergent is slowly biodegradable surfactant. The fluoroalkyl surfactant is resistant to biodegradation. AFFF removes oxygen from the water; however, all of the constituents can be biodegraded and oxygen restored (Esmond, 1989). An activated sludge treatment facility such as that used at San Angelo is capable of degrading these constituents and restoring the oxygen balance of the effluent. Therefore, there should be no adverse water quality impacts associated with the AFFF.

The new facilities will require water, sanitary sewer, storm sewer, and non-potable water for landscaping. Only the storm drainage and non-potable water currently exist in the proposed training area. The new utilities to be constructed will use loop systems and will tie into the existing systems already in place, therefore, minimizing any impacts of constructing new systems. The state and city will be contacted in order to obtain any required permits. The fire training facility, including vehicle wash rack, burn areas, and rest rooms, will require approximately 21,000 gallons of water per day. Goodfellow AFB presently uses approximately 648,139 gallons of water per day. The City of San Angelo presently uses 18,080,408 gallons of water per day. Total capacity of the two water treatment plants in San Angelo is 43 MGD. Therefore, the additional 21,000 gallons of water used per day by the fire fighting training would have little effect on the water supply of San Angelo. Storm water run-off will increase due to additional paved areas. Non-potable water will be needed for irrigation of the grasses and other plant materials. The base has begun construction of a series of retention/detention ponds to prevent overloading storm drains with storm water run-off. All domestic waste water from Goodfellow AFB is treated by the waste water treatment plant located in the City of San Angelo. The City of San Angelo is in the process of upgrading their waste water treatment plant from 8 MGD to 13.3 MGD and expect completion by 1992. There would be no significant adverse affects on the wastewater plant in San Angelo with the addition of the fire fighting training discharges.

The wastewater from the burn areas will flow through a six inch pipe to a gravity oil/water separator. This wastewater will contain a mixture of water, unburned fuel, soot particles, and AFFF. The utility trench will have a double lining and leak detection system. The oil/water separator can treat up to 250 gpm of waste water, producing aqueous effluent with 25 parts per million (ppm) or less total oil and grease. The

recovered oily waste will be stored in an 80 gallon tank and disposed of by a licensed contractor. Aqueous effluent will be routed to a drain leading to a base sewer main. The design of the burn areas has incorporated preventive measures to detect leaks in the system, should they occur, which will provide early detection of potential soil and and water contamination.

With the above mentioned facilities and methods of training there should be no significant adverse effects on water quality by any of the alternative sitings.

4.6 Air Quality.

Procedures used to conduct fire fighter training influence the quantity of air pollutants released by at least six mechanisms: 1) evaporation during application of fuel to the burn basin prior to ignition; 2) initial ignition period when the fire builds to a maximum burn rate; 3) uncontrolled emission of combustion by-products from facilities not provided with air pollution controls; 4) emission of partially or incompletely burned hydrocarbons; 5) post-burn evaporation of residual fuel; and 6) deposition of air transported polycyclic aromatic hydrocarbon (PAH) laden particulate matter. Studies of air emissions or possible adverse environmental consequences of live-fire training at these facilities have been undertaken. Research conducted in 1974 by the Air Force Weapons Laboratory at Albuquerque, New Mexico, showed that at least 1,000 pounds of air pollutants were produced per 1,000 pounds of JP-4 jet fuel burned in the open without air pollution controls. This does not apply to JP-4 alone but to other fuels as well. When any fuel is burned there are residues that are emitted in proportional amounts to the amount of unburned quantity (Brewer, 1987).

JP-4 fuel is used to power most Air Force jet aircraft and is, therefore, the fuel of choice for creating live-fire training environments. Burning of JP-4 in fire fighting training results in the release of plumes of smoke which contain suspended particulates, nitrogen oxides, carbon monoxide, hydrocarbons and sulfur oxides into the atmosphere. Nitrogen oxides and sulfur oxides are irritants, however, the quantity contained in the smoke is insignificant. JP-4 fuel is primarily composed of aliphatic hydrocarbons (averaging approximately 10% aromatics) and 1% unsaturated hydrocarbons. Although jet fuel contains several hundred hydrocarbon compounds, it is blended from a relatively small number of feedstocks. Each blend and lot can exhibit

slightly different characteristics and be composed of varying concentrations of organic species depending on the geographic region of origin of the crude oil and refinery location. In addition, minor additives are included in JP-4 to control oxidation, inhibit corrosion, prevent icing, and protect metal fuel system components (Brewer, 1987).

In 1979, Brayton fire fighting school located at Texas A & M University, College Station, Texas, had six fire fighting training instructors and two maintenance employees given complete health physicals to determine if the exposure to the smoke and training had any adverse effects on the health of these individuals. The test included blood analysis, chest x-rays, upper and lower gastrointestinal analysis, and urine analysis. At the time of testing these individuals had been employed by the fire fighting training school and had been exposed to the smoke and training for approximately 10 years. The results of the test were negative and revealed no adverse health effects to the individuals tested (Page, 1989). This is the most recent indepth study on fire fighting training exposures.

Presently, many states exempt or waive regulation of air emissions from fire fighter training facilities because they believe: 1) the benefit to society provided in terms of lives saved and property losses averted outweigh the adverse air pollution potential; 2) these facilities, when viewed individually, are generally not considered to be major stationary sources as defined by the Clean Air Act; and, 3) operators have suspended burning industrial waste materials and solvents in training fires (AFR 92-1(C1), 1983).

The State of Texas has exempted fire fighting training from permit requirements provided specific procedures are followed. Permission to train fire fighting personnel must be requested by certified mail and authorized in writing by the local air pollution control agency or health unit. In the absence of such local entities, the nearest Texas Air Control Board (TACB) Regional Office shall be notified. The burning shall be authorized if notice of denial from the local air pollution control agency, local health unit, or TACB Regional Office is not received within ten days of the request. In cases of repetitive, routine fire fighting training, a yearly written notification, with 24-hour advance telephone notice for each training session is sufficient. Authorization to conduct outdoor burning under this provision may be revoked by the TACB Executive Director (TACB Regulations I and VI, revised August 1989).

The Clean Air Act (CAA) of 1970 (PL 91-604), directs EPA to: 1) establish ambient air quality standards; 2) give states a timetable for developing State Implementation Plans (SIPs); 3) establish emission standards for hazardous air pollutants; and, 4) set performance standards for new stationary sources.

National Ambient Air Quality Standards (NAAQS) have been promulgated by EPA for the following major pollutants: carbon monoxide; nitrogen dioxide; sulfur dioxide; suspended particulate matter; photochemical oxidants (ozone); and, lead. The NAAQS include "primary" and "secondary" standards. Primary standards incorporate a margin of safety and are designed to insure immediate protection of the public from adverse health effects of air pollutants. Secondary standards were established to protect the public welfare from known or anticipated adverse effects of air pollutants. The promulgation of NAAQS shall not be considered in any manner to allow significant deterioration of existing air quality in any area already in compliance.

The applicability of NAAQSs to fire fighter training facility operation depends on the type and quantity of emissions from the facility and pre-existing ambient air quality at the site. If the facility were to be located in a non-attainment ambient air quality area, the regulatory agency (EPA and/or state) would determine air pollution control requirements and this could result in operational restrictions. Depending on the classification of land use where the facility is located, the incremental increase over the historical background level of ambient air quality could be specified to insure compliance with Prevention of Significant Deterioration (PSD) requirements. PSD Classes I, II, or III are applicable to NAAQS attainment areas only, and in no case can the air quality of a PSD area be allowed to exceed a NAAQS.

EPA has established national emission standards for particulates, nitrous oxides, carbon monoxide, and volatile organic compounds from certain industrial categories of mobile and stationary sources. Emission standards are designed to limit and minimize the release to the atmosphere of specific pollutants from all known major and fugitive emission sources. The types of industrial sources regulated to date include: power plants; cement and concrete plants; solid waste and sewage treatment plant sludge incinerators; acid plants; petroleum refineries and storage vessels; lead smelters; and, steel/brass/bronze ingot plants. Fire fighter training facilities are not included

under any of these sources for which specific emission standards have been set. Therefore, fire fighting training facilities must, at most, meet only general emission control limitations placed on visible emissions established in most State Implementation Plans of the Clean Air Act (Brewer, 1987).

Section 112 of the Clean Air Act has, perhaps, the greatest potential impact on design and operation of fire fighting training facilities. Section 112 provides for the establishment of National Emission Standards for Hazardous Air Pollutants (NESHAPs) in cases where there are no applicable NAAQSs. NESHAPs also include an ample margin of safety to protect the public health; however, this law would not apply at Goodfellow AFB since there are established NAAQSs.

There is the potential for exposure of training personnel, students, base employees and residents, and persons living in the vicinity of the base to contaminated air. The training personnel and students wear protective clothing and headgear which prevent them from being exposed to the pollutants. Since burning is not conducted during periods of atmospheric stagnation or inversion which would interfere with the rapid dispersal of pollutants, it is highly unlikely that base employees, residents, and persons living in the vicinity of the base would be exposed to the pollutants in significant quantities. Also, the burn areas would be located at least 1600 feet or over a quarter of a mile away from the nearest residential area.

The fuels training facilities should have no significant adverse impacts on air quality since quantities of potential air pollutants will be small and standard regulations controlling emissions of volatile hydrocarbons will be followed.

Based on review of the laws, regulations, design criteria, location and other information contained in this EA, no significant adverse air quality impacts are predicted to result from the fire fighting training. None of the alternatives would have a significant adverse impact on air quality.

4.7 Recreation.

The use of the southern part of the base for athletic activities is compatible with the existing and planned facilities. The current location of the obstacle course in the southeast corner of the abandoned airfield and the perimeter running track will remain

in current locations since they are not in conflict with the mission requirements and the current utilization of the adjacent sites.

The number of recreation facilities which have been planned and programmed for development at Goodfellow AFB and Goodfellow Recreation Camp will be adequate to accommodate the addition of average daily student load of 499 personnel and a permanent employee addition of 287 personnel. Increased pressures on existing regional recreation facilities will not be significant. None of the alternatives would have a significant adverse impact on recreation.

4.8 Aesthetics.

The fire fighting function will generate smoke, odor, and noise. The burning of JP-4 in quantities of 50-750 gallons will produce smoke. The plumes are expected to rise up to 2,000 feet above ground level on calm days at which time the smoke will travel downwind. Windspeed and disbursement time will have a bearing on the distance the smoke will travel.

The burn facilities will be located more than 1,600 feet from any residential areas to reduce smoke, odor, and noise impacts. Densely vegetated berms will be placed along the north boundary of the site to reduce visual impacts and mitigate for wildlife habitat losses. Burning will cease when high speed winds from the south occur in order to reduce visible smoke and odor impacts.

Goodfellow AFB plans to establish an outreach program to educate the surrounding community to the nature of the fire school burn area operations and activities to reduce reactions to fire fighting activities. Videos may be used to show actual fire fighting activities. This program would be expected to begin just prior to the start of training.

Alternatives 1 and 2 would have essentially the same visual impacts since the location of the burn areas are in close proximity. Alternative 3 would have less impacts since it would be constructed in a remote area away from residential areas. However, cost and other adverse impacts discussed in this EA make this alternative unattractive. None of the three alternatives would have a significant adverse impact on aesthetics.

4.9 Socioeconomics.

The Economic Impact Forecast System (EIFS) developed by the U.S. Army Corps of Engineers was used to estimate the anticipated socioeconomic impacts associated with the realignment at Goodfellow AFB. The realignment was separated into three categories and analyzed using the appropriate EIFS models. The Standard and Training EIFS Models were utilized to forecast the economic impact of permanent party and trainee personnel, respectively. Similarly, the EIFS Construction Model was used to determine the impact of the construction required to support the realignment.

The EIFS generates an income multiplier for each county or region using county business patterns, industrial structure, and economic base data obtained from the Bureau of the Census. The multiplier is a measure of the recirculation of dollars in the local economy. An income multiplier of 2.0955 was calculated for Tom Green County (Bloomquist, 1989).

Existing condition population and expenditures for Goodfellow during FY 89 were used to assess the impacts of the Goodfellow AFB realignment.

Baseline conditions at Goodfellow AFB used by the appropriate EIFS model to assess the local economic impacts included the change in the military and civilian populations and the percentage expected to reside on-base, the number of personnel expected to relocate, the respective average annual salaries, and the change in annual expenditures of the installation due to the population increase. The current population consists of approximately 1,950 permanent party military, and 1,300 civilian employees for a total of 3,250 personnel. An average daily student load of approximately 2,100 students was used to estimate the student population. The average military salary is \$28,500 and for civilian personnel is \$27,300. To determine the amount of additional expenditures which could be made due to the base population increase, a per capita cost estimate was derived based on the FY 89 operating expenditures and the actual base population. It is estimated that \$5,050 per capita is spent annually by Goodfellow AFB. Approximately 37.5 percent of the operating budget is spent locally.

The realignment of the Fuels and Fire Training from Chanute AFB will increase the number of permanent party, student, and civilian employees at Goodfellow AFB. A

total of 229 permanent party, and 66 civilians will be involved in the realignment. However, only about 16 (or 25 percent) of the required civilian personnel are expected to relocate to the San Angelo area. In addition, the average daily student load will increase by 499 students to a total of 2,599 students. The total permanent and student military population of 4,050 will increase by 728 persons to 4,778 military personnel. The civilian population will increase from 1,300 to 1,366 personnel.

The total existing housing at Goodfellow AFB can accommodate 2,593 unaccompanied enlisted and officer personnel and 99 family units on-base. Construction of a 650-bed UEPH on-base will increase the total student housing capacity from 1,964 to 2,614 bed spaces. Therefore, impacts were assessed based on 100 percent of the incoming student population residing on-base and 100 percent of the incoming permanent party personnel residing off-base. A total of 66 civilian personnel will be required by the training activity.

4.9.1 Permanent Party Impact.

The Standard EIFS model was used to estimate the impact of the permanent party population on the local economy. Administrative, training and technical support for the Goodfellow AFB realignment will require an additional 229 military and 66 civilian personnel. The base's estimated annual expenditure per person of \$5,050 was applied to the 295 additional personnel to yield a total of \$558,700 which may be spent in the local economy by the installation. The model used these added expenditures along with the increase in military and civilian personnel and their average incomes to forecast the permanent party impact on the local economy. Table 1b in Appendix C shows the results of the EIFS model forecast.

The increase in local expenditures, coupled with the demand for goods and services by the additional personnel, could produce an increase of over \$10.0 million in sales volume, and an increase of over \$9.5 million in income. The model estimates that at least 45 of the 50 direct civilian jobs would be filled by the local economy since only 16 of the 66 civilian personnel required are expected to relocate to Goodfellow AFB. In addition, about 300 secondary jobs could also be created as a result of the increase in expenditures by the installation.

The demand for housing and the enrollment in public schools will increase due to the 245 military personnel expected to relocate. These persons will seek housing off-base since existing on-base facilities are filled to capacity. The existing vacant housing of about 1,700 units would decline more than 14 percent as a result of this population increase. The model also estimated an increase of about 131 school children due to the permanent party and civilian personnel relocation. The expected increase in the student population is currently being examined by the school district. The district is preparing to accommodate the influx of school children by erecting portable classroom buildings, until expansion plans are completed.

Locally, approximately \$9.6 million in income and \$210,000 in net local government revenues are expected to be generated by this phase of the realignment. These forecasted impacts for permanent party military and civilian personnel are not expected to be affected by site selection of either Alternatives 1, 2 or 3, because neither would require additional personnel.

4.9.2 Training Impact

The estimated impacts of additional students on the local economy was forecast using the EIFS Training model. The realignment is expected to increase the average daily student load by 499 students or about 24 percent, bringing the total average annual student population to 2,599. Based on plans for a 650-bed UEPH and dining facility targeted for the fuel and fire training mission, 100 percent of the incoming students will be housed on-base. The EIFS Training model used \$945,000 in additional annual expenditures which would be spent by the base in the local economy for the 499 additional students. Table C-2 in Appendix C details the training impact forecast on the local economy. The table shows an increase in total sales volume of over 0.6 percent, local employment of about 1.17 percent and total income of 3.79 percent. Although trainees are not expected to seek off-base housing, the increased economic activity could increase the local population due to the increase in employment. The additional expenditures of the installation will help support about 500 secondary jobs. The salaries of the additional trainees along with the salaries from the secondary jobs is expected to generate about \$46 million in additional income, and annual net local government revenues of about \$1.9 million. The overall training phase impact on the local economy is expected to remain the same for all three alternative sites since the number of students involved will not change.

4.9.3 Construction Impact

The realignment action includes the construction of a 650-bed UEPH, a dining facility, and two (2) training facilities. The total cost of construction for these facilities was estimated at \$41.3 million. The EIFS Construction Model utilized the total construction cost estimate to forecast the impact on the local economy. Table C-3, Appendix C, displays the models results. Temporary increases in total sales volume, employment, and income of 2.12, 1.23, and 0.95 percent, respectively, were estimated for the construction phase. The construction could generate over \$38.0 million in total sales volume and net local government revenues of about \$157,000. These impacts are not expected to change for site selection Alternatives 1 and 2. Selection of the Alternative 3 site would cause a greater temporary increase in sales volume, employment and income during the construction period. These increases would be generated by the land acquisition costs and the construction of drinking water, shower and dining facilities. The estimated overall impact of Alternative 3 site would depend on the total cost of the additional construction.

4.9.4 Summary.

Realignment of Goodfellow AFB is expected to have a positive impact on all sectors of the Tom Green County economy. The largest amount of net government revenues and total income would be generated by the training phase of the realignment. The greatest and most lasting impact caused by the permanent party relocation would be to the study area's housing demand and school enrollment. The construction phase of the realignment would temporarily impact local employment and total sales volume over the period of construction.

On the aggregate, the personnel, training, and construction impacts are presented in Table C-4 of Appendix C. As shown, significant increases in total sales volume would increase employment, income, population, housing demand, and net government revenues in the local economy. Increased activity at Goodfellow AFB will be beneficial to Tom Green County because additional military purchases of goods and services in the local community will recirculate dollars and help create secondary jobs and wages. Overall, the socioeconomic impacts of the realignment of Goodfellow AFB are expected to have positive effects on the local economy. None of the economic impacts would

vary from the current condition by more than 4 percent and are not, therefore, considered significant.

4.10 Cultural Resources.

If cultural resources are present in the areas of proposed land modification, then the realignment may have an adverse impact on these resources. On the basis of current construction plans, none of the three properties of historical interest identified in the base's Historic Preservation Plan will be impacted. However, any ground disturbance associated with the construction of proposed facilities could be damaging to as yet unidentified archeological sites, should they exist.

On the basis of past disturbances, on base siting alternatives can be excluded from consideration of cultural resources. This refers to areas where past ground disturbing activities would have damaged significantly the contexts of any existing archeological sites. The best example of this is the proposed location of the Unaccompanied Enlisted Personnel Housing (UEPH), the dining facility, and the troop issue facility. Past construction of a detention pond at that location has essentially removed the potential for significant cultural resources. Similarly, those areas that were disturbed heavily by the construction of the runways and the existing DOT test track need not be surveyed for cultural resources. The potential for significant archeological sites at Goodfellow AFB is judged to be relatively low. If previously unidentified cultural resources are discovered during construction, work must be redirected so that it will avoid such resources and the Texas State Historic Preservation Officer shall be notified in accordance with 36 CFR 800 (11) and AFR 126-7. Neither of the on base alternative plans would have a significant impact on cultural resources. Alternative 3 would require a cultural resource survey prior to construction. If identified, cultural resources will be mitigated or avoided.

4.11 Toxic and Hazardous Management

The fuels training facility uses only two types of fuel during the training exercises; diesel fuel and JP-4 aircraft fuel. The fire fighting school burns only JP-4 aircraft fuel in the

training sessions. The courses utilize a closed hydrant system with storage tanks. There should be no significant adverse impacts associated with the storage and use of these fuels.

4.12 Installation Restoration Program

No information developed in the IRP will preclude any of the alternative plans for the realignment of the fuels and fire fighting training.

4.13 Mitigation Measures

The potential environmental and socioeconomic impact of the realignment of Goodfellow AFB in the performance of its mission is avoided by a series of plans, programs, and procedures, which are already in effect or are incorporated into the design of the future facilities. During and after construction, disturbed areas prone to erosion will be graded and seeded to reduce sediment run-off and promote the re-establishment of vegetation. Spill prevention measures will be incorporated into the facility design and careful adherence to operating procedures are intended to minimize the probability of accidental releases. During periods of high winds the fire fighting facility training will cease. Dense tree and shrub plantings on the berm to be located along the northern boundary of the base will mitigate the loss of wildlife habitat and visual impacts.

The realignment of Goodfellow AFB is expected to have a positive impact in all sectors of the Tom Green County and the City of San Angelo economy. The increased activity at the Goodfellow AFB will be beneficial to Tom Green County and the City of San Angelo by increasing military purchases of goods and services in the local community and recirculating dollars and help create secondary jobs and wages which in turn can further accelerate the local economy.

Alternatives 1 and 2 have incorporated all of the above mentioned mitigation features into the design, construction and operation of the facilities. However, depending on the characteristics of the site location, Alternative 3 could have significant adverse impacts on cultural resources and wildlife habitat .

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6.0 References Cited

Air Force Regulation 19-2, "Engineering Impact Analysis Process (EIAP)," Environmental Planning, Department of the Air Force, Headquarters United States Air Force, Washington D.C., 10 August 1982.

Air Force Regulation 92-1, (C1), "Fire Protection Program," Air Force Engineering and Services Center, Tyndall Air force Base, Florida, 3 June 1983. 19-20pp.

Bloomquist, K.M. 1989, "Economic Impact Forecase System (EIFS), U.S. Army Construction Engineering Research Laboratory, U.S. Army Corps of Engineers, Champaign, Illinois.

Brewer, R.E. 1987, "Air Quality Management Alternatives: United States Air Force Firefighter Training Facilities," ESL-TR-87-65, Univ. of North Carolina at Chapel Hill. 1-104pp.

Collins, William, Col., "Economic Resource Impact Statement," Goodfellow Air Force Base, San Angelo, Texas. 1-32pp.

Creel, Daryll, 1978, "An Archeological Survey in the South Concho River Area, West Central Texas," Bulletin of the Texas Archeological Society, Vol. 49, 241-307pp.

Dallas Morning News. 1988-1989, "Texas Almanac and State Industrial Guide," A.H. Belo Corporation, Dallas, Texas. 640pp.

Department of the Air Force 1979, "Local Economic Consequences Study of Base Closure," Goodfellow Air Force Base, San Angelo, Texas. 1-43pp.

Esmond, Steven. 1989. "Environmental Control Facilities Brayton Fireman Training Field," Esmond Engineering, College Station, Texas. 77840. 1-25pp.

Fisher, Lyndal. 1988. "Land Management Plan," Goodfellow Air Force Base San Angelo, Texas. 76908-5000. 1-31pp.

Flores, P.H. and Wiedenfeld, C.C. 1976. "Soil Survey of Tom Green, County, Texas," U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station. 1-58pp.

Green, F.E., 1961. "Archeological Salvage in the Twin Buttes Reservoir Area, San Angelo, Texas," Bulletin of the Texas Archeological Society, Vol. 30, 183-198pp.

Hangebrauck, Von Lehmden and Meeker, "Sources of Polynuclear Hydrocarbons in the Atmosphere," U.S. Department of Health, Education and Welfare, Durham, North Carolina, 18p., 1967.

Mayer-Oaks, William, 1977. "Preliminary Archeological Reconnaissance of Two Sites at O.C. Fisher Lake, Texas," Report Submitted to the Fort Worth District, U.S. Army Corps of Engineers by Cultural Resources Institute, Texas Tech University, Lubbock, Texas. 21pp.

Paul, Herbert 1979. "Environmental Impact Analysis for Base Closure, Goodfellow Air Force Base, Texas," 1-18pp.

Page, Charles L., "Verbal Conversation and Site Visit," Fire Protection Division, Texas Engineering Extension Service, College Station, Texas, October 2, 1989.

Peters, Gerald O., "Review and Analysis of Phase I Installation Restoration Program Reports for Selected Air Force Facilities," Air force Engineering and Services Center, Directorate of Environmental Planning, Tyndall Air Force Base, Florida, May 1985.

Planning Assistance Team, "Site Location Recommendations for Fire Fighting and Fuels Training Transfer," Goodfellow Air Force Base, San Angelo, Texas. 1-38pp.

Stephenson, Robert, 1949. "Archeological Survey of San Angelo Reservoir, Tom Green County, Texas," River Basin Surveys, Smithsonian Institute, 8pp.

Texas Air Control Board revised 1988, "Control of Air Pollution by permits for new Construction or Modification," Regulation VI (31 TAC Chapter 116). State of Texas. 1-54pp.

Texas Air Control Board 1975, "Outdoor Burning Regulation," State of Texas. 1-6pp.

Texas Air Control Board 1988, "Standard Exemption List," State of Texas. 1-67pp.

Texas Parks and Wildlife Department, 1988. "Endangered/Threatened Species Data File for Tom Green County, Texas,".

Thoms, Alston, 1979. "Archeological Excavation of a Petroglyphic Boulder at O.C. Fisher Lake, Tom Green County, Texas," Report Submitted to the Fort Worth District, U.S. Army Corps of Engineers by Benham-Blair and affiliates, Inc., Oklahoma City, 24pp.

U.S. Army Corps of Engineers, Fort Worth District. "Goodfellow Recreation Camp Master Plan," Goodfellow Air Force Base, San Angelo, Texas. 1-71pp.

U.S. Fish and Wildlife Service. 1987. "Endangered and Threatened Species of Texas and Oklahoma," Region 2, Albuquerque, New Mexico.

Walker, J.F., Brown, C.H., and Wilson, J.H. 1988. "Draft Environmental Test Plan for Tyndall Air Force," Base Fire Training Pit," Panama City, Fla. 1-21pp.

White, Allen L., "The Site History: A Tool for Management Risk," Hazardous Waste, Volume 1, Number 4 Mary Ann Liebert, Inc., 533-43pp. 1984.

APPENDIX A
WILDLIFE SPECIES LISTS

TABLE A-1

PLANTS

<u>Common name</u>	<u>Scientific Name</u>
Mesquite	<u>Prosopis sp.</u>
Live Oak	<u>Quercus virginiana</u>
Shinnery Oak	<u>Quercus Harvardii</u>
Juniper	<u>Juniperus sp.</u>
Mexican buckeye	<u>Ungnadia speciosa</u>
Skunkbush	<u>Rhus aromatica</u>
Greenbriar	<u>Smilax sp.</u>
Coralberry	<u>Cocculus sp.</u>
Texas Wintergrass	<u>Stipa leucotricha</u>
Sideoats grama	<u>Bouteloua curtipendula</u>
Condalia	<u>Condalia sp.</u>
Catclaw acacia	<u>Acacia sp.</u>
Tasajillo	<u>Opuntia leptocaulis</u>
Prickly-pear	<u>Opuntia sp.</u>
Agave	<u>Agave sp.</u>
Texas poppy mallow	<u>Callirhoe scabriuscula</u>

TABLE A-2

REPTILES AND AMPHIBIANS

<u>Common Name</u>	<u>Scientific Name</u>
Yellow mud turtle	<u>Kinosternon flavescens</u>
Texas map turtle	<u>Graptemys versa</u>
Texas slider	<u>Pseudemys concinna</u>
Spiney softshell	<u>Trionyx spinifer</u>
Ornate box turtle	<u>Terrapane ornata</u>
Diamondback water snake	<u>Nerodia rhombifera</u>
Blotched water snake	<u>Nerodia erythrogaster</u>
Rough green snake	<u>Opheodrys aestivus</u>
Western cottonmouth	<u>Agkistrodon piscivorus</u>
Hognosed snake	<u>Heterodon nasicus</u>
Western coachwhip	<u>Masticophis flagellum</u>
Texas night snake	<u>Hypsiglena torquata</u>
Prairie rattlesnake	<u>Crotalus atrox</u>
Racer	<u>Coluber constrictor</u>
Bullsnake	<u>Pituophis melanoleucus</u>
Great plains rat snake	<u>Elaphe guttata</u>
Desert kingsnake	<u>Lampropeltis getulus</u>
Collared lizard	<u>Crotophytus collaris</u>
Eastern tree lizard	<u>Urosaurus ornatus</u>
Texas horned lizard	<u>Phrynosoma cornutum</u>
Great plains skink	<u>Eumeces obsoletus</u>
Ground skink	<u>Lygosoma laterale</u>
Prairie racerunner	<u>Cnemidophorus</u>
	<u>sexlineatus</u>
Southern prairie lizard	<u>Sceloporus undulatus</u>

TABLE A-3

BIRDS

<u>Common Name</u>	<u>Scientific Names</u>
Red-eyed vireo	<u>Vireo olivaceus</u>
Carolina wren	<u>Thryothorus ludovicianus</u>
Turkey	<u>Meleagris gallopavo</u>
Wood duck	<u>Aix sponsa</u>
Golden-fronted woodpecker	<u>Centurus aurifeons</u>
Great horned owl	<u>Bubo virginianus</u>
Screech owl	<u>Otus asio</u>
Belted kingfisher	<u>Megaceryle alcyon</u>
Yellow-billed cuckoo	<u>Coccyzus americanus</u>
Great blue heron	<u>Ardea herodias</u>
Rough-winged swallow	<u>Stelgidopteryx ruficollis</u>
Wood stork	<u>Mycteria americana</u>
Bell's vireo	<u>Vireo belli</u>
Cactus wren	<u>Campylorhynchus</u> <u>brunneicapillum</u>
Bewick's wren	<u>Thryomanes bewickii</u>
Scaled quail	<u>Callipepla squamata</u>
Bobwhite	<u>Colinus virginianus</u>
Horned lark	<u>Eremophila alpestris</u>
Eastern meadowlark	<u>Sturnella magna</u>
Western meadowlark	<u>Sturnella neglecta</u>
Turkey vulture	<u>Cathartes aura</u>
Mississippi kite	<u>Ictinia mississippiensis</u>
Red-tailed hawk	<u>Buteo jamaicensis</u>
Swainson's hawk	<u>Buteo swainsoni</u>
Killdeer	<u>Charadrius vociferus</u>
Common nighthawk	<u>Chordeiles minor</u>
Mourning dove	<u>Zenaidura macroura</u>
Black-chinned hummingbird	<u>Archilochus alexandri</u>
Roadrunner	<u>Geococcyx californianus</u>
Scissor-tailed flycatcher	<u>Muscivora forficata</u>

TABLE A-3 Continued

BIRDS

<u>Common Name</u>	<u>Scientific Names</u>
Ash-throated flycatcher	<u>Myiarchus cinerascens</u>
Ladder-backed woodpecker	<u>Dendrocopos scalaris</u>
Mockingbird	<u>Minus polyglottos</u>
Red-winged blackbird	<u>Agelaius phoeniceus</u>
Brown-headed cowbird	<u>Molothrus ater</u>
Cardinal	<u>Richmondena cardinalis</u>
Pyrrhuloxia	<u>Pyrrhuloxia sinuata</u>

TABLE A-4

MAMMALS

<u>Common Name</u>	<u>Scientific Name</u>
Badger	<u>Taxidea raxus</u>
Black-tailed prairie dog	<u>Cynomys ludovicianus</u>
Plains harvest mouse	<u>Reithrodontomys montanus</u>
Pallid bat	<u>Antrozous pallidus</u>
Ringtail	<u>Bassariscus astutus</u>
Hog-nosed skunk	<u>Conepatus mesoleucus</u>
White-ankled mouse	<u>Peromyscus pectoralis</u>
Opossum	<u>Didelphis virginiana</u>
Fox squirrel	<u>Sciurus niger</u>
Eastern cotton tail	<u>Sylvilagus floridanus</u>
Hispid pocket mouse	<u>Perognathus hispidus</u>
Merriam pocket mouse	<u>Perognathus merriami</u>
Hispid cotton rat	<u>Sigmodon hispidus</u>
Black-tailed jackrabbit	<u>Lepus californicus</u>
White-tailed deer	<u>Odocoileus virginianus</u>

TABLE A-5

THREATENED AND ENDANGERED SPECIES

SPECIES	DOI	TPWD	TOES
Texas poppy mallow	E	NL	E
Guadalupe bass	NL	NL	T
Bald eagle	E	E	E
Golden eagle	NL	NL	T
Peregrine falcon	E	E	E
Merlin	NL	NL	T
Concho water snake	T	E	E
Wood stork	E	NL	NL
Texas horned lizard	NL	E	E

KEY

E = Endangered

T = Threatened

NL = Not Listed

DOI = Department of the Interior

TPWD = Texas Parks and Wildlife Department

TOES = Texas Organization for Endangered Species

TABLE A-6

COUNTY: TOM GREEN

ENDANGERED SPECIES

- ***Tern, Least, Interior (*Sterna antillarum athalassos*)
- ***Vireo, Blacked-capped (*Vireo atricapillus*)
- **Eagle, Bald (*Haliaeetus leucocephalus*)
- ***Snake, Water, Concho (*Nerodia harteri paucimaculata*)

THREATENED SPECIES

- ***Hawk, Zone-tailed (*Buteo albonotatus*)
- ***Falcon, Peregrine, Artic (*Falco peregrinus tundrius*)
- ***Plover, Piping (*Charadrius melodus*)
- **Ibis, White-faced (*Plegadis chihi*)
- **Stork, Wood (*Mycteria americana*)
- *Warbler, Golden-cheeked (*Dendroica chrysoparia*)
- ***Lizard, Horned, Texas (*Phrynosoma cornutum*)

*****Confirmed Species** - verified recent occurrence.

****Probable Species** - unconfirmed, but within general distribution pattern of species.

***Possible Species** - unconfirmed, but at periphery of known distribution of the species.

APPENDIX B
INSTALLATION RESTORATION PROGRAM (IRP)

INSTALLATION RESTORATION PROGRAM (IRP)

GOODFELLOW AIR FORCE BASE

South Landfill Site 1

History

South Landfill Site 1 was used from the 1950s to 1970. One portion of the landfill was used as a fire training pit from 1953 to 1958. The wastes disposed of in the South Landfill include demolition debris, industrial waste, containerized liquids, and household solid waste. The average depth of the trenches in the landfill is approximately 15 ft. The site is located at the south end of the Base property and encompasses an area of approximately 1,600 ft by 800 ft.

Previous Studies

During the IRP Phase II-Stage 1 investigation completed in 1987, several monitoring wells were installed around the south Landfill at depth ranging from, 44 ft. to 84 ft. an additional well was installed during the second stage of field investigation. These were installed along the periphery of the site in an effort to monitor the groundwater quality. Also, during the first phase of investigation, soil samples were collected from ten locations and analyzed. After completing Stage 1 and Stage 2 activity and reviewing the data collected, potential public health risk calculations were performed on the analyses received from this site.

Future Investigation

Based on the results of the public health evaluation, it is recommended that a no-further-action decision document be prepared. When approved, this site will be removed from consideration and no further investigation will be performed at South Landfill Site 1.

Drum Storage Area Site 2

History

The Drum storage Area is located at the north end of the Base property near the main gate. The site encompasses an oblong-shaped area, approximately 100 to 150 ft. in diameter, which was used to store several hundred drums in the early 1950's, However, the exact contents of the drums are not known.

Previous Study

During the IRP Phase II-Stage 1 investigation completed in 1987, fifteen test pits were excavated at this site. The test pits were approximately 10.5 ft. deep. Five surface soil samples were collected and analyzed. Also, two soil borings were installed at this site, samples were taken from depths of 0 to 4 ft. and 8 to 10 ft. One of the soil borings was completed as a monitoring well, which was sampled one time, in duplicate. The results of all the samples taken at this site were reviewed by risk assessment personnel who performed a total potential public health risk calculation. The low risk that would result from a lifetime of potential ingestion of under a worst-case scenario does not warrant further action at this Site.

Future Investigation

Based on the results of the public health evaluation, it is recommended that a no-further-action decision document be prepared. When approved, this site will be removed from further consideration and no future investigation will be performed at the landfill Site 3.

Southeast Landfill Site 3

History

The Southeast Landfill is located in the southeast corner of the base property near the end of the old runways. The landfill encompasses an area of approximately 2000 by

800 ft, and was used as a general purpose landfill from 1970 until 1982. The average trench depth in the landfill is approximately 15 ft. Waste types deposited in the landfill were predominately household waste, with small quantities of industrial wastes included.

Previous Studies

The investigation at this site included seven borings that were drilled and completed as monitoring wells around the periphery of the landfill. The borings (monitoring wells) ranged in depth from 48 ft. to 53 ft.. All of these wells were sampled and analyzed. Surface soil samples from ten locations were also taken at this site and analyzed. Upon completion of the analysis of the samples taken, a potential public health risk analysis was performed.

Future Investigation

Based on the results of the public health evaluation, it is recommended that a no-further-action decision document be prepared. When approved, this site will be removed from further consideration and no future investigation will be performed at the Southeast Landfill Site 3.

Fuel storage Area Site 4

History

The former Fuel storage area is located in a grassed lawn area near the west-central part of the Base and occupies approximately 0.8 acres. The former underground storage tank (UST) site is rather flat, but the general vicinity slopes to the northwest. The area formerly contained nine 25,000-gallon, four 12,000-gallon, one 3,000-gallon, and one 1,000-gallon USTs. The nine larger tanks were reportedly removed in 1976. The times of removal of the other USTs are unknown, however, none exist at this site at this time.

Previous Studies

Two phases of fieldwork were performed at Site 4 to assess the presence and extent of contamination and determine the subsurface geology. The first phase of the investigation involved drilling five soil borings at the former location of the nine 25,000-gallon USTs. Upon completion of the soil borings, it was determined that the installation of five monitoring wells was required. These were installed around the site to verify ground water contamination. Testing these wells revealed that contamination had reached the ground water and further investigation would be necessary. The second phase of fieldwork involved drilling a series of soil borings in the vicinity of the former USTs. In addition to the soil borings, 20 temporary wells were installed to determine the movement of the contamination associated with Site 4. A number of the temporary wells were developed into monitoring wells that will be used in the Remedial Design phase of this project.

Although there are no identified downgradient receptor wells, this plume is cause for concern. The plume is quite large and underlies a residential area. Left unchecked, it will eventually spread off the Base where domestic wells could possibly be installed at some time in the future.

Future Activity

In an effort to determine the water movement required to design a pump and treat system, pump tests will be performed. Upon completion of the pump tests, a Remedial Design will be developed which will be used to perform the Remedial Action required at this site.

Buried Tank Area Site 5

History

Site 5 is an inactive service station located immediately north of Building 421 on 9th Street, approximately 4 blocks north of Site 4. The service station contained two unprotected steel USTs which at one time contained leaded gasoline and possibly diesel fuel. The two USTs have full storage capacities of approximately 5,000 gallons and 25,000 gallons. The tanks were installed in 1944 and taken out of service in 1978.

Previous Studies

No field work other than surface geophysics to confirm the location of the two tanks has been conducted.

Future Investigation

Both of the tanks have been removed and disposed. Soil samples taken after the tanks were removed indicated the tanks had not leaked. It is recommended that a no-further-action decision document be prepared. When approved, this site will be removed from further consideration and no future investigation will be performed at the former Buried Tank Area.

APPENDIX C
SOCIOECONOMICS

TABLE C-1

STANDARD EIFS MODEL FORECAST FOR GOODFELLOW AFB REALIGNMENT

		Percent Increase	
Income multiplier: 2.0955			
Change in local			
Sales volume	Direct:	\$4,904,000	
	Induced:	\$5,372,000	
	Total:	\$10,276,000	(0.572%)
Employment	Direct:	42	
	Total:	382	(0.753%)
Income	Direct:	\$555,000	
Total (place of work)	:	\$9,491,000	
Total (place of residence)	:	\$9,435,000	(0.770%)
Local population	:	616	(0.675%)
Local off-base population	:	474	
Number of school children	:	131	
Demand for housing	Rental:	116	
	Owner occupied:	72	
Government expenditures	:	\$323,000	
Government revenues	:	\$556,000	
Net Government revenues	:	\$233,000	
Civilian employees expected to relocate	:	16	
Military employees expected to relocate	:	229	

TABLE C-2

TRAINING IMPACT FORECAST FOR GOODFELLOW AFB REALIGNMENT

		Percent Increase	
Income multiplier	2.0955		
Change in local			
Sales volume	Direct	\$5,215,000	
	Induced	\$5,713,000	
	Total	\$10,929,000	(0.608%)
Employment	Direct	44	
	Total	592	(1.165%)
Income	Direct	\$590,000	
	Total (place of work)	\$15,436,000	
	Total (place of residence)	\$16,384,000	(3.786%)
Local population		1,243	(1.361%)
Local off-base population		0	
Number of school children		0	
Demand for housing	Rental	0	
	Owner occupied	0	
Government expenditures		\$48,000	
Government revenues		\$1,913,000	
Net Government revenues		\$1,865,000	
Civilian employees expected to relocate		0	
Military employees expected to relocate		499	

TABLE C-3

CONSTRUCTION IMPACT FORECAST FOR GOODFELLOW AFB REALIGNMENT

		Percent Increase	
Income multiplier: 2.0955			
Change in local			
Sales volume	Direct:	\$18,207,000	
	Induced:	\$19,946,000	
	Total:	\$38,153,000	(2.124%)
Employment	Direct:	154	
	Total:	623	(1.226%)
Income	Direct:	\$2,059,000	
	Total (place of work):	\$11,615,000	
	Total (place of residence):	\$11,585,000	(0.946%)
Local population	:	0	(0.000%)
Local off-base population	:	0	
Number of school children	:	0	
Demand for housing	Rental:	0	
	Owner occupied:	0	
Government expenditures	:	\$320,000	
Government revenues	:	\$478,000	
Net Government revenues	:	\$157,000	
Civilian employees expected to relocate:		0	
Military employees expected to relocate		0	

TABLE C-4

AGGREGATE IMPACTS OF GOODFELLOW AFB REALIGNMENT

		Percent Increase	
Total change in local			
Sales volume	Direct:	\$28,326,000	
	Induced:	\$31,031,000	
	Total:	\$59,358,000	(3.304%)
Employment	Direct:	240	
	Total:	1,597	(3.144%)
Income	Direct:	\$3,204,000	
	Total (place of work):	\$36,564,000	
	Total (place of residence):	\$67,404,000	(5.502%)
Local population	:	1,859	(2.036%)
Local off-base population	:	474	
Number of school children	:	131	
Demand for housing	Rental:	116	
	Owner occupied:	72	
Government expenditures	:	\$691,000	
Government revenues	:	\$2,946,000	
Net Government revenues	:	\$2,255,000	
Civilian employees expected to relocate:		16	
Military employees expected to relocate:		728	

APPENDIX D

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

AFB - Air Force Base
AFFF - Aqueous Fire Fighting Foam
AFR - Air Force Regulation
AnA - Angelo Clay Loam
ATC - Air Training Command
CAA - Clean Air Act
CEQ - Council on Environmental Quality
CFR - Code of Federal Regulations
DEA - Draft Environmental Assessment
DOI - Department of the Interior
DOT - Department of Transportation
EA - Environmental Assessment
EIFS - Economic Impact Forecast System
EPA - Environmental Protection Agency
FM - Farm to Market Road
gpm - Gallons Per Minute
HDPE - High-Density Polyethylene
HWY - Highway
IRP - Installation Restoration Program
JP-4 - Aircraft Fuel
KmC - Kimbrough Clay Loam
LOX - Liquid Oxygen
MeA - Mereta Clay Loam
MGD - Million Gallons Per Day
MPH - Miles Per Hour
NAAQS - National Ambient Air Quality Standards
NCO - Noncommissioned Officer
NEPA - National Environmental Policy Act
NESHAP - National Emission Standards for Hazardous Air Pollutants
PAH - Polycyclic Aromatic Hydrocarbon
PL - Public Law
ppm - Parts Per Million
PSD - Prevention of Significant Deterioration

SATCOM - Satellite Communication Facility
SCS - Soil Conservation Service
SECDEF - Secretary of Defense
SIP - State Implementation Plan
TACB - Texas Air Control Board
TOES - Texas Organization for Endangered Species
TPWD - Texas Parks and Wildlife Department
UEPH - Unaccompanied Enlisted Personnel Housing
USDA - United States Department of Agriculture
UST - Underground Storage Tank
WWTP - Waste Water Treatment Plant