



FINAL
ENVIRONMENTAL ASSESSMENT
OF THE
801 HOUSING PROGRAM
AT WHITEMAN AIR FORCE BASE
MISSOURI



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Prepared for
THE UNITED STATES AIR FORCE
STRATEGIC AIR COMMAND

Prepared by
ROBERT D. NIEHAUS, INC.

NOVEMBER 1988

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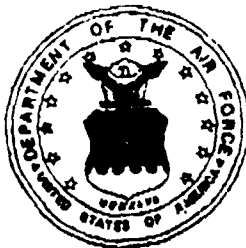
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FINAL
ENVIRONMENTAL ASSESSMENT
OF THE
801 HOUSING PROGRAM
AT WHITEMAN AFB, MO

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**ENVIRONMENTAL ASSESSMENT
OF THE 801 HOUSING PROGRAM
AT WHITEMAN AFB, MO**

1. EXECUTIVE SUMMARY

Whiteman Air Force Base (AFB), Missouri -- an installation of the U.S. Air Force (USAF) Strategic Air Command (SAC) -- proposes to acquire assignable land options on four sites, comprising a total of approximately 1,000 acres, on which to develop up to 900 housing units. The proposed new housing is to be built under the Section 801 program, which authorizes the government to enter into long-term agreements with private developers to provide military family housing. After a competitive bidding process, the government would assign the land options to the winning contractor(s), who would buy the land, finance and construct the housing, and then lease the units to the base for use by military personnel. A need for at least 900 units has been identified at Whiteman AFB to provide accommodations for the expected large increase in personnel associated with the deployment of the B-2 bomber.

As directed in Air Force Regulation (AFR) 19-2, this Environmental Assessment (EA) is intended to assist the Air Force in complying with the National Environmental Policy Act (NEPA) by providing the analysis necessary to support either a Finding of No Significant Impact (FONSI) or a Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement (DEIS). Consistent with this purpose, and as directed by Council on Environmental Quality (CEQ) regulations implementing NEPA, the EA relies on available environmental information and communication with knowledgeable and affected public agencies.

This assessment provides Air Force decision-makers with an analysis of the environmental impacts potentially resulting from the proposed action and alternatives. Based on this assessment, the Air Force may place restrictions on the proposed development as required to mitigate project effects. In addition, subsequent to entering into a contract to construct the housing, the private-sector developer would be required to comply with all applicable state and local regulations governing development at the proposed locations.

This EA includes a discussion of the affected environment and expected impacts and mitigations for each of the following issue areas: land use; growth and housing; public services and finance; public health and safety; traffic; air quality; noise; earth resources; biological resources; and cultural resources. Principal findings of the assessment are summarized here.

Land Use. Development of housing on the four identified sites is consistent and compatible with current and planned uses on these and adjacent tracts. Each site contains acreage designated as prime farmland; although conversion of prime farmland to nonagricultural uses is not encouraged, none of these farmlands is unique and their total acreage is small relative to the abundant prime farmland in the three-county region.

Growth and Housing. Beneficial economic growth would occur in the region as the proposed project would support approximately 760 direct and indirect jobs in Johnson County during the one-year construction period at the Knob Noster and Warrensburg sites (if construction at the two sites occurs simultaneously). In Pettis County, about 380 direct and indirect jobs

would be supported by construction at the Sedalia site for a two-year period and in Henry County, approximately 280 direct and indirect jobs would be maintained by construction at the Windsor site for about one year. Additional jobs would also be supported over a longer term from the spending of payrolls for goods and services in each of the counties by residents of the 801 housing. The project is designed to provide needed housing for B-2 mission personnel; without it, impacts on housing in the local communities would be severe.

Public Services and Finance. The additional demand for public services would have the greatest affect on the Warrensburg Middle School which is already approximately 3 percent above design capacity. The additional project-related growth would probably increase enrollment to a level 13 percent above capacity. Other schools would reach levels close to capacity due to project-related growth, including Knob Noster's high school, and Sedalia's and Warrensburg's elementary schools. These effects could be alleviated to some degree if personnel are distributed among the 801 housing sites based on the availability at local schools and the grade levels of each family's children. The Warrensburg sewerage treatment facility would also reach a level close to capacity due to project-related growth. No substantial negative fiscal impacts to local governments are anticipated from the 801 housing.

Public Health and Safety. No hazardous materials have been identified on any proposed site. A small sewage lagoon associated with a former trailer site at the Knob Noster site and a small debris fill at the Warrensburg site should be cleared as site preparation. Easements surrounding high voltage power lines at Sedalia and a hardened intersite communications system cable (HICS) at Knob Noster should be respected to facilitate proper utility maintenance and ensure current environmental safety standards.

Traffic. Most portions of the transportation network which would be affected by the proposed 801 housing developments are all utilized well below their capacities. The majority of transport links currently have Level of Service ratings of "A" or "B", and would experience only minimal changes as a result of the project. There are, nevertheless, two major exceptions. Missouri Highway 132, between U.S. Highway 50 and Whiteman Air Force Base currently passes over an inadequate bridge, and has Level of Service ratings of "D" at certain points. However, as part of the Defense Access Roads Program (DARP) improvements to this section of road are planned over the next three years -- including widening the road surface, realignment at its intersection with U.S. Highway 50, and replacement of the problem bridge. The other area of concern is the street system in Warrensburg, connecting the proposed housing tract with U.S. Highway 50 to the north. These streets are already experiencing problems with their Levels of Service, and additional traffic would increase these difficulties. Planned improvements under DARP to Missouri Highway DD, which provides a more direct connection between the Warrensburg site and Whiteman AFB, should enable this link to carry additional traffic -- removing some of the increased strain on city streets.

Air Quality. Short-term emissions would be produced by construction vehicles and equipment and long-term emissions would be generated by residential use of natural gas, electricity, and vehicles. These emissions would be negligible; furthermore, each of the four sites is located in a county which is in compliance with federal air emission standards.

Noise. Construction noise at the proposed sites would create intermittent, minor disturbance to existing adjacent residential areas. All sites lie outside the 65 dBA noise contour of the base airfield, however deployment of the B-2 bomber (which has classified noise projections) may impact environmental noise levels at the Knob Noster site.

Earth Resources. The project sites pose no geologic hazards that cannot be addressed using standard construction procedures. Shrink-swell, low strength, depth to rock, flooding, slope steepness, and perched water table/wetness properties of soils at each proposed site require specific treatment in project design to reduce potential structural damage. Immediate replanting of vegetation in newly disturbed areas at construction sites should suffice to prevent excessive runoff and erosion during and following construction.

Biological Resources. Housing construction would eliminate much of the existing vegetation and wildlife at the proposed sites. However, since no sensitive plant or animal species have been identified at these locations, this impact would not be substantial.

Cultural Resources. A total of four archaeological sites presently are known to exist on the properties proposed for 801 housing: one at Knob Noster; one at Warrensburg; and two at Windsor. The sites provide limited information, with only one (on the Windsor parcel) containing datable artifacts. The three sites on the Warrensburg and Windsor tracts are all located very close to the boundaries of those parcels, and thus could be avoided with minimal difficulty. Although the site on the Knob Noster parcel lies closer to the central portion of the housing tract, it is located on a sloping area of poor soil on which building is not recommended -- suggesting that this site might be preserved as well. Impacts on cultural resources are, therefore, expected to be minimal, in part due to the limited value of the few archaeological sites present, and in part to the ease of avoiding these sites while developing the four parcels.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This Environmental Assessment (EA) examines the consequences of the proposed Section 801 build-lease housing program at Whiteman Air Force Base (AFB), Missouri. The study was prepared in compliance with Air Force Regulation (AFR) 19-2, which implements the National Environmental Policy Act (NEPA) PL 91-190, the Council on Environmental Quality (CEQ) regulations (40 CFR, parts 1500-1508), and Department of Defense (DOD) Directive 6050.1.

The purpose of the EA is to provide a description of current conditions and an initial analysis of potential impacts of the proposed action on the human environment -- including the natural or physical environment and the relationship of people with that environment. By regulation (AFR 19-2), the EA must lead to a decision either to file a Finding of No Significant Impact (FONSI), or a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS), or a decision to take no action.

NEPA and its implementing regulations generally have been interpreted to require the federal government to consider the environmental effects of its proposed actions to the extent these effects can be predicted. In this case, the government action is to acquire assignable land options for future housing sites. Although some decisions regarding specific development plans are left to the developer, specifications of unit size and quality characteristics, along with the distribution of units per site will be provided by the Air Force.

Section 801 (amending 10 USC 2828) authorizes military departments to enter into long-term leases for the purpose of providing housing at military installations. Under the program, private contractors finance and construct housing, which in turn is leased to the government to operate as accommodations for military personnel and their families. While the federal government action of acquiring the land options must comply with NEPA, the subsequent proposed housing development must adhere to state and local regulations. Although compliance by the proposed project with local requirements may effectively serve to mitigate any environmental impacts, NEPA requires the Air Force to ensure that appropriate mitigation procedures are implemented. To accomplish this, the Air Force may, if required and as a condition of the build-lease contract with the housing developer, place certain restrictions or requirements upon the agreement.

2.1 PROPOSED ACTION AND PURPOSE

The proposed action is for Whiteman AFB to acquire assignable land options on four sites, comprising a total of approximately 1,000 acres, on which to develop up to 900 housing units. Under authorization of the Section 801 housing program, the government will issue a Request for Proposals (RFP) specifying the number of units to be built at each site. The current proposed distribution of units is as follows:

Knob Noster	125 units
Sedalia	425 units
Warrensburg	225 units
Windsor	125 units.

The purpose of the proposed housing program is to provide accommodations for the expected large increase in personnel at Whiteman AFB associated with deployment of the B-2 bomber. Basing the B-2 bomber at Whiteman AFB represents a major new mission for the base, involving an increase of more than 2,350 personnel between 1989 and 1992. Including dependents, the total B-2 mission-related population is expected to exceed 5,500 (USAF/HQSAC, 1987). A recently completed housing survey at Whiteman AFB projects a need of 907 additional units of military family housing (Whiteman AFB, Housing Office, 1988).

2.2 SETTING AND PROPOSED SITES

Whiteman AFB, located approximately 70 miles southeast of Kansas City, Missouri, was originally activated during World War II as Sedalia Army Air Field (Figure 2.2-1). Closed after the war, it was again activated in 1951 as part of the U.S. Air Force Strategic Air Command (SAC), and since the mid-1960s it has been the home of the 351st Strategic Missile Wing.

Of the approximately 3,400 military personnel stationed at Whiteman AFB, just over half (1,770) live on the base, while the rest live in privately constructed housing in nearby towns. With the new B-2 bomber mission coming to Whiteman AFB, Air Force planners have decided to acquire additional needed family housing through the 801 build-lease program, and have identified four potential housing development sites -- all of which are currently agricultural land -- adjacent to the neighboring communities of Knob Noster, Sedalia, Warrensburg, and Windsor (Figure 2.2-2).

- o The Knob Noster site is approximately three miles from the base, just north of U.S. Highway 50 and to the northwest of the town. It is a 205-acre parcel of land with rolling topography, currently used primarily for grazing, but also containing a substantial area of woodland and some cropland.
- o About 19 miles east of the base, on the western edge of the town, the Sedalia site is the largest of the four proposed locations and is comprised of two parcels of land -- one 306 acres, the other 126 acres. The land at this site is gently rolling to flat and has been used for both pasture and crops.
- o Southwest of the town of Warrensburg and due west about 13 miles from the base, this site is also a combination of two land parcels. The northern parcel is 67 acres in size and is used for grazing, while the southern 173-acre parcel is mostly cropland. The site consists of gently rolling topography sloping westward to the East Fork of Post Oak Creek.
- o Eighteen miles south of the base, the Windsor site covers 108 acres of land straddling the city limits. The northwest and southeast corners of the parcel contain wooded areas, with the rest of the land used for crops or lying fallow. For the most part, the land is relatively level and slopes gently westward toward the East Fork of Tebo Creek.

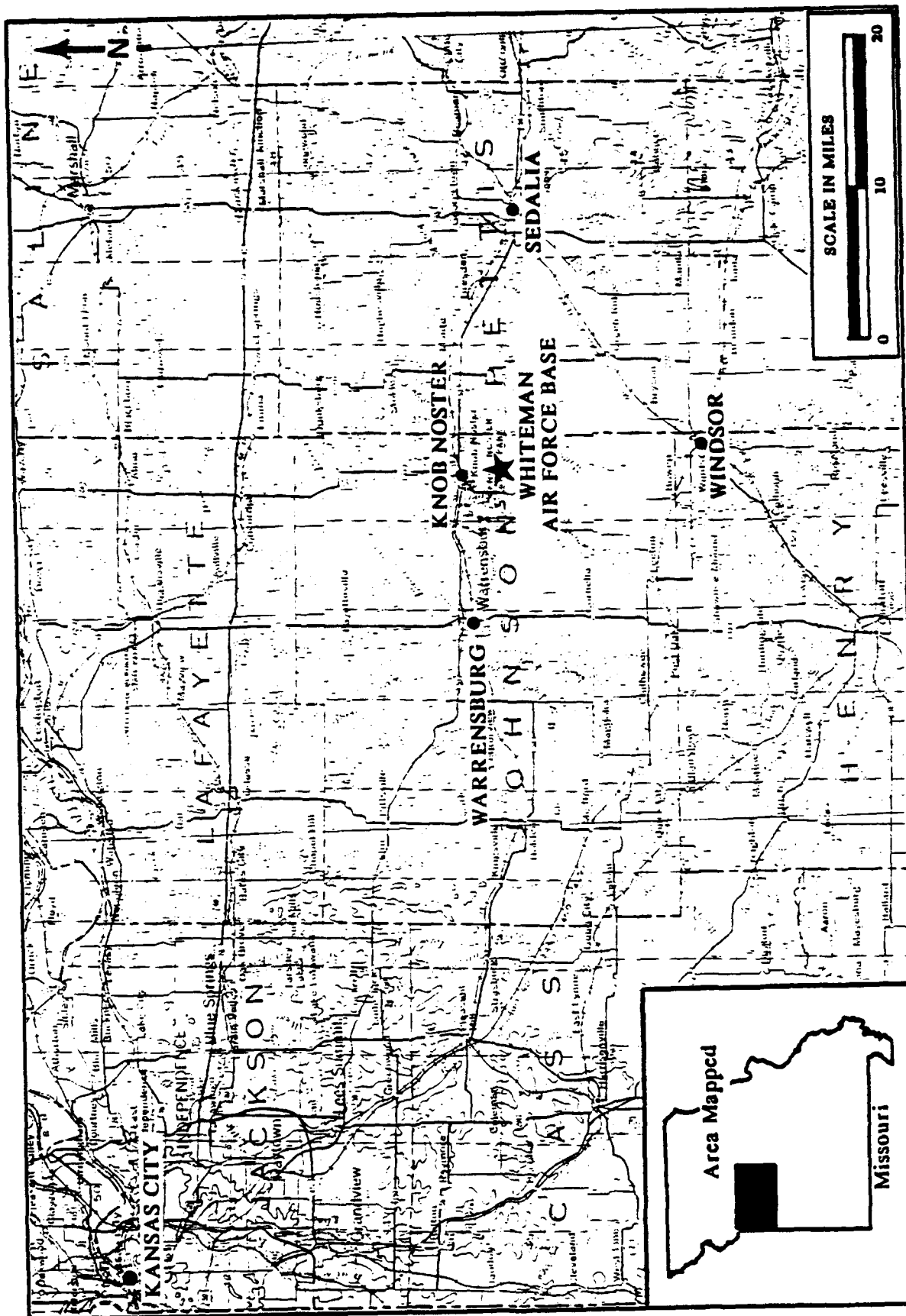


Figure 2.2-1
LOCATION OF WHITEMAN AFB

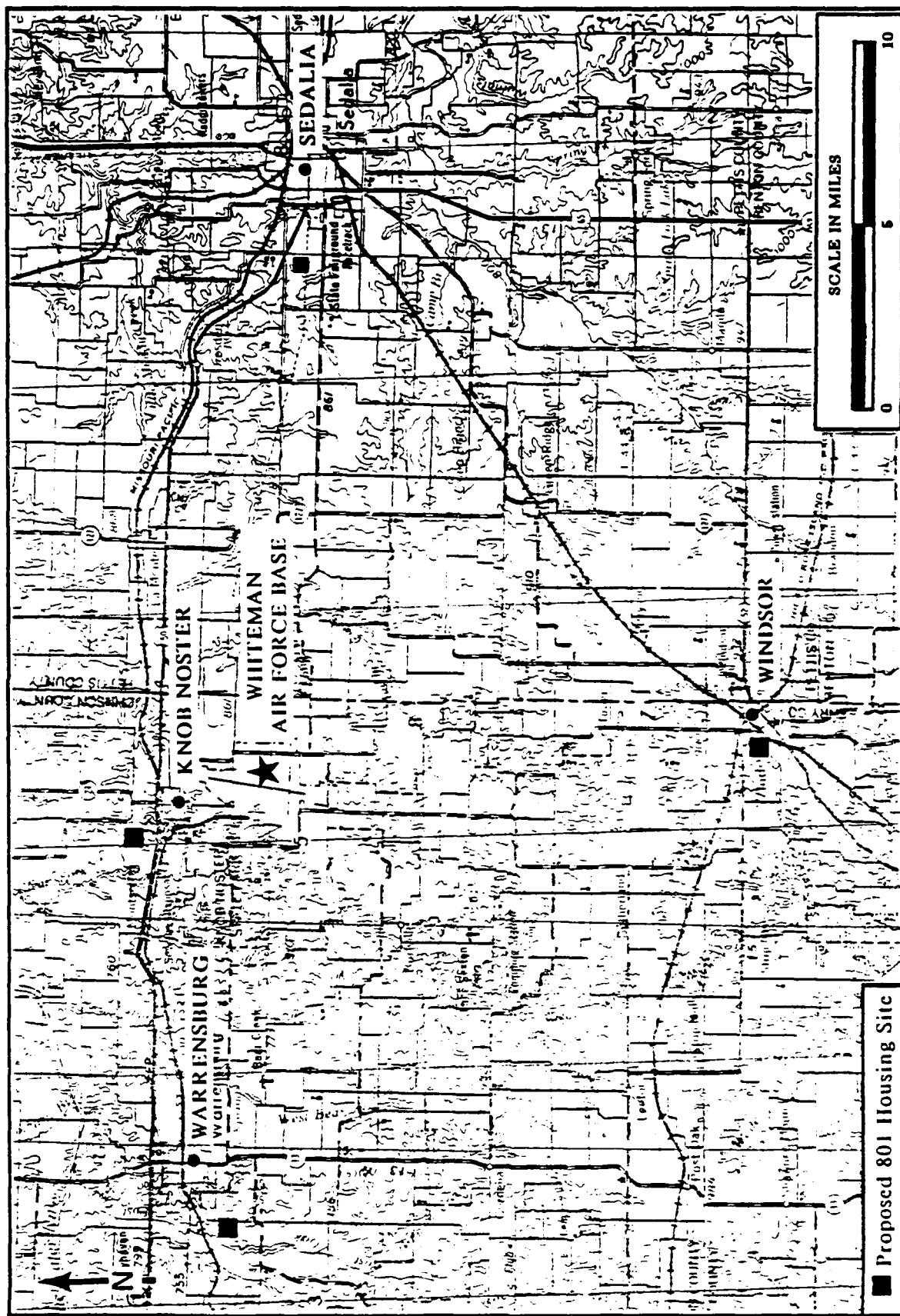


Figure 2.2-2
LOCATION OF SITES PROPOSED FOR THE 801 HOUSING PROGRAM

2.3 ALTERNATIVES TO THE PROPOSED ACTION

Increased Site Development Alternative

Alternatives to the proposed action potentially could involve different combinations of sites and numbers of units per site. Rather than specifying numerous theoretically possible options, this analysis considers an increased site development alternative of building up to the following maximum number of units at each site:

Knob Noster	200 units
Sedalia	750 units
Warrensburg	300 units
Windsor	200 units.

No Action Alternative

The only other presently defined alternative to the proposed action is the no action alternative. Under this alternative, the Air Force would not acquire options to the land under consideration and the construction of new housing in the area to meet the demands of B-2 personnel would be left entirely to the private sector. In this case it is impossible to predict precisely what would happen, but clearly the impacts on housing in the local communities would be severe, particularly in Knob Noster and Warrensburg, where most off base personnel currently choose to live. By pursuing the 801 housing program and specifying the locations and appropriate numbers of units per site, the Air Force not only facilitates the timely construction of needed housing, but also may attenuate some of the potential impacts to the surrounding communities.

2.4 ORGANIZATION OF THE REPORT

This report addresses all currently foreseen environmental effects of the proposed action and alternatives. The report is structured to provide a concise discussion of the affected environment and expected impacts and mitigations for each of the following issues:

- o Land use;
- o Growth, and housing;
- o Public services and finance;
- o Public health and safety;
- o Traffic;
- o Air quality;
- o Noise;
- o Earth resources;
- o Biological resources; and
- o Cultural resources.

The affected environment related to each of these issues is presented in section 3; environmental consequences of the project for each issue area are discussed in section 4.

3. AFFECTED ENVIRONMENT

3.1 LAND USE

Whiteman Air Force Base (AFB) covers 4,677 acres of Johnson County in central Missouri, approximately 70 miles southeast of Kansas City (Figure 2.2-1). The base was originally activated as Sedalia Army Air Base in 1942 and served as a troop carrier and glider training facility during World War II. In 1947, the base was placed on inactive status and most of the original buildings were disposed of. In 1951, the base was reactivated by the Strategic Air Command (SAC) to host a bombardment wing, which was phased out during the early 1960s and replaced with a Minuteman Intercontinental Ballistic Missile (ICBM) wing and control center (U.S. Air Force, 1988a).

The host organization of Whiteman AFB is the 351st Strategic Missile Wing, which supports 15 Minuteman II ICBM Launch Control Facilities and 150 Minuteman II missiles with a launch network dispersed over approximately 10,000 square miles of west central Missouri (U.S. Air Force, 1988a). Whiteman AFB has been designated for the deployment of the B-2 bomber in the early 1990s (USAF/HQSAC, 1987). The base presently has a full complement of mission support facilities as well as administrative and community facilities. The base lies in an unincorporated area of Johnson County, two miles south of the city of Knob Noster. The city of Warrensburg lies ten miles to the west, the city of Sedalia is 20 miles to the east, and the city of Windsor is 18 miles to the south (Figure 2.2-2).

Predominant land uses surrounding the base include residential, commercial, recreational, and agricultural development. Residential and commercial uses are found primarily north of the base in Knob Noster. The Knob Noster State Park, west of the base, contains the largest amount of forested area and is a focus of recreational land uses near the base. Pasture for livestock and cultivation of nonirrigated cropland for corn, soybeans, legumes, and grasses are the primary agricultural land uses. Beef cattle is the largest livestock operation, however hogs, dairy cattle, and sheep are also raised. Dispersed throughout Johnson County are strip mines where limestone is quarried in limited amounts for farm uses and road material.

Knob Noster

The Knob Noster site proposed for 801 housing is approximately one mile west-northwest of the commercial center of the city of Knob Noster and three miles northwest of the base (Figure 3.1-1). The 205-acre site slopes west toward the flood plain of Clear Fork and faces south toward U.S. Highway 50, one-quarter mile northwest of its junction with State Highway 192. It is located in an unincorporated area of Johnson County and is bordered on the southeast by new commercial development (a motel). On all other sides, the site is bounded by privately-owned land used for pasture or light cropping. One-half mile southwest of the site is a municipal sewage disposal pond. The site itself currently contains cattle pasture, fallow cropland, and broken stands of woods. Improvements on the site are limited to an artificial pond, fences, and dirt roadways.

Approximately 25 acres of the Knob Noster site are considered prime farmland by the Soil Conservation Service (SCS) in Warrensburg. This prime farmland coincides with the Macksburg (MaB) and Weller (WdB) soil series found on the site (see section 3.8, Earth Resources). Conversion of such prime farmland to nonagricultural uses is not encouraged,

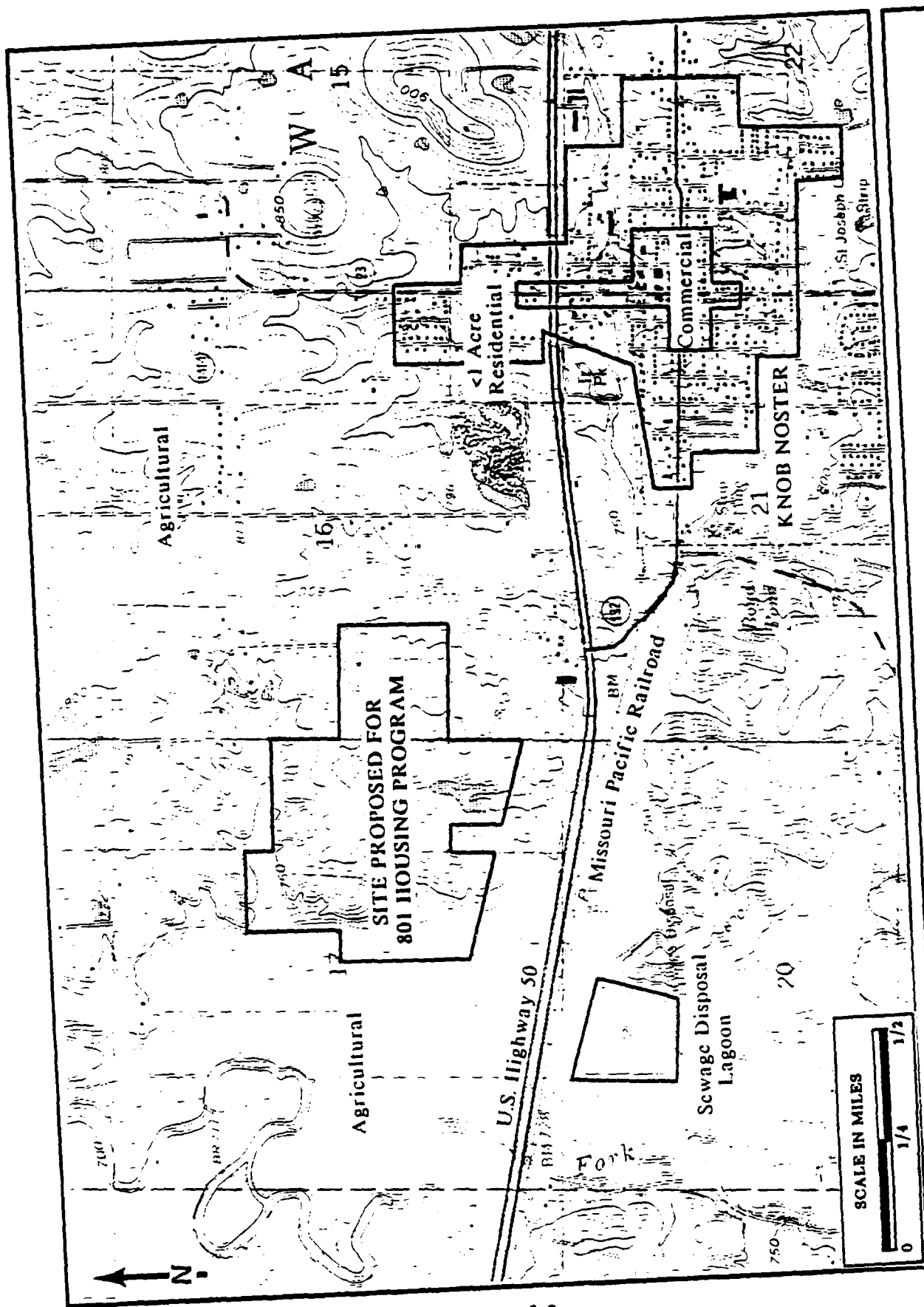


Figure 3.1-1
EXISTING LAND USE SURROUNDING KNOB NOSTER SITE

however, the total acreage on this site is not substantial when compared with the amount found in the county (Bob Hagedorn, SCS, Warrensburg, personal communication, 1988).

Land use in the vicinity of the site is influenced by the jurisdictions of the area: Whiteman AFB, the city of Knob Noster, and Johnson County. Neither the city of Knob Noster nor Johnson County currently have a comprehensive development plan. Although the proposed project site lies outside the boundary of Whiteman AFB, potential development that may influence or be influenced by base activities may be guided by recommendations of the Whiteman AFB Air Installation Compatible Use Zone (AICUZ) report (U.S. Air Force, 1976). The report indicates objectives directed by the Air Force and consistent with base's mission designed to promote land use development near the Whiteman AFB airfield in a manner which will not only protect adjacent communities from noise and safety hazards associated with aircraft operations but also preserve the operational integrity of the airfield. AICUZ goals include protection of mission capability through airfield safety clearance and planning of land uses compatible with existing constraints (such as noise impacts and flood plains).

Sedalia

The proposed Sedalia site, comprising 432 acres, is located less than one-quarter mile west of the Sedalia city limits in an unincorporated area of Pettis County. The parcel is situated between Main Street Road on the north and Missouri State Route Y on the south (Figure 3.1-2). The east and west boundaries are defined by private property lines. The terrain of the site is gently undulating with a gradual westward slope toward Coon Creek (traversing an adjacent property). The site presently contains cattle pastures, fallow cropland, a small feedlot, and a farmhouse complex. Two sets of high voltage electrical utility lines, operated by the Missouri Public Service Company and the Central Electric Power Cooperative, cross the site to a substation on an adjacent property.

Nearly 275 acres of the proposed are considered prime farmland by the Soil Conservation Service in Sedalia. This prime farmland coincides with the distribution of the Deepwater (77B), Greenton (28B), non-eroded Grundy (24B2), and Macksburg (23B) soil series on the site (see below, section 3.8, Earth Resources). Although conversion of prime farmland to non-agricultural uses is discouraged, this land is not considered unique and prime farmlands are abundant throughout the county (Keith Davis, SCS, Sedalia, personal communication, 1988).

Development surrounding the site includes single-family housing, condominiums, a trailer park, a golf course and country club, and pasture and cropland. Enclosed by the Sedalia site and Route Y is a parcel of land slated for residential development of single family homes on 1-5 acre lots which also contains the electrical substation. The State Fair Community College (with an exercise course and jogging track) and the Missouri State Fairgrounds lie within one mile southeast of the site. Commercial development of western Sedalia, including shopping plazas, office complexes, and strip development associated with U.S. Highway 50, is found east of the site. Land use in the vicinity of the site is influenced by the jurisdictions of the city of Sedalia and Pettis County, but both lack comprehensive development plans.

Warrensburg

The 240-acre Warrensburg site is located less than one-half mile southwest of the Warrensburg city limits in an unincorporated area of Johnson County (Figure 3.1-3). The dimensions of

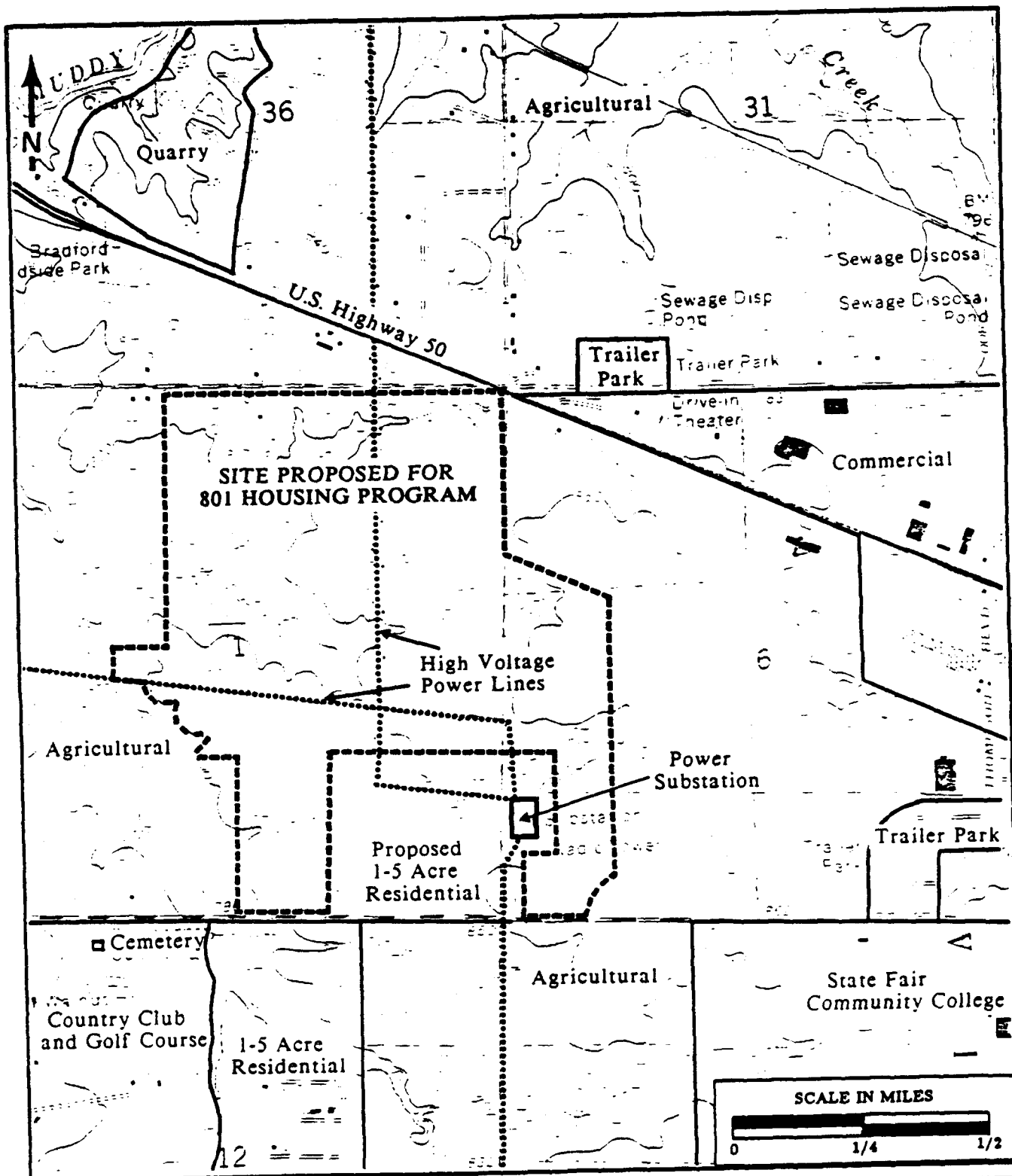


Figure 3.1-2
EXISTING LAND USE SURROUNDING SEDALIA SITE

the site are defined by private property boundaries. The site currently contains fallow fields used for cattle grazing, isolated stands of trees, and cropland dedicated to corn, sorghum, and soybeans. Several east-to-west gullies bisect the parcel. The site is generally undulating but dips gently toward the channelized East Fork of Post oak Creek, the site's western border.

Nearly 75 acres of the Warrensburg site are considered prime farmland by the Soil Conservation Service in Warrensburg. This prime farmland coincides with the non-eroded stages of Deepwater (DpB) and Samsel (SaB) soil series found on the site (see section 3.8, Earth Resources). Conversion of prime farmland to nonagricultural uses is not encouraged, however, the acreage on this site is not substantial when compared with the amount found in the county (Bob Hagedorn, SCS, Warrensburg, personal communication, 1988).

Land use immediately to the north, south, and west of the site is similar to that of the site: mixed pastures and cropland with occasional woods. To the east, residential development of Warrensburg approaches the site. The central campus of Central Missouri State University and commercial zones of Warrensburg are approximately two miles northeast of the site; Whiteman AFB is roughly thirteen miles to the east via Missouri State Route DD.

Land use in the vicinity of the site is influenced by the jurisdictions of the area: the city of Warrensburg and Johnson County. The Warrensburg Development Plan (Show-Me Regional Planning Commission, 1987) outlines goals of moderate growth to meet future population demands for the city, which include active pursuit of annexations to improve the overall community, with emphasis to the north and south of the city. The plan stresses concentrated residential development that is isolated from through traffic, preserves natural watercourses and drainages, maintains ground cover to stabilize soil, and maintains an orderly manner.

Windsor

The 108-acre site at Windsor straddles the Windsor city limit with slightly more than half the site in an unincorporated area of Henry County (Figure 3.1-4). The irregular shape of the parcel is determined by private property boundaries. The mostly level site is currently used primarily as cropland for soybeans and corn. Riparian woodland and isolated stands of trees are scattered across the site.

Approximately 40 acres of the site is considered prime farmland by the Soil Conservation Service in Clinton. This acreage corresponds to the Hartwell (HtB), Deepwater (DpB), and dry Lightning (Ls) and Verdigris (Ve) soil series found on the site (see below, section 3.8, Earth Resources). Although conversion of prime farmland to nonagricultural uses is not encouraged, this farmland is not considered unique and the soils of prime farmlands are abundant; in fact, they comprise the majority of the soils in the county (Curtis Marshall, SCS, Clinton, personal communication, 1988).

Surrounding land use to the north, west, and south is similar to that of the site: mixed cropland and pasture interspersed with woods. To the east, the site surrounds a residential development of 3-4 units per acre -- similar to the proposed density of the 801 housing program. The commercial district of Windsor is located less than one mile east of the site. Land use in the vicinity of the site is influenced by the city of Windsor and Henry County, however, neither jurisdiction has a detailed development plan.

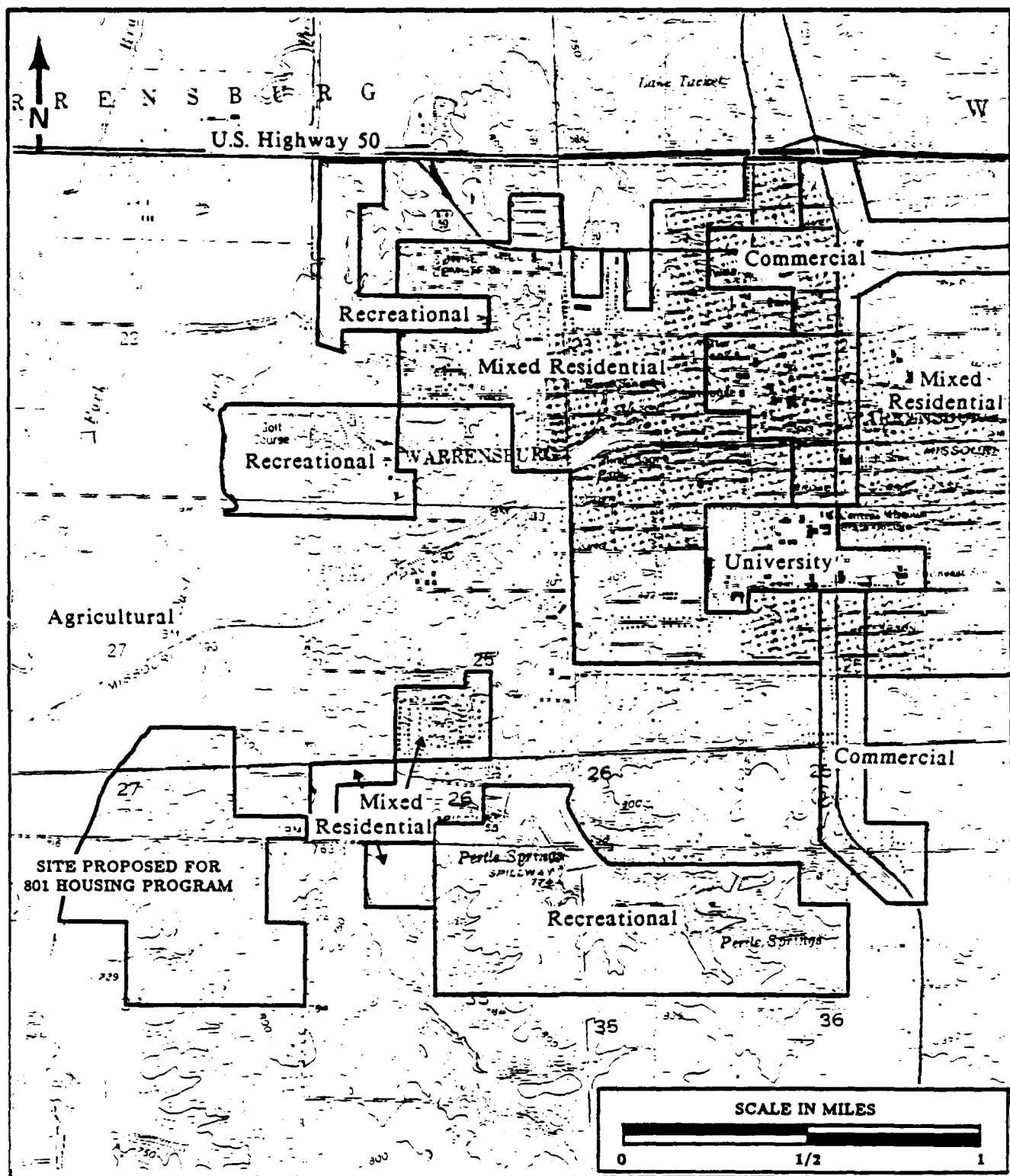


Figure 3.1-3
EXISTING LAND USE SURROUNDING WARRENSBURG SITE

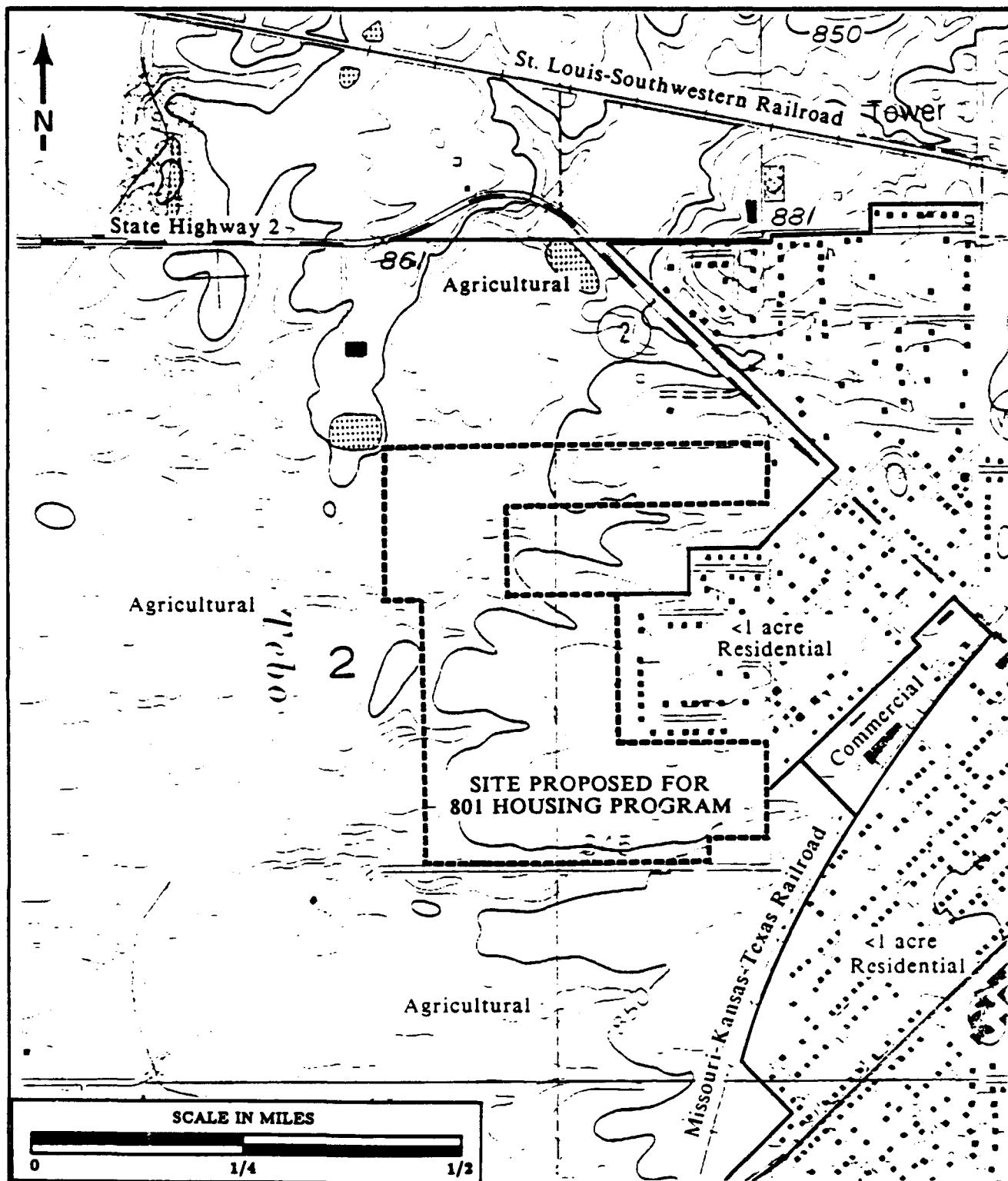


Figure 3.1-4
EXISTING LAND USE SURROUNDING WINDSOR SITE

3.2 GROWTH AND HOUSING

3.2-1 Economic Activity

Total employment in each of the counties where the 801 housing would be located increased between 1970 and 1986 (Table 3.2-1). Johnson County grew at the fastest pace of the three counties, although none of the counties grew as fast as the national average rate of 2.0 percent per year.

The government sector provided 39.3 percent of Johnson County jobs in 1986, primarily due to employment at Whiteman AFB (Figure 3.2-1). There were almost 4,400 federal jobs in the county during that year. Although the government sector historically has been extremely important to the county's economy, growth in government sector jobs has been relatively slow during the past two decades. All other sectors of the economy experienced a higher rate of job growth between 1969 and 1986, except the farming sector, which actually provided fewer jobs. The loss of farming jobs in the county is not unusual, however, as jobs in the farming sector have decreased over the past two decades in each of the three counties, and also at the state and national level. Nevertheless, the farming sector continues to be very important to the economy, providing nearly 2,200 jobs in 1986. The mining sector accounted for relatively few of the jobs in the county (approximately 20) during 1986, but average earnings per job exceeded earnings in all other sectors at nearly \$22,200 (all values are in 1988 dollars unless otherwise indicated).

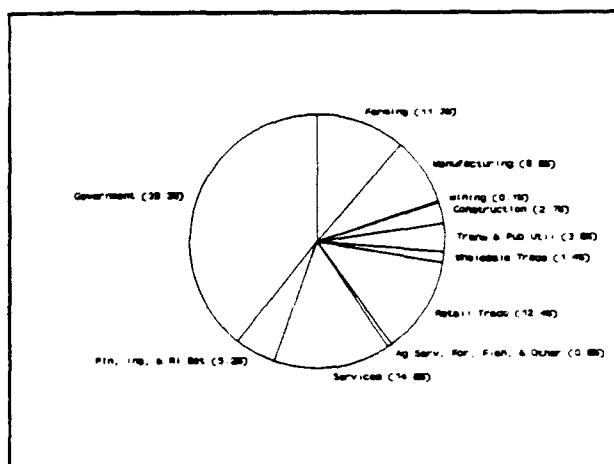


Figure 3.2-1
EMPLOYMENT BY INDUSTRY, 1986
JOHNSON COUNTY, MISSOURI

The industrial sectors providing the most jobs in Pettis County during 1986 were services, manufacturing, retail trade, and government (Figure 3.2-2). Farming was also relatively important to the county economy, accounting for over 1,700 jobs (8.6 percent) in 1986. By comparison, farming provided 5.1 percent of the jobs in Missouri and 2.7 percent of the jobs at the national level. Agricultural services, forestry, and fishing was the fastest growing sector in the county over the past two decades, with the number of jobs increasing by 6.3 percent annually between 1969 and 1986. This rapid rate of job growth exceeded both the state and national rates of 4.8 and 5.1 percent, respectively, in this sector over the same period.

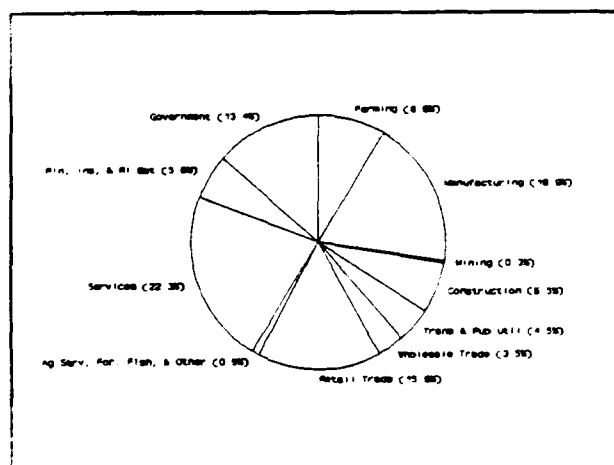


Figure 3.2-2
EMPLOYMENT BY INDUSTRY, 1986
PETTIS COUNTY, MISSOURI

Table 3.2-1

HISTORIC ECONOMIC INDICATORS FOR
HENRY, JOHNSON, AND PETTIS COUNTIES, MISSOURI

	1970	1975	1980	1985	1986	1987	Average Annual Change
HENRY COUNTY							
Total Employment [1]	8,542	9,088	9,512	9,813	9,710	NA [2]	0.8%
Average Earnings Per Job [3]	\$14,500	\$17,092	\$15,136	\$14,471	\$14,022	NA	-0.2%
Labor Force	7,924	8,431	9,443	8,702	8,444	8,022	0.1%
Per Capita Personal Income [3]	\$9,923	\$11,793	\$12,140	\$12,489	\$12,569	NA	1.5%
Unemployment Rate	1.2%	5.5%	6.8%	7.5%	7.1%	8.8%	NA
JOHNSON COUNTY							
Total Employment	14,493	16,243	17,867	19,144	19,370	NA	1.8%
Average Earnings Per Job	\$16,550	\$16,381	\$13,708	\$14,104	\$14,384	NA	-0.9%
Labor Force	12,203	12,851	14,688	17,263	17,351	18,376	2.4%
Per Capita Personal Income	\$9,398	\$10,554	\$9,762	\$11,190	\$12,002	NA	1.5%
Unemployment Rate	1.4%	3.4%	6.5%	3.9%	3.8%	4.3%	NA
PETTIS COUNTY							
Total Employment	15,251	15,823	17,477	19,570	19,961	NA	1.7%
Average Earnings Per Job	\$17,115	\$17,128	\$14,951	\$15,042	\$15,283	NA	-0.7%
Labor Force	14,526	14,843	16,100	18,066	18,405	17,624	1.1%
Per Capita Personal Income	\$10,324	\$11,577	\$11,437	\$12,794	\$13,266	NA	1.6%
Unemployment Rate	2.0%	9.1%	9.1%	7.4%	7.1%	6.5%	NA

[1] Employment is by place of work.

[2] NA - data not available or not applicable.

[3] Earnings and income are in constant 1988 dollars.

Sources: U S. Department of Commerce, Bureau of Economic Analysis, 1988 (employment, earnings, and income);
Missouri Division of Employment Security, 1988 (labor force and unemployment rates).

The mining sector provided relatively few jobs (approximately 50) in the county, however average annual earnings per job in that industry were the highest in the county at over \$39,200 in 1986.

Services and mining provided the largest number of jobs in Henry County during 1986, although the mining sector probably comprised a relatively small share of this employment (Figure 3.2-3). The two sectors were combined because of the disclosure rules maintained by data sources -- the U.S. Department of Commerce, Bureau of Economic Analysis. Other dominant sectors of the county economy included retail sales, farming, government, and manufacturing. Although farming provided a large number of jobs (approximately 1,370), average annual earnings per job in that sector were only about \$2,100 during 1986 (average earnings per job in the farming sector in Pettis and Johnson counties were also quite low, about \$4,000 and \$1,600, respectively -- this compares with averages of \$14,200 per job for the U.S. and \$5,800 per job in the state of Missouri). The transportation, communication, and public utilities sector provided the largest average annual earnings per job in the county in 1986 at about \$30,000 (data for the mining sector, however, were not available for comparison).

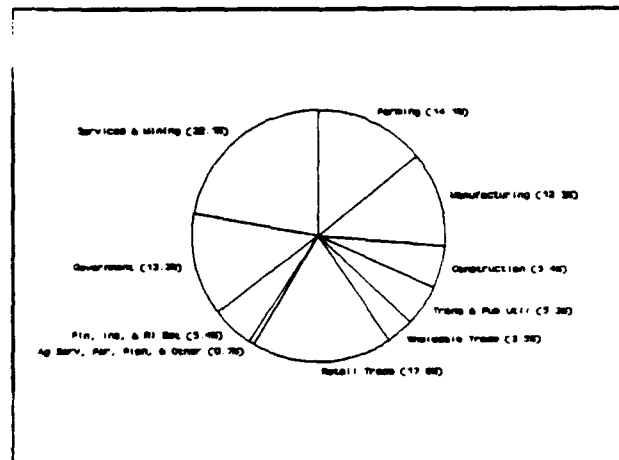


Figure 3.2-3
EMPLOYMENT BY INDUSTRY, 1986
HENRY COUNTY, MISSOURI

Unemployment rates in Johnson County have consistently remained below the national rate since 1970 (Figure 3.2-4). Although Pettis County was significantly below the national rate in the early 1970s, since 1975, the unemployment rate has typically been above that of the nation. Only in the last three years has Henry County exceeded the national unemployment rate; most recently, in 1987, unemployment in Henry County was 2.7 percentage points above that of the U.S.

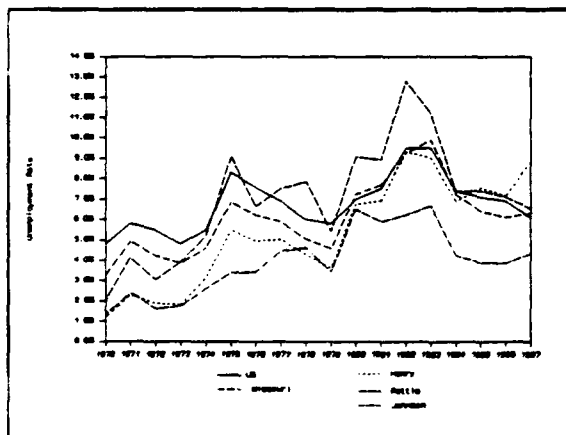


Figure 3.2-4
UNEMPLOYMENT RATE
1970-1987

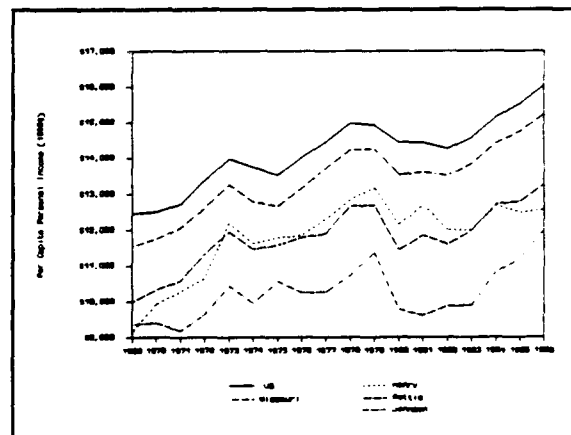


Figure 3.2-5
PER CAPITA PERSONAL INCOME
1969-1986

Per capita personal income has consistently been below both the state and national level since 1969. Of the three counties, income levels have typically been lowest in Johnson County and highest in Henry County throughout the past two decades. More recently, however, income levels have been highest in Pettis County (Figure 3.2-5).

3.2.2 Demographics and Housing

Warrensburg comprised 40 percent and Knob Noster made up 6 percent of Johnson County population in 1985 (Figure 3.2-6). The county population increased by an average of 1.7 percent annually during the 1960s, and by 1.4 percent during the 1970s. Since 1980, however, the population of Johnson County has decreased slightly, according to the mid-decade estimate made by the U.S. Department of Commerce, Bureau of the Census. Warrensburg recorded an overall population increase between 1960 and 1985, growing at an average annual rate of 1.7 percent (Table 3.2-2). The population of Knob Noster, on the other hand, remained virtually unchanged over the same time period.

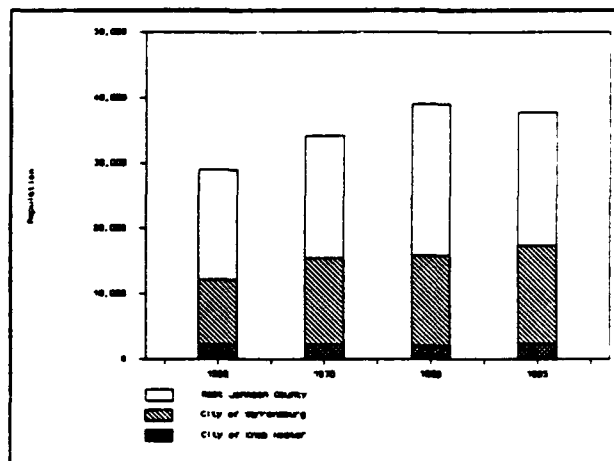


Figure 3.2-6
POPULATION, 1960, 1970, 1980, 1985
JOHNSON COUNTY, MISSOURI

The number of year-round housing units in the county increased by an average of 2.1 percent per year between 1960 and 1980. A similar increase was made in Warrensburg, while housing units in Knob Noster increased as well, but only at about half the average annual rates recorded in Warrensburg and Johnson County.

Sedalia is the largest city in Pettis County, comprising 59 percent of county population in 1985 (Figure 3.2-7). The number of county inhabitants increased very slightly between 1960 and 1985, while the city's population has shown a slight decrease, averaging -0.4 percent per year.

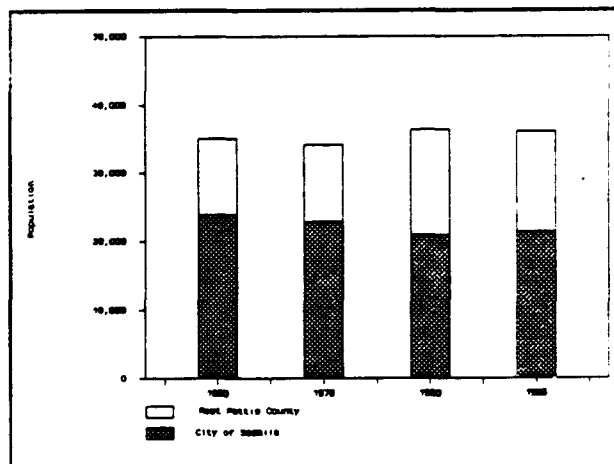


Figure 3.2-7
POPULATION, 1960, 1970, 1980, 1985
PETTIS COUNTY, MISSOURI

Although the population of Sedalia showed a slight decrease between 1960 and 1985, the total number of year-round housing units increased between 1960 and 1980. At the same time, the number of housing units in the county also increased at an average annual rate of 0.9 percent

Windsor made up 15 percent of the population of Henry County in 1985 (Figure 3.2-8). The population of Windsor increased by an average of 0.5 percent annually between 1960 and 1985, while the county population remained relatively unchanged.

Table 3.2-2

HISTORIC DEMOGRAPHIC INDICATORS FOR HENRY, JOHNSON,
AND PETTIS COUNTIES, AND CITIES OF WINDSOR,
KNOB NOSTER, WARRENSBURG, AND SEDALIA, MISSOURI

	1960	1970	1980	1985 [1]	Average Annual Change
POPULATION					
Henry County	19,226	18,451	19,672	19,900	0.1%
City of Windsor	2,714	2,778	3,058	3,058	0.5%
Johnson County	28,981	34,172	39,059	37,800	1.1%
City of Knob Noster	2,292	2,264	2,040	2,300	0.0%
City of Warrensburg	9,889	13,125	13,807	15,100	1.7%
Pettis County	35,120	34,137	36,378	36,100	0.1%
City of Sedalia	23,874	22,847	20,927	21,377	-0.4%
HOUSING [2]					
Henry County	7,649	7,758	8,855	NA [3]	0.7%
City of Windsor	1,086	1,181	1,437	NA	1.4%
Johnson County	9,159	10,558	13,897	NA	2.1%
City of Knob Noster	725	848	907	NA	1.1%
City of Warrensburg	2,952	3,718	4,531	NA	2.2%
Pettis County	12,719	12,919	15,262	NA	0.9%
City of Sedalia	8,672	8,881	9,425	NA	0.4%

[1] Based on number of sewer hook-ups.

[2] Year-round housing units.

[3] NA - data not available.

Source: U.S. Department of Commerce, Bureau of the Census, 1982ab, 1972, 1963 (decennial data);
U.S. Department of Commerce, Bureau of the Census, 1988 (1985 county-level data); USAF/
HQSAC, 1987 (1985 city-level data).

Although the county population recorded only a minor increase during the 25-year period between 1960 and 1985, the number of housing units increased by nearly 1,200 between 1960 and 1980. Almost 400 of the additional units were located in Windsor.

Although each of the three counties have posted overall population increases during the past three decades, population growth in Henry and Pettis counties has been relatively small relative to growth in Johnson County. Part of the historic population variation in the local communities and counties, particularly in Warrensburg and Johnson County, was probably due to changes in employment levels at Whiteman AFB. Annual

population growth between 1960 and 1985 in Johnson County averaged 1.1 percent, the same as the annual growth rate for the U.S., but greater than the 0.6 percent growth rate for Missouri during the same period. Johnson County was growing at a slightly faster pace during the 1960s and 1970s, but since 1980 the population has decreased by almost 1,300.

The number of year-round housing units increased in each of the cities and counties at a faster pace than the population. This trend includes Sedalia, where population declined between 1960 and 1980, but the number of housing units increased. None of the increases are very substantial, however, compared to national housing unit increases.

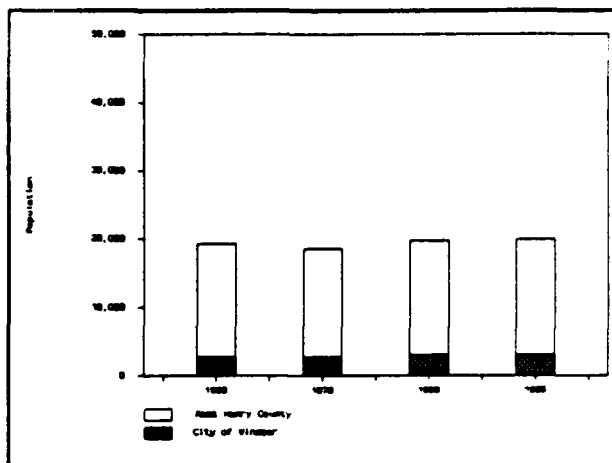


Figure 3.2-8
POPULATION, 1960, 1970, 1980, 1985
HENRY COUNTY, MISSOURI

3.3 PUBLIC SERVICES AND FINANCE

City of Knob Noster

The City of Knob Noster provides water services to area residents with a system capable of pumping 669,600 gallons per day (gpd) and a storage reservoir of 450,000 gallons (letter: Knob Noster Mayor Maurice Krause to Col. Thomas E. Kuenning, Jr., dated July 11, 1988). The city's current peak load of 250,000 gpd (USAF/HQSAC, 1987) therefore leaves excess capacity of 419,000 gpd. The city also provides sewerage treatment services with excess capacity of 180,000 gpd (letter: Mayor Krause to Col. Kuenning, July 11, 1988).

The city employs 5 full-time police but no full-time fire department personnel. There are also 10 full-time county sheriff personnel and 22 volunteer firefighters. The city has a fire insurance rating of 8 (on a scale of 1 to 10, with 1 the best and 10 the worst) within city limits and 10 in the surrounding unincorporated area (Missouri Division of Community and Economic Development, 1984).

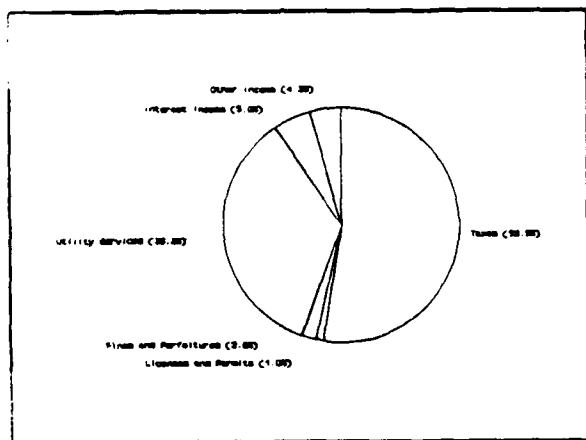


Figure 3.3-1
SOURCES OF REVENUE, 1987
CITY OF KNOB NOSTER, MISSOURI

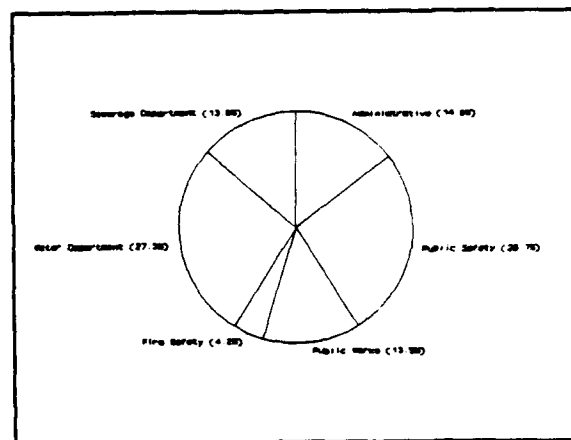


Figure 3.3-2
DISTRIBUTION OF EXPENDITURES, 1987
CITY OF KNOB NOSTER, MISSOURI

The City of Knob Noster obtained most of its \$295,884 in revenues from taxes and utility service charges in the six months ended June 30, 1988 (Figure 3.3-1). The major sources of tax revenue were from franchise, retail sales, motor vehicle sales, and gasoline taxes; property tax revenue was relatively minor in comparison. Income from all other sources represents approximately 12 percent of total revenues. The majority of the \$285,815 in expenditures during this period, were for public safety and water provision, while fire safety expenditures were relatively small (Figure 3.3-2). The city's fund balances increased during the period by \$10,669, however, the current level of funds was not available in the city's combined financial statement (City of Knob Noster, 1988).

Knob Noster R-VIII School District

The Knob Noster R-VIII School District has adequate facilities to accommodate an additional 225 pupils in grades K-6 and 225 pupils in grades 7-12 if enrollments are distributed evenly at each grade level (letter: Knob Noster R-VIII School District Superintendent John Brummel to Col. Thomas E. Kuenning, Jr., dated July 6, 1988).

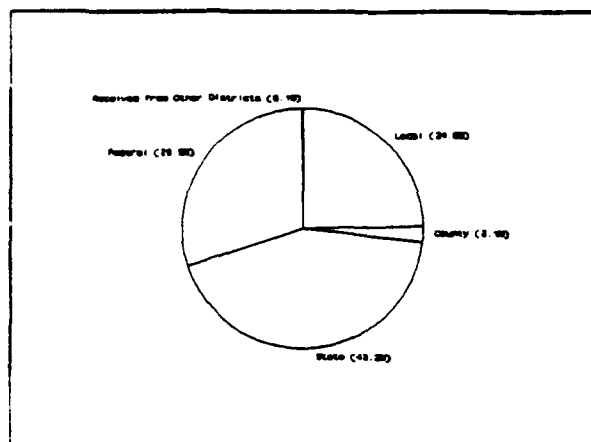


Figure 3.3-3
SOURCES OF REVENUE, 1987
KNOB NOSTER R-VIII SCHOOL DISTRICT

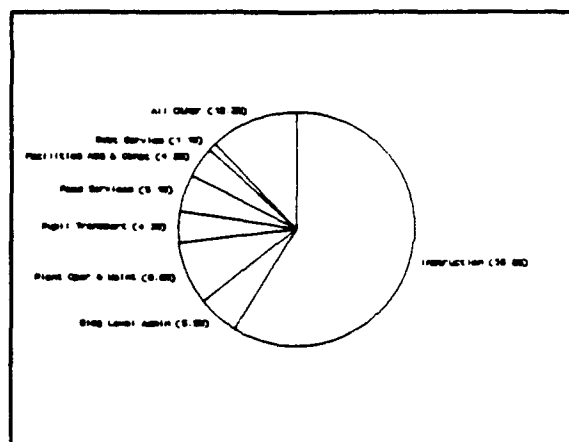


Figure 3.3-4
DISTRIBUTION OF EXPENDITURES, 1987
KNOB NOSTER R-VIII SCHOOL DISTRICT

Federal disbursements provided almost 30 percent of the \$4,856,329 in total cash receipts received by the district during the year ended June 30, 1987 (Figure 3.3-3). This relatively large share of federal revenues is attributable mainly to the large number of pupils within the district who are dependents of uniformed military personnel residing on federally-owned land at Whiteman AFB (USAF/HQSAC, 1987). The federal government distributes this revenue to local school districts in accordance with Public Law (PL) 874 since federally-owned housing does not provide local school districts with property tax revenues that would typically be collected from privately-owned housing. State and local sources provided most of the rest of the revenues received during the year. Total 1987 expenditures were \$4,966,640, nearly 60 percent of which went to instruction (Figure 3.3-4); total expenditures per pupil were \$3,161. Fund balances for the district decreased during the year by \$110,311 to \$3,586,333. These balances amounted to 72.2 percent of total expenditures for 1987 (Knob Noster R-VIII School District, 1987).

City of Sedalia

The City of Sedalia Water Department provides water services to area residents with a system capable of pumping 8,000,000 gpd. The city's current peak load of 5,652,000 gpd leaves excess capacity of 2,348,000 gpd. The city also provides sewerage treatment services with excess capacity of 2,000,000 gpd (USAF/HQSAC, 1987). City sewer treatment facilities have had some problems recently complying with requirements of the U.S. environmental Protection Agency's National Pollutant discharge Elimination System (each of the four city's sewer treatment facilities have had some compliance problems but reportedly this in Sedalia are more serious). To alleviate these problems, the city has contracted with an engineering firm to design a second trickling filter and improved sludge-handling equipment at the existing central plant. Construction is expected to be complete in approximately 18 months. Additional work is also contemplated for major upgrading which would increase capacity at the plant as well. This second phase work is expected to be complete in about four years (letter: Sedalia Mayor Larry G. Foster to Col. Thomas E. Kuenning, Jr., dated July 8, 1988).

The city employs 45 full-time police and 40 full-time fire department personnel. There are also 33 full-time county sheriff personnel and 61 volunteer firefighters. The city has a fire

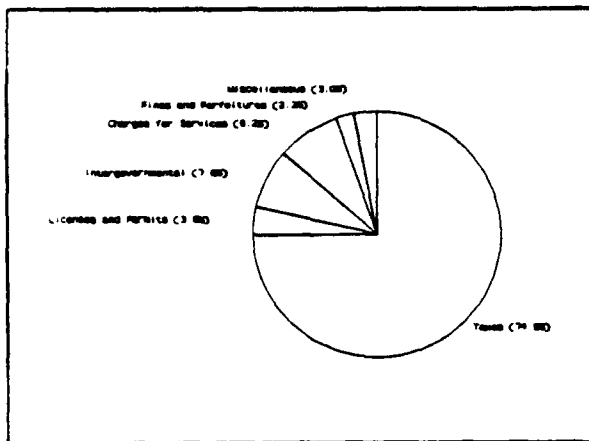


Figure 3.3-5
SOURCES OF REVENUE, 1987
CITY OF SEDALIA, MISSOURI

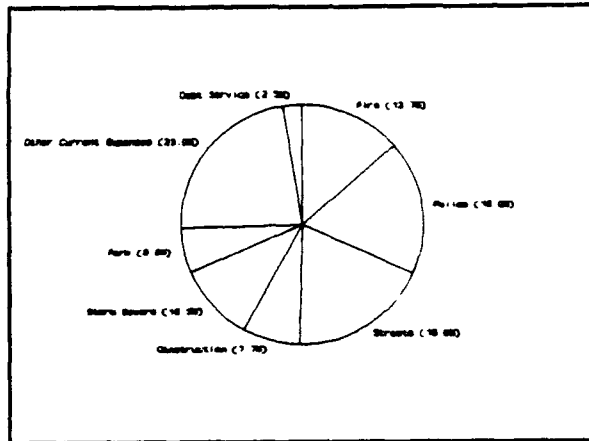


Figure 3.3-6
DISTRIBUTION OF EXPENDITURES, 1987
CITY OF SEDALIA, MISSOURI

insurance rating of 5 within city limits and 7 to 9 in the surrounding unincorporated area (Missouri Division of Community and Economic Development, 1987a).

In the City of Sedalia, tax collections accounted for nearly 75 percent of the \$6,555,282 in revenues received during the year ended June 30, 1987 (Figure 3.3-5). Most of the taxes collected were from sales, property, and franchise taxes. The majority of expenditures, which amounted to \$6,763,688, were for streets, police and fire protection, and storm sewers (Figure 3.3-6). Fund balances for the city decreased during the year by \$208,406 to \$1,222,208, representing 18.1 percent of total 1987 expenditures (City of Sedalia, 1987).

Sedalia #200 School District

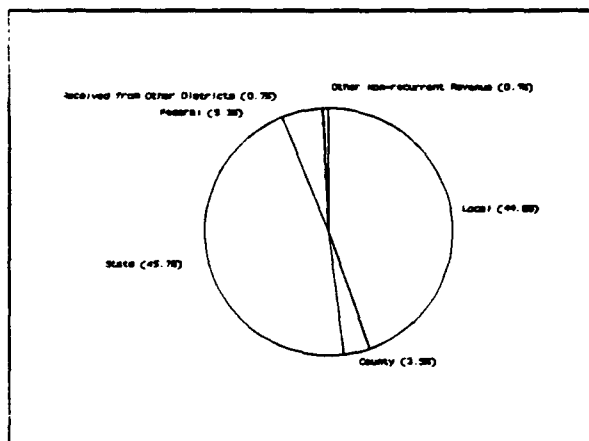


Figure 3.3-7
SOURCES OF REVENUE, 1987
SEDALIA #200 SCHOOL DISTRICT

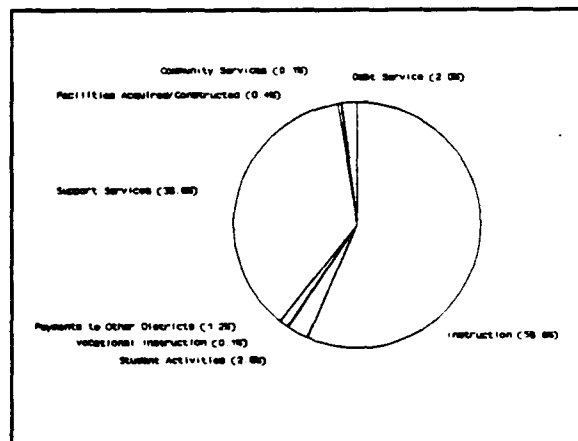


Figure 3.3-8
DISTRIBUTION OF EXPENDITURES, 1987
SEDALIA #200 SCHOOL DISTRICT

The Sedalia #200 School District has adequate facilities to accommodate an additional 414 pupils in grades K-5 (letter: Sedalia #200 School District Assistant Superintendent Bob Griffey to Col. Thomas E. Kuenning, Jr., dated July 5, 1988). There is also additional capacity for 299 pupils at the middle school level and 394 pupils at the high school level (USAF/HQSAC, 1987). Recently, the district succeeded in passing a tax levy increase to finance the construction of two new elementary schools. Although the two new schools will replace two existing schools, they will be larger and provide an overall increase in the district's capacity at the elementary school level (letter: Assistant Superintendent Griffey to Col. Kuenning, July 5, 1988).

State and local sources provided most of the \$11,835,388 in total revenues received by the district during the year ended June 30, 1987 (Figure 3.3-7). Total expenditures of \$11,829,481 were made during the year, over 55 percent of which went to instruction (Figure 3.3-8). Total expenditures per pupil were \$3,300 for the same period. Fund balances for the district increased during the year by \$5,907 to \$1,626,448, representing 13.7 percent of total expenditures (Sedalia #200 School District, 1987).

City of Warrensburg

The Missouri Cities Water Company provides water services to Warrensburg area residents with a system capable of pumping 3,000,000 gpd and storage capacity of 250,000 gallons. The city's current peak load of 2,500,000 gpd leaves excess capacity of 500,000 gpd (USAF/HQSAC, 1987). The City of Warrensburg provides sewerage treatment services from three plants. The plant that would serve the proposed 801 housing site has excess capacity of 190,000 gpd (letter: Warrensburg Mayor Robert A. Ulrich to Col. Thomas E. Kuenning, Jr., dated July 13, 1988).

The city employs 21 full-time police and 14 full-time fire department personnel. There are also 13 full-time county sheriff personnel and 17 volunteer firefighters. The city has a fire insurance rating of 6 within city limits and 8 to 9 in the surrounding unincorporated area (Missouri Division of Community and Economic Development, 1986).

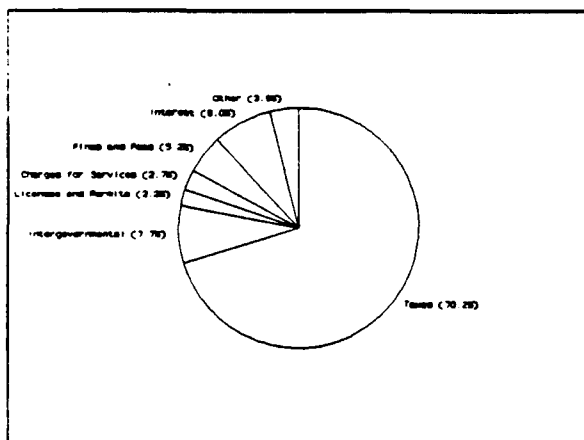


Figure 3.3-9
SOURCES OF REVENUE, 1987
CITY OF WARRENSBURG, MISSOURI

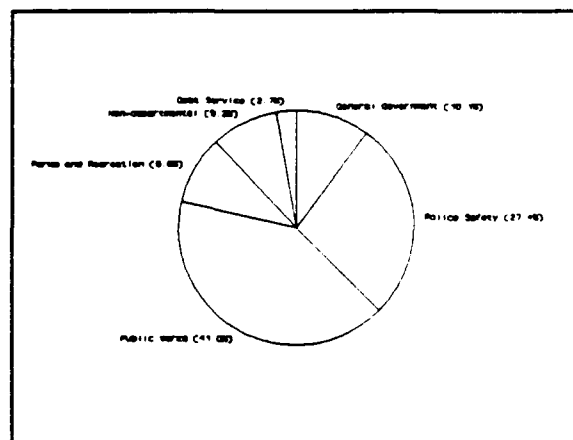


Figure 3.3-10
DISTRIBUTION OF EXPENDITURES, 1987
CITY OF WARRENSBURG, MISSOURI

Tax collections accounted for over 70 percent of the \$2,888,740 in revenues received by the City of Warrensburg during the year ended September 30, 1987 (Figure 3.3-9). Interest income and intergovernmental revenues provided an additional 15.7 percent of the total revenues. The largest portions of the \$3,073,627 in 1987 expenditures were spent on public works and public safety (Figure 3.3-10). Fund balances decreased during the year by \$184,887 to \$4,153,810, but were still 135.1 percent of total city expenditures (City of Sedalia, 1987).

Warrensburg R-VI School District

The Warrensburg R-VI School District has adequate facilities to accommodate an additional 220 pupils in grades K-5, and 300 students in grades 9-12. In grades 6-8, however, existing facilities are currently slightly above capacity; the Warrensburg Middle School was designed for 500 pupils, but the district anticipates 1988-89 enrollments will be approximately 515 (letter: Warrensburg R-VI School District Superintendent Michael W. Jinks to Col. Thomas E. Kuenning, Jr., dated July 7, 1988).

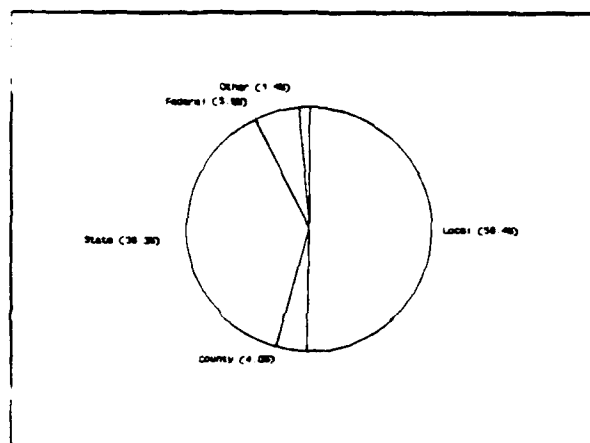


Figure 3.3-11
SOURCES OF REVENUE, 1987
WARRENSBURG R-VI SCHOOL DISTRICT

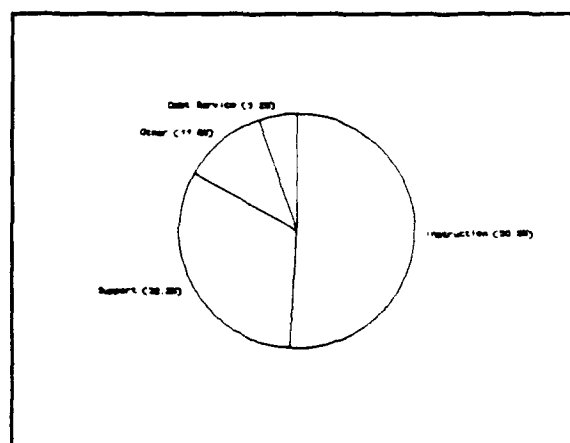


Figure 3.3-12
DISTRIBUTION OF EXPENDITURES, 1987
WARRENSBURG R-VI SCHOOL DISTRICT

Most of the \$8,494,247 in total revenue received by the district during the 1987-88 school year was provided by local sources (Figure 3.3-11). State sources also provided a large proportion of revenue to the district. Total expenditures of \$9,174,803 were made during the year, over 50 percent of which went to instruction (Figure 3.3-12). Total expenditures per pupil were \$3,929, assuming average daily attendance of 2,335 pupils, which was the reported 1987-88 school enrollment for the district (USAF/HQSAC, 1987). Fund balances for the district decreased during the year by \$680,556 to \$758,355. The fund balances were 8.3 percent of total expenditures (Warrensburg R-VI School District, 1987).

City of Windsor

The City of Windsor provides water services to area residents with a system capable of pumping 1,771,200 gpd and additional storage capacity of 415,000 gallons. The city's current peak load of 500,000 gpd leaves excess capacity of 1,271,200 gpd (letter: Michael H. Zimmerman, P.E. to Windsor Mayor Ben Mangina, dated July 11, 1988). The city also provides sewerage treatment services with excess capacity of 92,300 gpd (USAF/HQSAC, 1987).

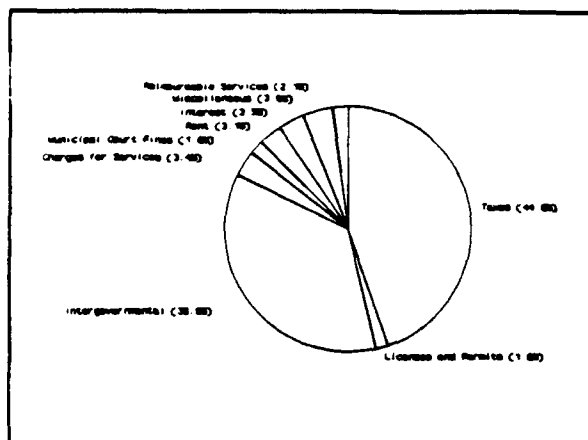


Figure 3.3-13
SOURCES OF REVENUE, 1987
CITY OF WINDSOR, MISSOURI

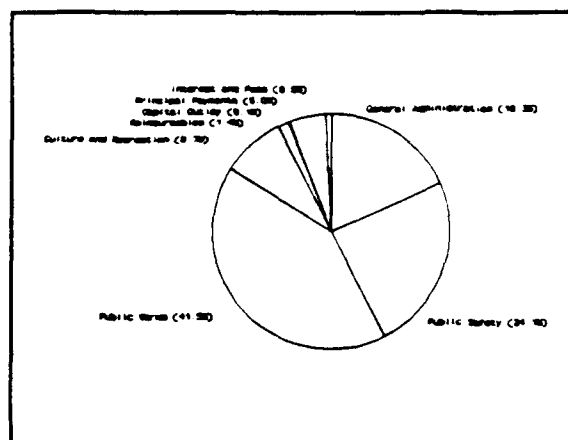


Figure 3.3-14
DISTRIBUTION OF EXPENDITURES, 1987
CITY OF WINDSOR, MISSOURI

The city employs 5 full-time police but no full-time fire department personnel. There are also 19 full-time county sheriff personnel and 15 volunteer firefighters. The city has a fire insurance rating of 8 within city limits and 10 in the surrounding unincorporated area (Missouri Division of Community and Economic Development, 1987b).

Tax collections accounted for almost 45 percent of the \$525,439 in revenues received by the City of Windsor during the year ended September 30, 1987 (Figure 3.3-13). Over 35 percent of total revenues were from intergovernmental revenues, however, intergovernmental revenues were actually distributions of sales, gasoline, and motor vehicle taxes (therefore taxes accounted for over 80 percent of the city's revenues). The majority of tax collections were from property and sales taxes. Total expenditures of \$607,859 were made during the year, most of which went to public works, public safety, and general administration (Figure 3.3-14). Fund balances for the city decreased over the period by \$82,420 to \$200,001, and were 32.9 percent of total expenditures made during the year (City of Windsor, 1987).

Henry County R-I School District

The Henry County R-I School District has adequate facilities to accommodate an additional 262 pupils in grades K-6 and 310 pupils in grades 7-12 (letter: Henry County R-I School District Superintendent Charles R. Snider to Col. Thomas E. Kuenning, Jr., dated July 8, 1988).

Local and state sources provided most of the \$2,109,550 in total revenues received by the district during the year ended June 30, 1987 (Figure 3.3-15). Total expenditures of \$2,058,284 were made during the year, approximately 40 percent of which went to instruction (Figure 3.3-16). Total expenditures per pupil were \$2,902 during the same period. Fund balances for the district increased during the year by \$51,266 to \$420,472, representing 20.4 percent of total expenditures (Henry County R-I School District, 1987).

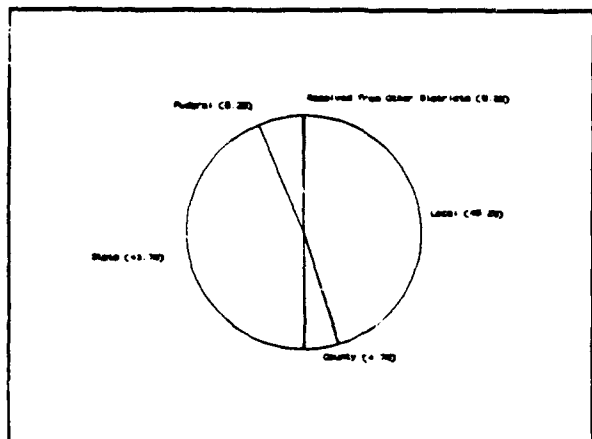


Figure 3.3-15
SOURCES OF REVENUE, 1987
HENRY COUNTY R-I SCHOOL DISTRICT

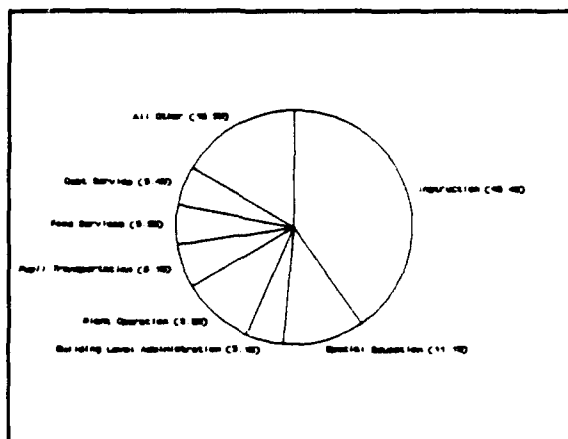


Figure 3.3-16
DISTRIBUTION OF EXPENDITURES, 1987
HENRY COUNTY R-I SCHOOL DISTRICT

3.4 PUBLIC HEALTH AND SAFETY

No potential threats to public health or safety have been identified by either the Air Force, current landowners, or municipal or county jurisdictions for any site proposed for the 801 housing program. No toxic waste dumps, buildings identified containing asbestos, underground storage tanks, or transformers with PCBs have been located on any site. A few of the sites do contain small debris dumps or sensitive improvements that would require special attention to establish or maintain safety standards.

Knob Noster

A hardened intersite communication system (HICS) cable crosses about one-third of the site (Figure 3.1-1); the U.S. Air Force maintains an easement that restricts surface excavations around this cable. Additionally, a small sewage lagoon (approximately 20 feet in diameter), associated with a former mobile home site, is located on the southeast quadrant of the site.

Sedalia

Two sets of high voltage power lines operated by the Missouri Public Service Company and the Central Electric Power Cooperative cross the Sedalia site proposed for the 801 housing program (Figure 3.1-2). A 50-foot easement on either side of the power lines is held by the power companies which must be kept free of development to facilitate regular and emergency power line maintenance. Both lines converge on a power substation located on an adjacent property.

Warrensburg

At the southern end of the King property of the proposed Warrensburg site, an east-to-west trending drainage gully into the East Fork of Post Oak Creek has been used as a private debris fill. Contained within the gully are five abandoned automobiles and assorted domestic refuse (furniture, wood, and garbage).

Windsor

No debris or hazardous waste has been identified on the Windsor site.

3.5 TRAFFIC

Regional access to Whiteman AFB is provided primarily by U.S. Highway 50, a four-lane divided east-west artery passing slightly north of the base (Figure 3.5-1). North-south regional access to the installation is somewhat limited. Although Missouri Highway 23 provides a link leading from slightly east of the base northward, currently it is a two-lane connection of limited capacity. One must travel approximately 20 miles east to the city of Sedalia to find a major north-south transportation route -- in the form of U.S. Highway 65.

The road network on Whiteman AFB is organized around two arteries, Arnold Avenue and Mitchell Avenue. Arnold Avenue provides basic north-south access along the eastern portion of the main base, acting as the primary connection between the northern portion of the base and the flight line, community center, and other major employment areas (Figure 3.5-2). Mitchell Avenue passes from the western edge of the main base eastward and southward, through accompanied personnel housing and the main dormitory area. A system of major east-west collector links connects the two main arteries, including 1st Street (Ramsey Road), 3rd Street, 5th Street, and 7th Street. Access to Arnold Avenue is through one of the two main gates on the installation, the Knob Noster gate. This gate lies on the northern edge of the base; it connects Arnold Avenue with Missouri Highway J, a two-lane road leading northward to the center of Knob Noster and U.S. Highway 50. Access to Mitchell Avenue, in turn, is provided by the Warrensburg gate, located on the western edge of the base at the intersection between Mitchell Avenue and Missouri Highway 132, the latter leading northward to U.S. Highway 50. Access to the base also is provided by the Windsor gate, located at the southwest corner of the base and currently functioning only part time. Traffic counts for Whiteman AFB gates are provided in Figure 3.5-2.

The transportation system on Whiteman AFB is important in the present context because traffic problems on the base can quickly spread into the network off base. A 1985 study of the roadway and parking on Whiteman AFB noted that although no serious problems in traffic flow were encountered, the general development of the southern portion of Whiteman AFB had introduced a need for changes in the base road network (Harland Bartholomew & Associates, Inc., 1985, pp.29-30). These suggested improvements include:

- o extending the Arnold Avenue and Mitchell Avenue arterial system southward to accommodate better the development that had occurred on that portion of the base;
- o improving 3rd Street or 7th Street to accommodate anticipated traffic diversion caused by the planned closing of 5th Street;
- o redesigning the Hospital Drive-Summit Drive area to improve traffic flow; and
- o installing a new gate at Summit Drive (to connect with a proposed extended and improved Missouri Highway 132) to serve increased employment in the core area of the installation, and/or a new Windsor gate (on an extension of Vandenberg Avenue) to serve operations along the flight line.

A subsequent study of the transportation network on Whiteman AFB examined three scenarios of future development (Harland Bartholomew & Associates, Inc., 1986, pp.25-32). For present purposes, the scenario of greatest interest is "Concept A," which emphasized major mission expansion and a concomitant increase in the use of the transportation network.

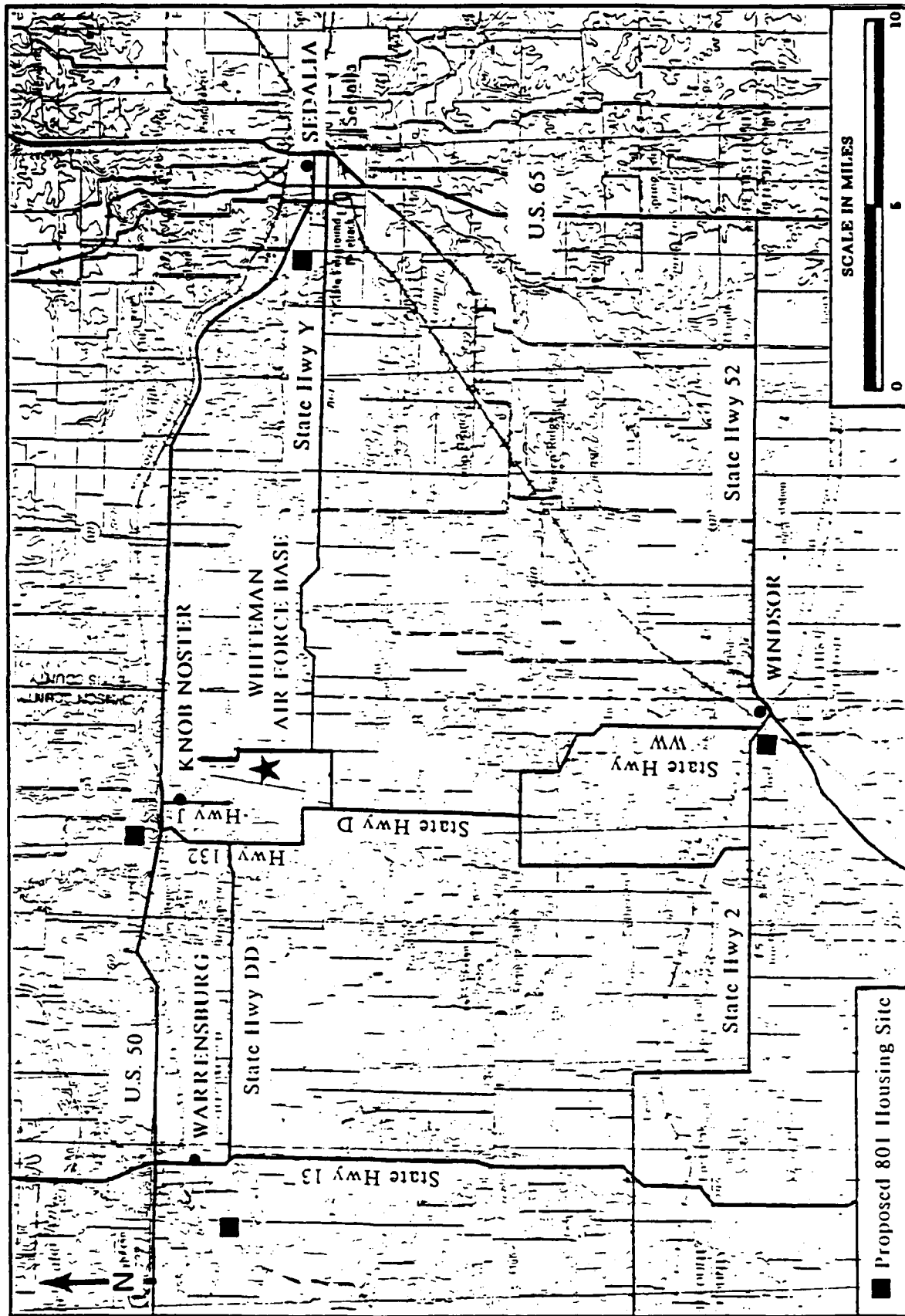


Figure 3.5-1
MAJOR ARTERIES IN THE VICINITY OF WHITEMAN AFB

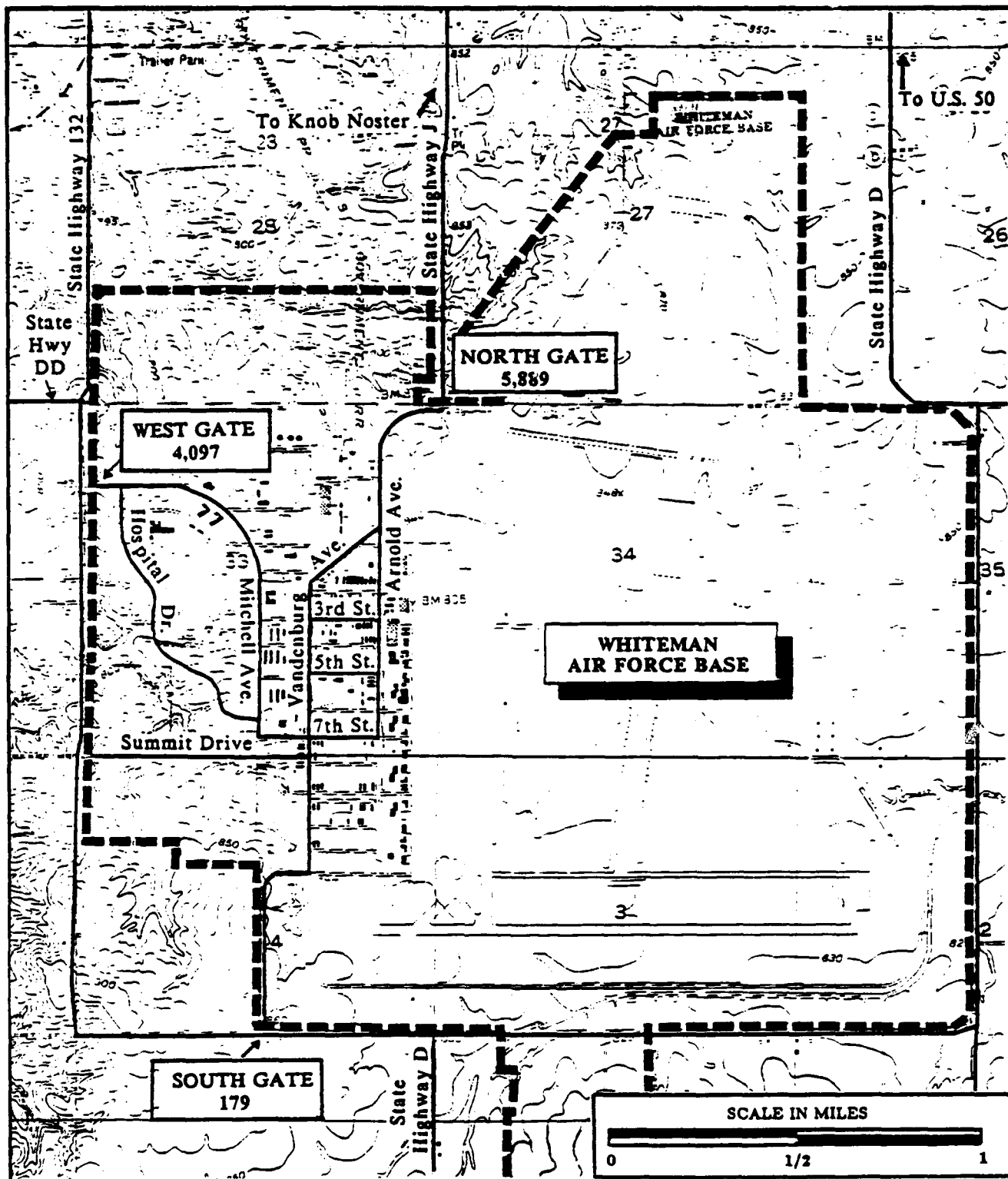


Figure 3.5-2
EXISTING 24 HOUR TRAFFIC AT WHITEMAN AFB ENTRANCE GATES

The expansion of family housing within this concept, however, was anticipated to occur off base to the southwest -- coinciding with none of the proposed locations considered in this study. Suggested transportation improvements under "Concept A" included the following:

- o upgrading 7th Street-Summit Drive into an arterial;
- o installing a new full-time gate at the intersection of Summit Drive and Missouri Highway 132;
- o extending Mitchell Avenue to 9th Street;
- o extending Arnold Avenue to Missouri Highway AB;
- o installing a new Windsor gate at the intersection of Missouri Highway AB and Arnold Avenue;
- o upgrading 1st Street and 3rd Street, as collectors, from Arnold Avenue to Mitchell Avenue.

A study of the transportation network near Whiteman AFB has been conducted by the U.S. Air Force in conjunction with the Missouri Highway Department, as part of the Defense Access Roads Program (DARP) (Hudson, 1988; Wiley, 1988). The following improvements have been suggested for FY1990:

- o increasing the width of Missouri Highway 132 from two to four lanes between the Warrensburg gate and Missouri Highway DD, roughly three blocks to the north of the gate;
- o improving and (probably) signalizing the intersection between Missouri Highways 132 and DD;
- o improving Missouri Highway DD between Whiteman AFB and Warrensburg, primarily through increasing shoulder width (to eight feet), changing grades in areas of limited visibility, and installing a left-turn at the school east of Warrensburg; and
- o improving the intersection of Missouri Highway 132 and U.S. Highway 50, bringing the former straight north from its current intersection with the business leg of U.S. Highway 50, and developing a multi-grade diamond interchange between the two links.

The realignment of Missouri Highway 132, and its improved intersection with U.S. Highway 50, will remove a dangerous bottleneck currently present in the form of an inadequate bridge over the railroad tracks on Missouri Highway 132 immediately south of U.S. Highway 50. Currently the State of Missouri is also considering improvements to Missouri Highway 23, north of U.S. Highway 50, tying it into the new diamond intersection (Missouri Highway and Transportation Department, 1988a). The state is also considering improvements to Missouri Highway 132 south of the Warrensburg gate, though the specific nature of these improvements have not been defined.

Additional improvements under DARP are also being considered for 1991 (Wiley, 1988). These upgrades include expanding Missouri Highway 132 between U.S. Highway 50 and Missouri Highway DD from two to four lanes, and installing a signal at the Warrensburg gate (although the status of these proposed improvements at present is uncertain).

The transportation network affecting each of the proposed locations of 801 housing is different for each parcel. The links and intersections expected to provide access to Whiteman AFB, as well as main commercial activities, are discussed below.

Knob Noster

The proposed location of 801 housing at Knob Noster lies immediately north of U.S. Highway 50 and west of the intersection between U.S. Highway 50 and Missouri Highway 132 -- roughly three miles northwest of Whiteman AFB and one mile northwest of the community of Knob Noster. Portions of Missouri Highway MM run north and east of the proposed housing site. Key transportation links, and traffic counts, are provided in Figure 3.5-3.

Sedalia

This site lies approximately one mile west of the Sedalia city limits, and roughly 18 miles east of Whiteman AFB. The northeastern corner of the housing tract terminates at U.S. Highway 50, with Missouri Highway Y forming part of the southern boundary of the parcel in two different places. Two light duty county roads -- along the northern border, and northeast of the tract -- round out the immediately accessible transportation network. The locations of relevant transportation links, and associated traffic volumes, are provided in Figure 3.5-4.

Warrensburg

The site at Warrensburg is about 13 miles west of Whiteman AFB, roughly two miles southwest of the town. The site lies immediately west of the end of Missouri Highway DD (Hale Lake Road), a two-lane road which leads directly to the base. U.S. Highway 50 passes approximately three miles to the north, with a number of possible connections (primarily, Warren, Holden, and Macguire streets) between the parcel and the highway passing through the community of Warrensburg. Important links, and associated traffic data, are provided in Figure 3.5-5.

Windsor

The proposed Windsor housing site is located within the western portion of the Windsor city limits, roughly 18 miles south of Whiteman AFB. The northeastern corner of the irregularly-shaped tract lies very close to Missouri Highway 2, which leads southeast to the center of Windsor. The most direct access to the base involves two main options: north on Missouri Highway D, to the southern edge of the installation; or north on Missouri Highway WW to Missouri Highway D, and then to the base. Relevant transportation links, and their current traffic volumes, are presented in Figure 3.5-6.

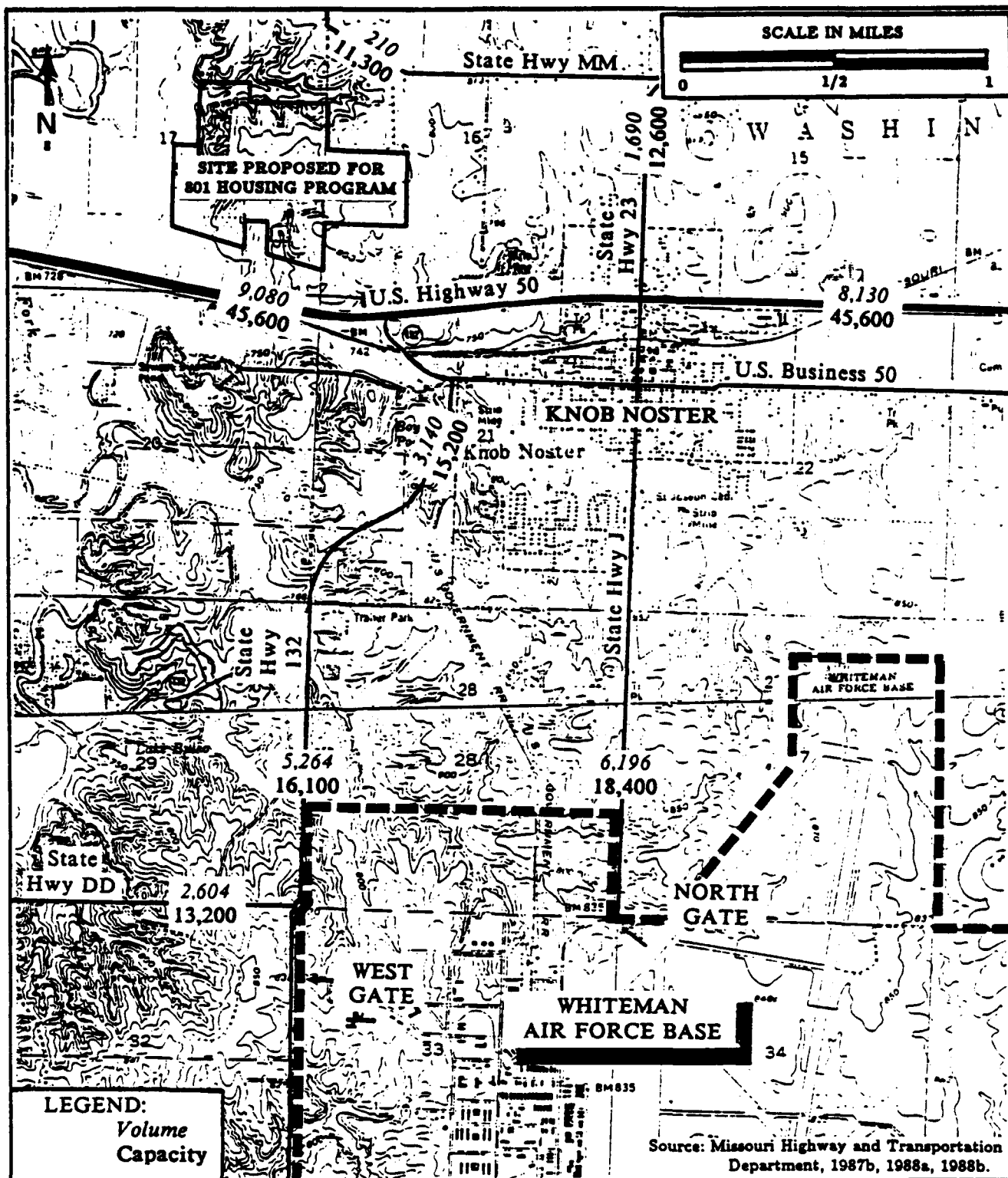


Figure 3.5-3
EXISTING 24 HOUR TRAFFIC IN THE VICINITY OF KNOB NOSTER SITE

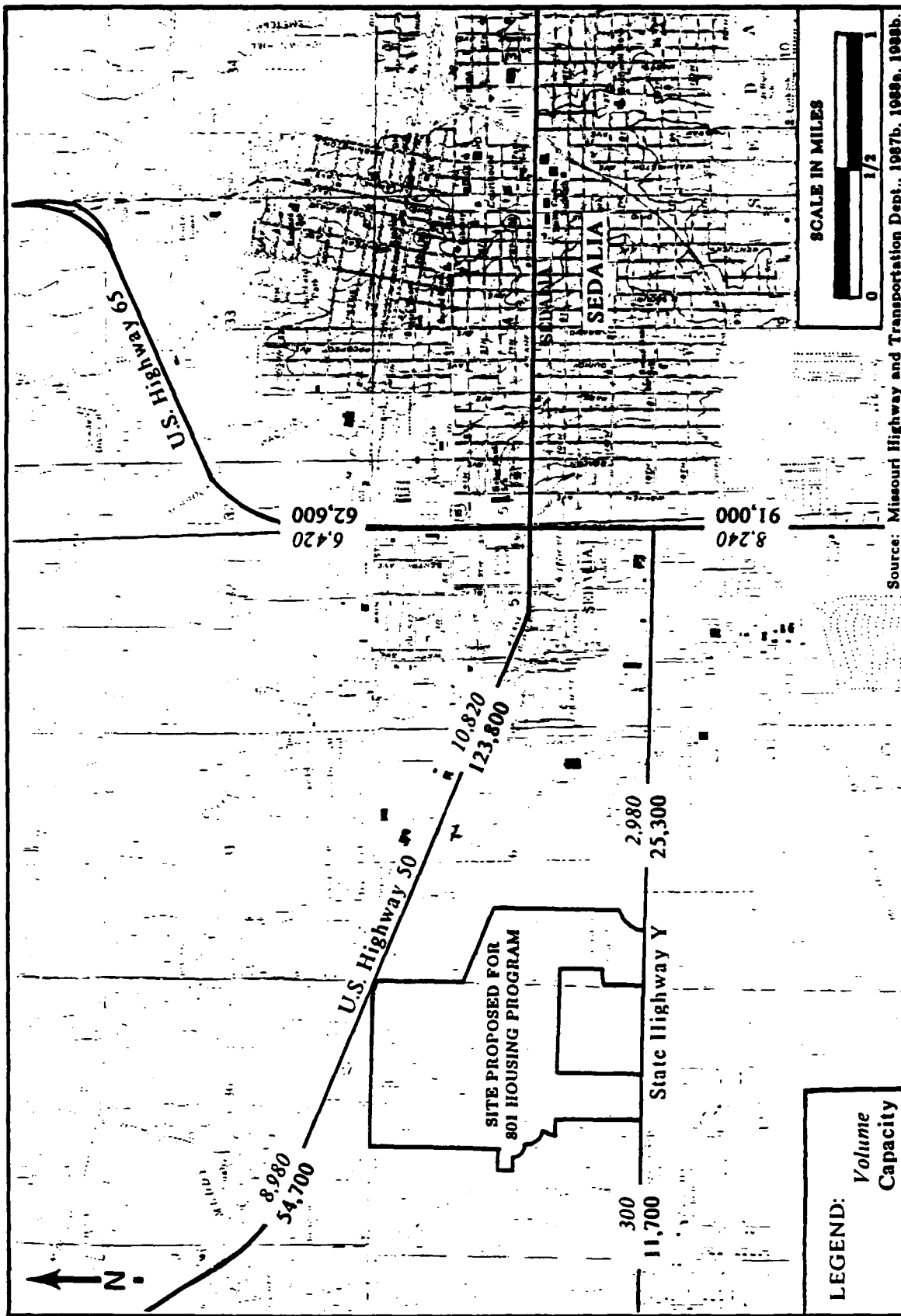


Figure 3.5-4
EXISTING 24 HOUR TRAFFIC IN THE VICINITY OF SEDALIA SITE

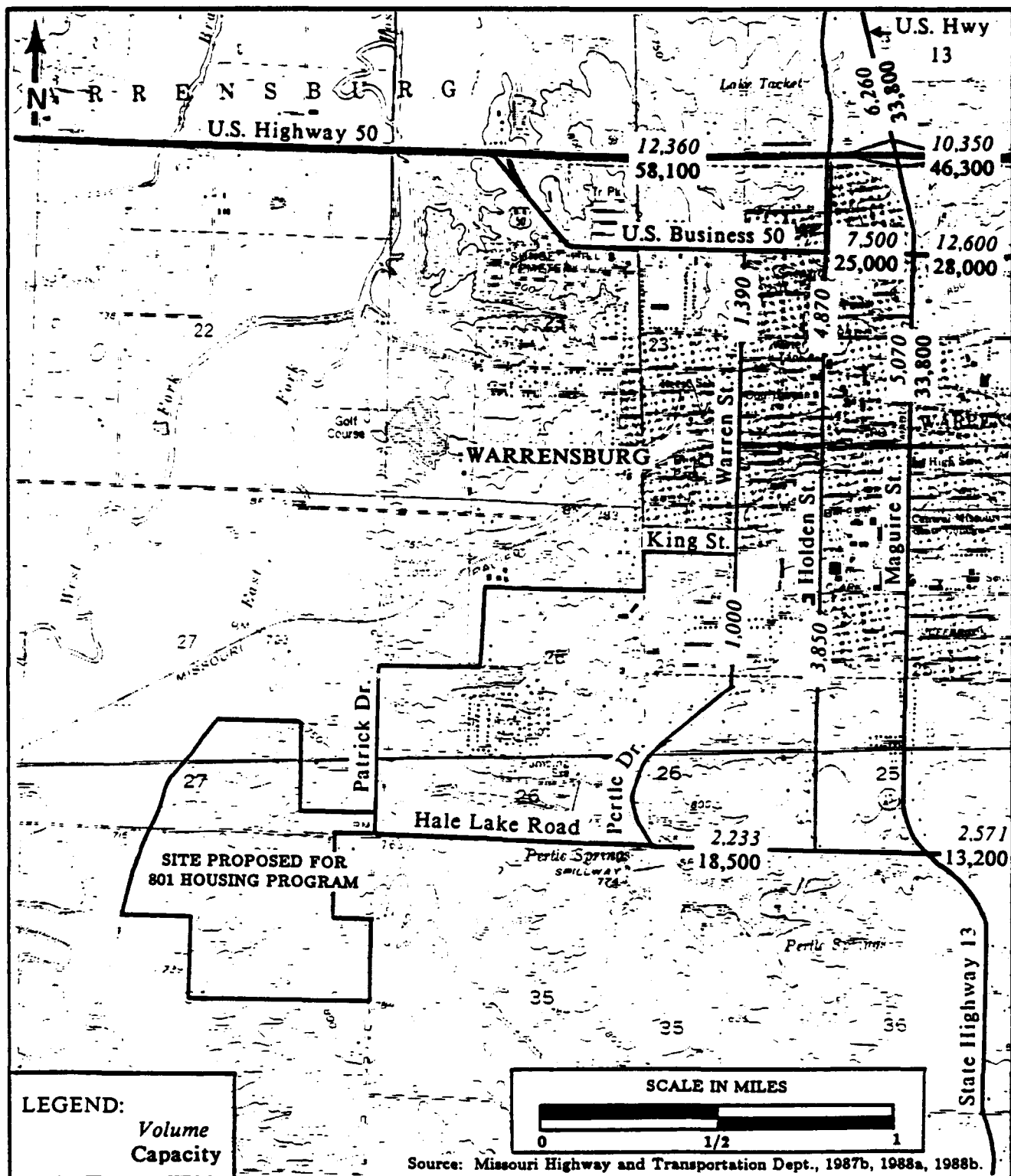


Figure 3.5-5
EXISTING 24 HOUR TRAFFIC IN THE VICINITY OF WARRENSBURG SITE

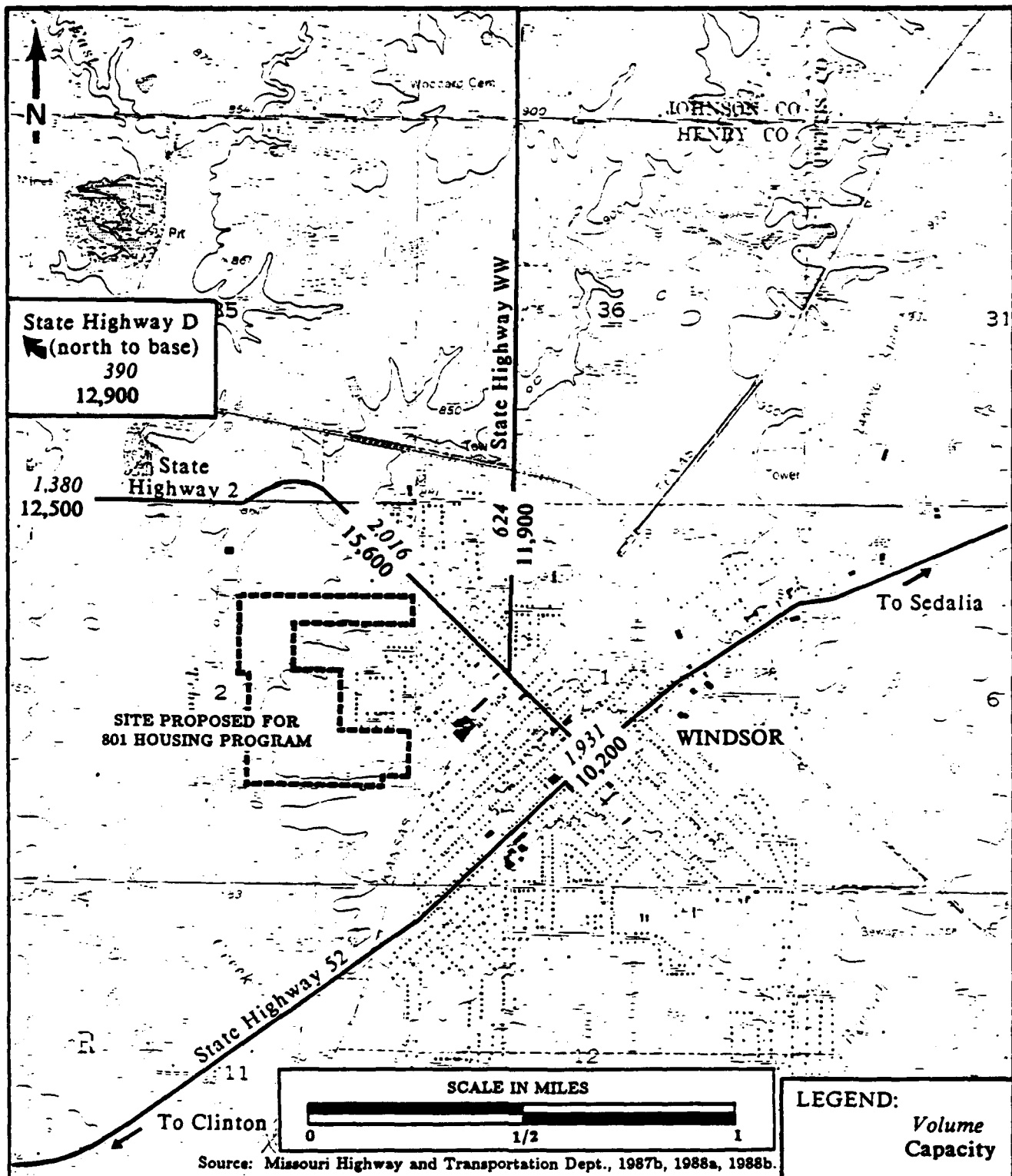


Figure 3.5-6
EXISTING 24 HOUR TRAFFIC IN THE VICINITY OF WINDSOR SITE

3.6 AIR QUALITY

The climate in the region of the four potential 801 housing sites is characterized by hot humid summer weather and cold dry winters. The air quality near each of the sites is affected by the regional weather patterns. Wind speed and direction are the meteorological factors which are most important in dispersing air pollutants. The prevailing wind direction is typically out of the south in the summer and out of the northwest during winter. Average monthly wind speeds within the region peak in February at about 12 mph.

The Missouri Air Conservation Commission has jurisdiction in the region to enforce National Ambient Air Quality Standards (NAAQS) and other regulations established under the Clean Air Act, as amended in 1977. These standards regulate maximum allowances for six contaminants; ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulate (TSP), and lead (Pb).

Henry, Johnson, and Pettis counties were in attainment of all NAAQS criteria pollutant levels in 1980 (U.S. Environmental Protection Agency, 1980).

The Missouri Air Conservation Commission is assisted by four regional air quality agencies in the populated areas of the state which are not in full compliance with NAAQS regulations, however, none of the proposed 801 housing sites are located within the jurisdiction of any of these agencies. The closest of the regional air quality agencies is located in Kansas City, approximately 60 to 80 miles northwest of the four housing sites.

3.7 NOISE

In the context of this study, noise is taken to mean unwanted sound created or observed during construction or operation of any of the components of the proposed action. Such noise may be intermittent or continuous, and may vary considerably depending on the type and number of noise sources, the sensitivity of the receptor, time of day, and distance. Also considered in the study is the compatibility of the proposed land uses with existing noise sources.

Noise contours are the mapped expression of average noise levels surrounding a single source of noise, such as a highway or airport. In the case of the Whiteman AFB airfield, the noise contours depict Day/Night Average Sound Level (L_{dn}), an index based on a 24-hour average of noise levels, with nighttime sound levels weighted. These levels are measured in "A-weighted" decibels (dBA), which simulate the response of the human ear to environmental noise. Although noise contour maps may not be available for all highways and aircraft patterns, noise impacts of these sources can be estimated based on the type of source and distance from receptor.

Knob Noster

There are presently three major noise sources near the Knob Noster site: aircraft using the Whiteman AFB airfield, vehicular traffic on U.S. Highway 50, and train traffic on the Missouri Pacific Railroad.

The noise exposure contours surrounding the Whiteman AFB airfield are depicted in Figure 3.7-1. The Whiteman AFB Comprehensive Plan (U.S. Air Force, 1986a) suggests that residential land uses are acceptable in areas with average noise exposure levels less than 65 dB; the Air Installation Compatible Use Zone (AICUZ) report (U.S. Air Force, 1976) also recommends that, wherever possible, residential uses should be located in areas with average noise exposure levels less than 65 dB.

Deployment of the new B-2 bomber at Whiteman AFB may intensify noise impacts associated with air traffic, particularly in the eastern sections of Knob Noster. But since the noise characteristics of the B-2 are classified, it is not possible at this time to predict noise contours associated with its deployment. Under current operations at Whiteman AFB, the proposed Knob Noster 801 housing site lies outside the 65 dB range of noise generated from the base airstrip.

The southern portion of the Knob Noster site slopes southward toward U.S. Highway 50 and the Missouri Pacific Railroad creating an amphitheater-like setting focussed on the highway. Although the highway is located more than 300 yards from the boundary of the site, some noise generated from highway traffic is projected and dispersed onto the site. Contour maps of highway noise are not available for the area, however the noise levels, not likely exceeding 65 dBA, would not encumber development of the site. The railroad, located on the south side of the highway, is set into a depression which partially shields the proposed site from noise generated by train traffic.

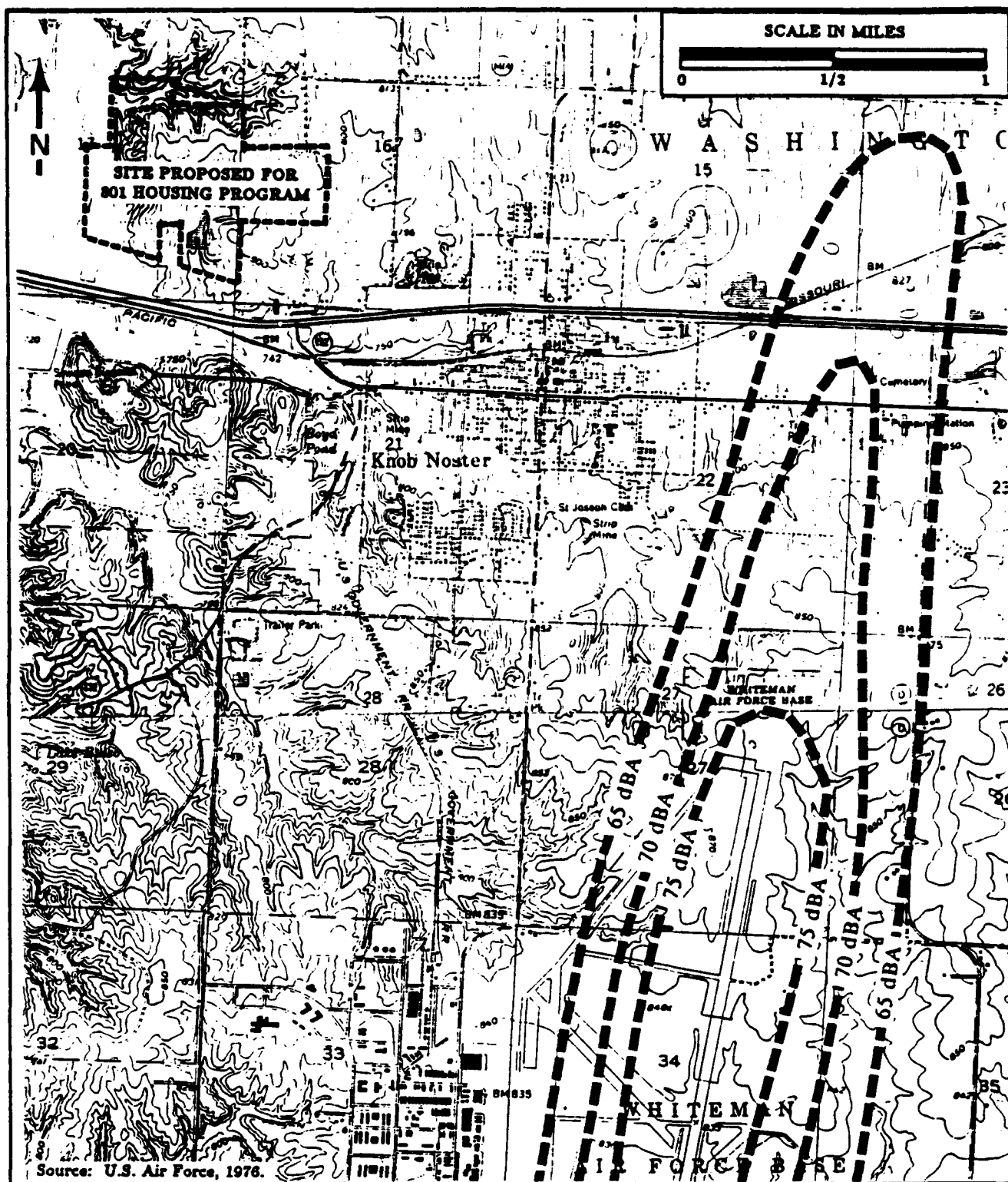


Figure 3.7-1
NOISE CONTOURS AT WHITEMAN AFB

Sedalia

The northeasternmost corner of the proposed 801 housing site in Sedalia fronts U.S. Highway 50, approximately one mile west of its intersection with Thompson Boulevard. Noise generated from traffic along this stretch of highway is projected onto the property for only a short distance.

Warrensburg

The Warrensburg site proposed for 801 housing development is unaffected by community noise generated by traffic or aircraft due to the distance of the site from such noise sources.

Windsor

The Windsor site, also, is unaffected by community noise generated by traffic or aircraft due to its distance from such noise sources.

3.8 EARTH RESOURCES

3.8.1 Geology and Topography

The structural geology underlying Whiteman AFB and the four proposed sites for 801 housing development is Paleozoic in age and the relatively horizontal strata are predominantly of the Pennsylvanian and Mississippian systems. In areas surrounding streams and riverbeds, recent (Quaternary) alluvium overlies the bedrock. No major faults or fracture zones have been mapped near the base or any of the proposed 801 housing sites (Missouri Geological Survey and Water Resources, 1961; Missouri Department of Natural Resources, 1979).

The base and proposed sites are located in the Osage Plains division of the Central Lowland physiographic province. The landscape consists of gently undulating hills, broadly eroded valleys, and dissected uplands. This physiographic region lies just below the southern limit of Pleistocene glaciation, and, therefore, was essentially unaffected by direct glacial geomorphological processes. The region did, however, receive significant amounts of loess -- fine textured wind-blown silt originating from the grinding action of glacial ice on rock which tends to produce fertile soils (White *et al.*, 1985).

Knob Noster

The Knob Noster site, as well as all of Whiteman AFB, is underlain by bedrock of the Cherokee group, a major rock unit of the Desmoinesian series of the Pennsylvanian system. The strata in the area consist of sandstone, siltstone, shale, underclay, limestone, and coal beds. The topography of the site is undulating with slopes tapering gradually to the south and more steeply to the west. The far western portion of the site lies in the flood plain of Clear Fork. Maximum relief is 110 feet; the highest elevation is approximately 830 feet in the northeastern area of the site and the lowest elevation, 720 feet, is in the Clear Fork floodplain.

Sedalia

The Sedalia site is located on bedrock of the Kinderhookian series of the Mississippian system. The three formations assigned to that series consist of a thin silty shale (Northview formation) overlying a dolomitic limestone (Sedalia formation) which covers another prominent limestone unit (Compton formation). The gently rolling topography of the site slopes westward toward Coon Creek with an elevation range of 100 feet, from 870 feet in the east to 770 feet in a tributary to Coon Creek.

Warrensburg

The site proposed for the 801 housing program near Warrensburg is located on bedrock of the Desmoinesian series of the Pennsylvanian system. The underlying strata consist of a succession of shale, limestone, clay, and coal beds. The limestone units here tend to be thick and persistent (State of Missouri, 1961). The topography of the site is rolling with slopes tapering gradually to the west at the bank of the channelized East Fork of Post Oak Creek. The western boundary of the site lies in the flood plain of the East Fork of Post Oak Creek. Maximum relief is eighty feet; the highest elevation is approximately 800 feet in the

southeastern corner of the site and the lowest elevation, 720 feet, is in the East Fork of Post Oak Creek streambed.

Windsor

Surficial geology underlying the Windsor site proposed for the 801 housing program belongs to the Desmoinesian series of the Pennsylvanian system. The strata are comprised of sandstone, siltstone, shale, clay, limestone, and coal beds. The topography of the site is relatively level, with a slight westwardly-draining depression of an intermittent tributary of the Tebo Creek drainage system. Maximum relief is 40 feet, ranging from 870 feet on eastern boundary and 850 feet in the northwest corner to slightly below 830 feet in the Tebo Creek system tributary.

3.8.2 Soils

The soil inventories discussed below are based on the Soil Conservation Service soil surveys of Henry, Johnson, and Pettis counties (Soil Conservation Service, 1976 and 1980; Soil Survey of Pettis County, 1988). Field work for the Henry County survey was completed in the period from 1956 to 1962; soil names and descriptions were approved in 1966. Field work for the Johnson County survey was conducted from 1972 through 1976 with classifications and nomenclature approved in 1977. The Pettis County soil survey is currently underway. Although the Henry and Johnson County surveys represent soil conditions of 1969 and 1977, respectively, land use, climate, vegetation, and other factors affecting soil formation on the sites have not been significantly altered since. The soil descriptions, therefore, can be considered valid for 1988.

Soils found on the study sites in the three county region are typically either shallow to moderately deep soils on rolling uplands formed in thin loess and underlying residuum derived from sandstone or shale (Hartwell-Deepwater or Mandeville-Norris-Bolivar soil association); or they are deep, nearly level, moderate to poorly drained formed on alluvium (Verdigris-Osage or Zook-Dockery-Blackoar soil association). Representative soils from both of these association types are found at each proposed site.

Soils from these association types may present limitations to building site development due to shrink-swell potential, low soil strength, shallow depth to bedrock, slope steepness, flooding, or high water table/wetness:

- o Shrink-swell potential -- potential for volume change in a soil with a loss or gain of moisture. Soils of the area tend to exhibit various degrees of shrinking of soil when dry and swelling of soil when wet. If construction procedures and maintenance do not anticipate and accommodate for these conditions (through proper design and installation), soils rated with moderate to high shrink-swell potential can damage roads, building foundations, and other structures.
- o Low strength -- soil is not strong enough to support loads/buildings;
- o Depth to rock -- bedrock too near the surface for specified use. Rippable bedrock can be excavated with a single-tooth ripping attachment on a tractor, but hard bedrock requires blasting;

- o Steepness -- slopes too steep to support buildings;
- o Flooding -- temporary inundation of soils and structures caused by overflowing streams or runoff from adjacent slopes;
- o Wetness/Seasonal High Water Table -- a thick zone of free water in the soil near the soil surface (within a depth of six feet and lasting longer than one month per year).

Knob Noster

Eight different soil series have been identified on the Knob Noster site proposed for the 801 housing program. Figure 3.8-1 depicts the distribution of these soils; Table 3.8-1 describes their principal characteristics. Of these soils, four series (Bremer, Lightning, Macksburg, and Norris) exhibit limitations considered severe for building site development due to varying combinations of shrink-swell, low strength, wetness, flooding, or slope characteristics. These soils cover approximately 60 percent of the site. Soils of the remaining 40 percent of the site present moderate limitations to building site development.

The Bremer and Lightning series consist of deep, poorly drained, slowly permeable soils on floodplains and low terraces that have formed on the recent alluvial deposits of Clear Fork. These soils are subject to occasional flooding, have low strength, and shrink and swell.

Soils of the Norris and Mandeville series are well drained and moderately permeable that have formed in residuum weathered from sandstone, siltstone, and soft shale. The Mandeville series is found on broad ridgetops and uplands while the Norris series tends to occupy steeper backslopes. Surface runoff is rapid for the Norris series and although the surface layer is friable and easily tilled, site development is restricted by its steep slope and the shale bedrock located below a depth of 14 inches.

The remaining soil series (Barco, Deepwater, Macksburg, and Weller) on the site are generally deep, moderately well drained soils on ridgetops and uplands formed in silty loess over residuum weathered from sandstone and shale. Runoff from these soils tends to be medium to slow and shrink-swell potential is low to moderate. Only the Macksburg series presents severe limitation to building development due to its moderate-to-high shrink-swell potential.

Sedalia

Seven soil series are found at the proposed 801 housing site near Sedalia (Figure 3.8-2 and Table 3.8-2). Of these seven, four series (Greenton, Grundy, Hoberg, and Macksburg) present severe limitations to building development due to wetness and shrink-swell characteristics. The soils cover 50 to 60 percent of the site while the soils of the remaining acreage present moderate limitations to building.

The Hoberg and Eldon series consist of deep, moderately to well drained soils formed in residuum weathered from cherty limestone, or shale and sandstone on uplands and terraces. These series are found mostly on the far western portion of the site, near Coon Creek; the Hoberg series presents severe limitations to building due to wetness.

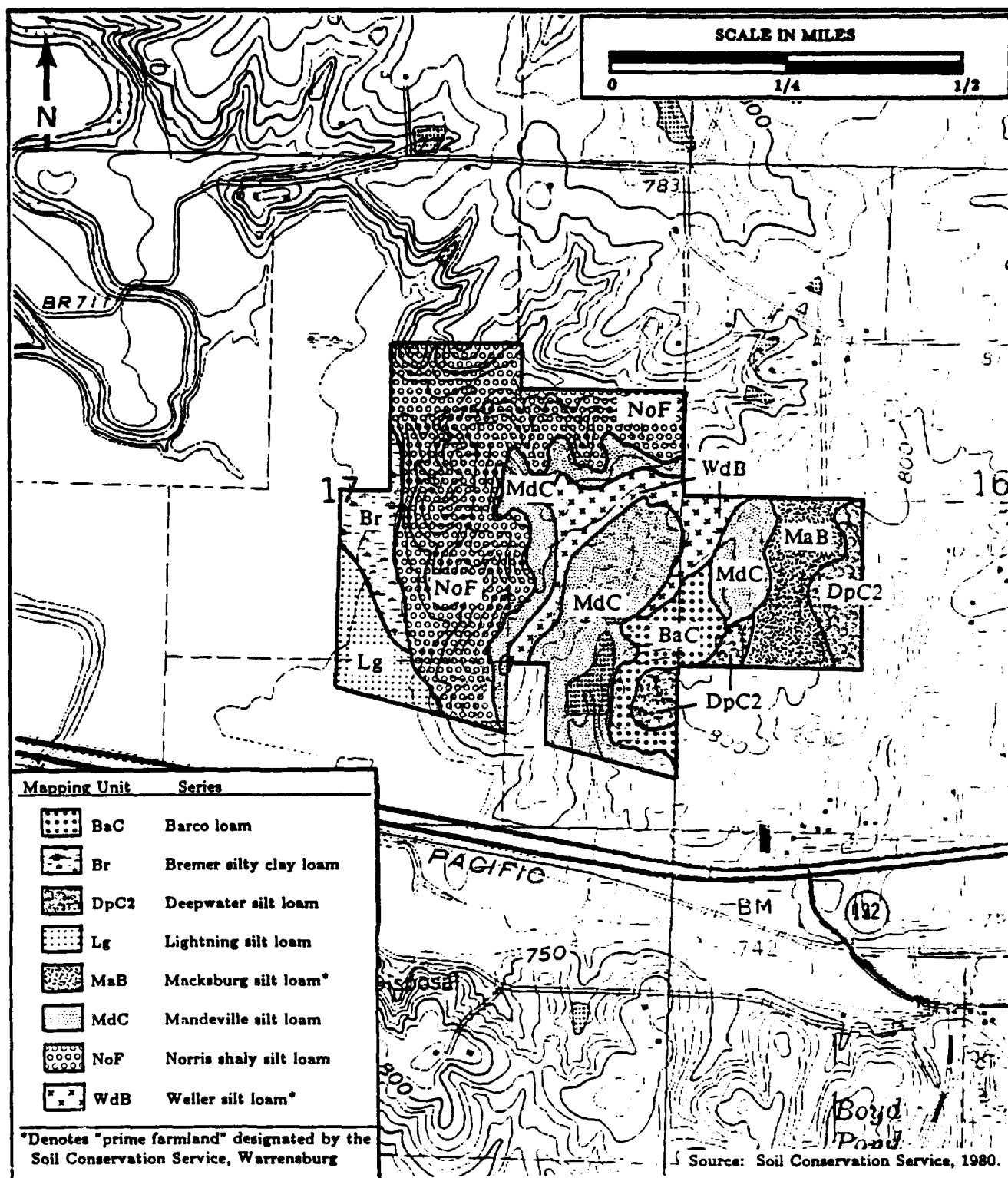


Figure 3.8-1
SOILS AT SUBSERIES LEVEL AT KNOB NOSTER SITE

Table 3.8-1
SOIL CHARACTERISTICS AT KNOB NOSTER SITE

Mapping Unit	Series	Slopes	Shrink-Swell Potential	Runoff	Permeability (inches/hr)	Building Site Limitations
BaC	Barco loam	5-9%	low-moderate	medium	2.0-6.0	moderate: shrink-swell, low strength
Br	Bremer silty clay loam	0-2%	moderate-high	slow	0.2-0.6	severe: wetness, shrink-swell, low strength
DpC2	Deepwater silt loam	5-9%	low	medium	0.6-2.0	moderate: shrink-swell, low strength
Lg	Lightning silt loam	0-2%	moderate-high	very slow	0.06-0.6	severe: floods, shrink-swell, low strength
MaB	Macksburg silt loam	1-4%	moderate-high	slow	0.6-2.0	severe: shrink-swell
McC	Mandeville silt loam	5-9%	low	medium	0.6-2.0	moderate: low strength, depth to rock
NoF	Norris shaly silt loam	14-35%	low	rapid	0.6-2.0	severe: depth to rock, slope
WdB	Weller silt loam	2-5%	moderate-high	medium	0.6-2.0	moderate: shrink-swell, low strength

Source: Soil Conservation Service, 1980.

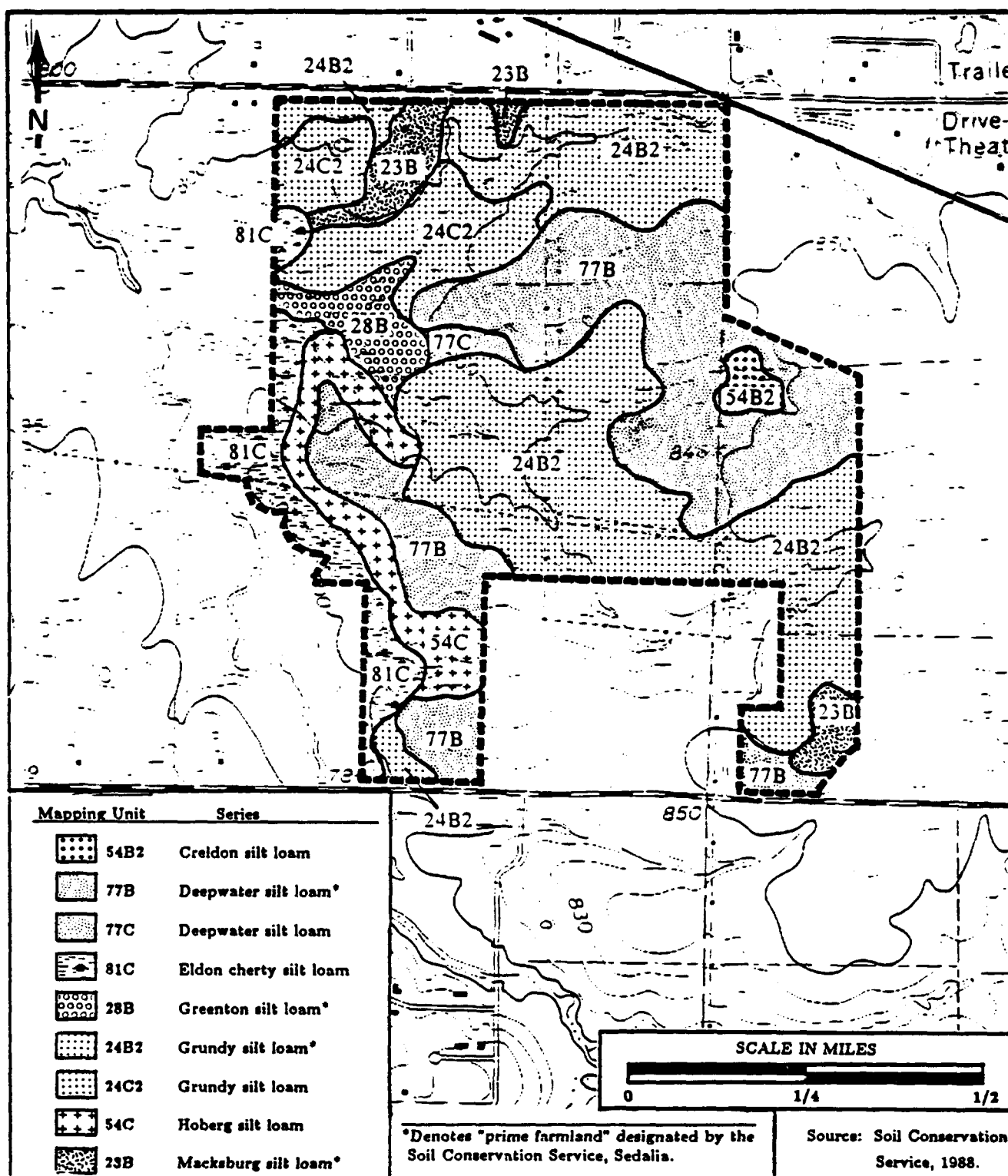


Figure 3.8-2
SOILS AT SUBSERIES LEVEL AT SEDALIA SITE

Table 3.8-2
SOIL CHARACTERISTICS AT SEDALIA SITE

Mapping Unit	Series	Slopes	Shrink-Swell Potential	Runoff	Permeability (inches/hr)	Building Site Limitations
5482	Credon silt loam	2-5%	low-moderate	medium	0.6-2.0	moderate-severe: wetness, shrink-swell
77B	Deepwater silt loam	2-5%	low-moderate	medium	0.6-2.0	moderate: shrink-swell, low strength
77C	Deepwater silt loam	5-9%	low-moderate	medium	0.6-2.0	moderate: shrink-swell, low strength
81C	Eldon cherty silt loam	3-9%	low-moderate	medium	2.0-6.0	moderate: shrink-swell
288	Greenton silt loam	2-5%	moderate	medium	0.2-0.6	severe: wetness, shrink-swell
2482	Grundy silt loam	2-5%	moderate-high	rapid	0.2-0.6	severe: wetness, shrink-swell
24C2	Grundy silt loam	5-9%	moderate-high	rapid	0.2-0.6	severe: wetness, shrink-swell
54C	Hoberg silt loam	5-9%	low	medium	0.6-2.0	severe: wetness
238	Macksburg silt loam	1-5%	moderate-high	medium	0.6-2.0	severe: wetness, shrink-swell

Source: Soil Conservation Service, 1988.

The Deepwater, Greenton, Grundy, and Macksburg series are generally deep soils on ridgetops and uplands formed in silty loess over residuum weathered from sandstone and shale. The series vary with respect to permeability, drainage, and runoff. The high potential for shrinking and swelling of the Greenton, Grundy, and Macksburg soils presents severe limitation to building development.

Warrensburg

Six soil series have been identified at the proposed Warrensburg site. Figure 3.8-3 shows the soil distribution and Table 3.8-3 describes principal characteristics of the soils at the subseries level. Four series on the site (Blackoar, Norris, Sampsel, and Snead) present limitations considered severe for building site development due to varying combinations of shrink-swell, low strength, wetness, flooding, or slope characteristics. These series cover approximately half the site. Soils of the remaining half pose moderate limitations to building site development.

The Blackoar series consist of deep, poorly drained, moderately permeable soils on bottom lands between streams and uplands. This series is restricted to recent alluvial deposits associated with the flood plain of the East Fork of Post Oak Creek. These soils are subject to occasional flooding and a seasonal high water table within a depth of one foot. This soil is not suited to buildings because of flooding, the seasonally high water table, and low strength.

Soils of the Norris series are well drained and moderately permeable that have formed in residuum weathered from soft shale on uplands. Surface runoff is rapid and although the surface layer is friable and easily tilled, site development is restricted by its steep slope and the shale bedrock located below a depth of 14 inches.

The Snead and Sampsel series are similar in that they consist of deep, somewhat moderately drained, slowly permeable soils on uplands. The Sampsel series formed in residuum weathered from alkaline or calcareous shale and the Snead series formed in calcareous shale and thin interbedded limestone. The Snead series tend to be on steeper slopes on the Warrensburg site (7-16 percent) resulting in a more rapid runoff than the Sampsel soils. Limitations to building on these series are due to high shrink-swell potential, low strength, and depth to shale bedrock or thin layers of limestone bedrock.

The remaining soil series on the site (Bolivar and Deepwater series) are generally deep, moderately well drained soils on ridgetops and uplands formed in silty loess over residuum weathered from sandstone and shale. Runoff from these soils tend to be medium and shrink-swell potential is low to moderate.

Windsor

Soils representing five different series have been identified on the proposed 801 housing site near Windsor (Figure 3.8-4 and Table 3.8-4). Three of these series (Hartwell, Lightning, and Verdigris) present severe limitations to building development due to flooding, low strength, and shrink-swell characteristics. These soils cover approximately 55 percent of the site; the remaining 45 percent of the site consists of soils posing slight or moderate building limitations.

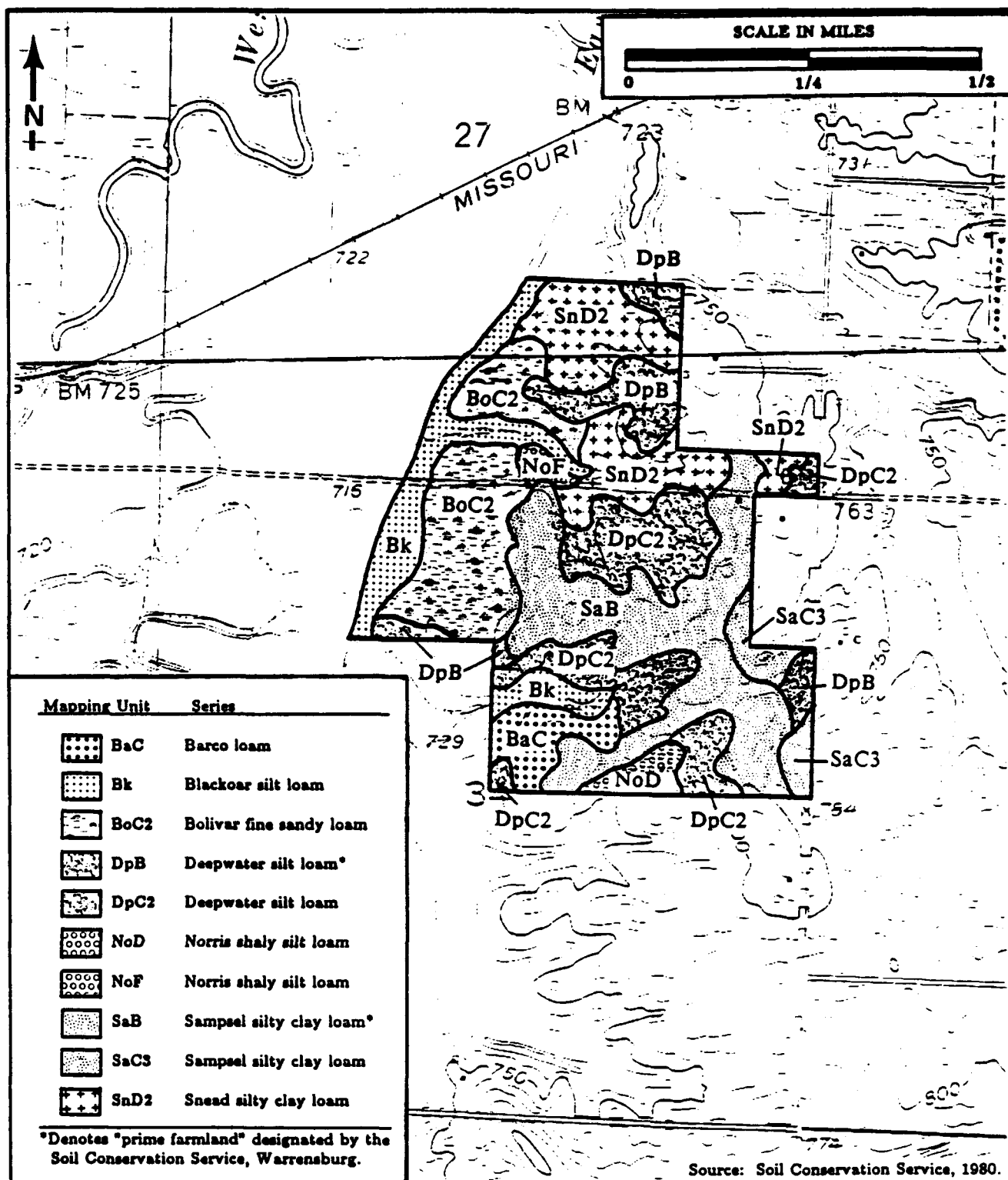


Figure 3.8-3
SOILS AT SUBSERIES LEVEL AT WARRENSBURG SITE

Table 3.8-3

SOIL CHARACTERISTICS AT WARRENSBURG SITE

Mapping Unit	Series	Slopes	Shrink-Swell Potential	Runoff	Permeability (inches/hr)	Building Site Limitations
BaC	Barco loam	5-9%	low-moderate	medium	2.0-6.0	moderate: shrink-swell, low strength
Bk	Blackoar silt loam	0-2%	low	slow	0.6-2.0	severe: floods, wetness
BoC2	Bolivar fine sandy loam	5-9%	low-moderate	medium	0.6-2.0	moderate: shrink-swell, low strength
Dp8	Deepwater silt loam	2-5%	low	medium	0.6-2.0	moderate: shrink-swell, low strength
DpC2	Deepwater silt loam	5-9%	low	medium	0.6-2.0	moderate: shrink-swell, low strength
HoD	Morris shaly silt loam	4-14%	low	rapid	0.6-2.0	moderate-severe: depth to rock, slope
HoF	Morris shaly silt loam	14-35%	low	rapid	0.6-2.0	severe: depth to rock, slope
SoB	Sampsel silty clay loam	2-5%	moderate-high	medium	0.2-0.6	severe: shrink-swell, low strength
SoC3	Sampsel silty clay loam	5-9%	moderate-high	medium	0.2-0.6	severe: shrink-swell, low strength
SoD2	Snead silty clay loam	7-16%	moderate-high	rapid	0.2-0.6	severe: shrink-swell, wetness, depth to rock

Source: Soil Conservation Service, 1980.

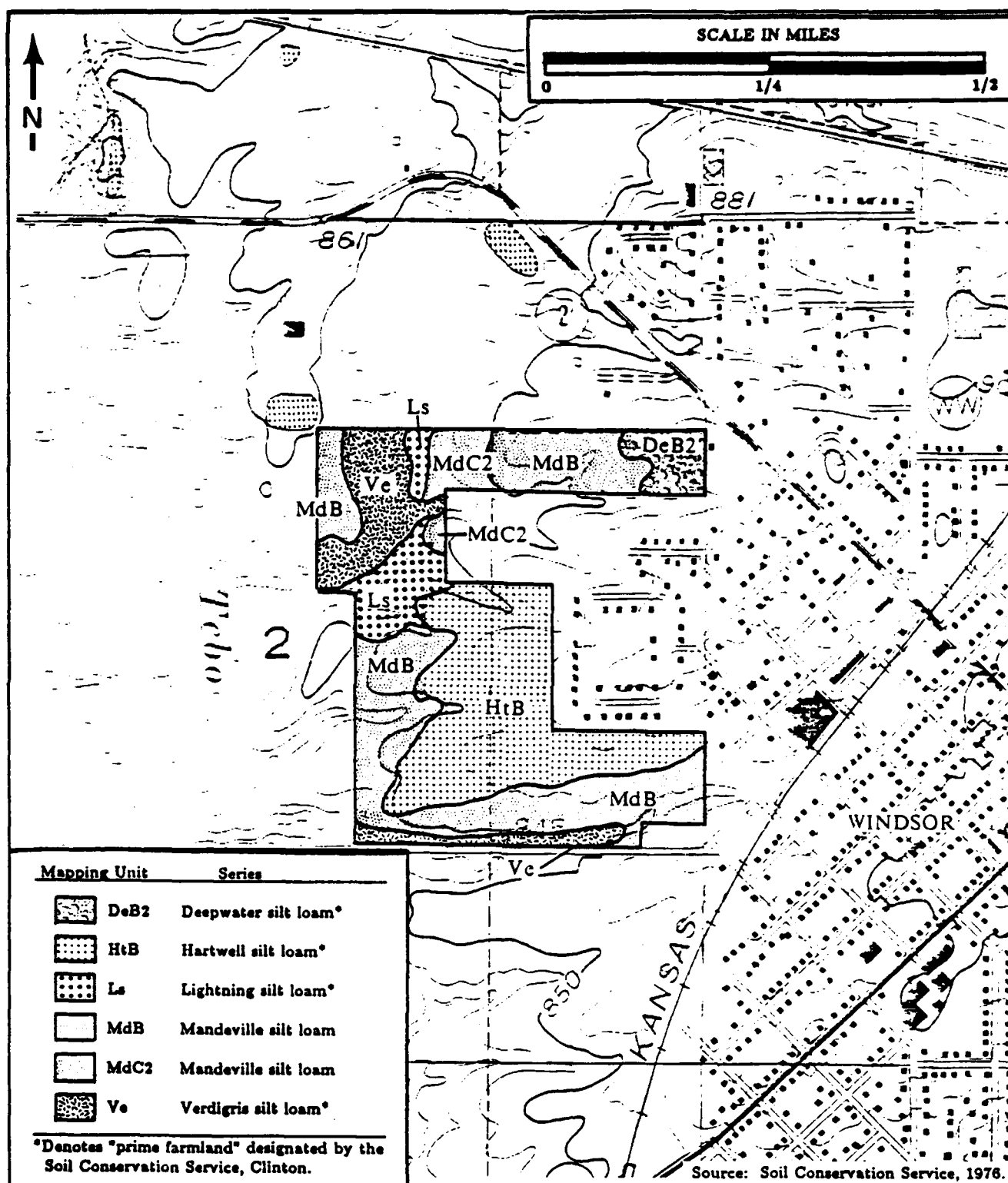


Figure 3.8-4
SOILS AT SUBSERIES LEVEL AT WINDSOR SITE

Table 3.8-4

SOIL CHARACTERISTICS AT WINDSOR SITE

Mapping Unit	Series	Slopes	Shrink-Swell Potential	Runoff	Permeability (inches/hr)	Building Site Limitations
DeB2	Deepwater silt loam	2-5%	low-moderate	medium	0.6-2.0	moderate: shrink-swell, low strength
Ht8	Hartwell silt loam	2-4%	high at depth	medium	0.2-2.0	severe: shrink-swell, seasonal perched water table
Ls	Lightning silt loam	0-2%	moderate	slow	0.6-2.0	severe: flooding, poor drainage
Md8	Mandeville silt loam	2-5%	low	medium	0.6-2.0	slight: shale at depth is rippable
MdC2	Mandeville silt loam	5-10%	low	medium	0.6-2.0	slight: shale at depth is rippable
Ve	Verdigris silt loam	0-1%	low-moderate	slow	0.6-2.0	severe: flooding

Source: Soil Conservation Service, 1976.

The Verdigris and Lightning series typically consist of deep, nearly level soils on bottom lands, terraces, and flood plains adjacent to streams. At the Windsor site, these soils are found in and surrounding an intermittent tributary in the Tebo Creek system. Soils of the Verdigris series are moderately well drained formed in silty alluvium while Lightning soils are poorly drained, having formed in clayey alluvium. Major limitations presented by these series are occasional flooding and wetness (Lightning series).

The Hartwell and Deepwater series are generally deep, slightly sloping soils on ridgetops and uplands formed in loess over silty and shaly material. The Hartwell series tends to be somewhat poorly drained while the Deepwater series is well drained. The high shrink-swell potential at depth combined with a seasonal perched water table presents severe limitations for building by the Hartwell series.

Soils of the Mandeville series are well drained and moderately permeable that have formed in residuum weathered from sandstone and siltstone. This series is found on broad, rounded ridgetops and uplands. Surface runoff is medium and the soils present only slight limitations for building.

3.8.3 Hydrology and Water Quality

Surface Water

Whiteman AFB and the four proposed sites all lie within drainage systems of Missouri River tributaries: the Blackwater River, Muddy Creek-Lamine River, and Tebo Creek-Osage River systems. The climate of the area is considered moist continental, with strong seasonal temperature contrasts and high day-to-day weather variability. The area is characterized by hot, humid summers and cold winters. Mean annual rainfall at Warrensburg (averaged over 24 years) is 39 inches which peaks seasonally in June with a secondary maximum in September (Soil Conservation Service, 1980). Tornadoes and severe thunderstorms, which can cause great yet concentrated damage, occur occasionally but are localized and of short duration.

Knob Noster. Surface drainage at the Knob Noster site proposed for the 801 housing program flows southerly and westerly into tributaries of Clear Fork, the only perennial stream in the vicinity. Definition of the 100-year flood plain of Clear Fork is unavailable, however the distributions of the Bremer and Lightning soil series, whose formations have been shaped by flooding and which continue to experience occasional flooding, may serve as a proxy of the flood plain extent (Figure 3.8-1).

Sedalia. At the Sedalia site, surface drainage enters Coon Creek directly from the site and through intermittent tributaries. According to the National Flood Insurance Program (1983), the 100-year flood plains of Coon Creek and its intermittent tributaries on the site lie approximately 200 feet on either side of their respective streambeds.

Warrensburg. Surface drainage at the Warrensburg site enters the East Fork of Post Oak Creek directly from the site and through intermittent tributaries and erosional gullies. No data defining the 100-year flood plains of the East Fork of Post Oak Creek and its intermittent tributaries are available, however the distribution of the Blackoak soil series, whose formation has been shaped by flooding and continue to experience occasional flooding, may serve as a proxy of the flood plain extent (Figure 3.8-3).

Windsor. Intermittent streams drain westwardly through the Windsor site toward the East Fork of Tebo Creek. Information detailing the 100-year flood plains of the East Fork of Tebo Creek and its tributaries are currently unavailable, however the distribution of the Verdigris and Lightning soil series, whose formations have been shaped by flooding and which continue to experience occasional flooding, may serve as a proxy of the flood plain extent (Figure 3.8-4).

Groundwater

The majority of water used in the region surrounding Whiteman AFB is supplied by deep bedrock aquifers (U.S. Air Force, 1988b). On the basis of water-bearing properties, five hydrogeologic units can be identified beneath Whiteman AFB and the sites proposed for the 801 housing program. From shallowest to deepest, these units are: (1) surficial deposits of alluvium, loess, and residuum; (2) shale, siltstone, sandstone, coal, underclay, and limestone associated with the Pennsylvanian age Cherokee Group; (3) limestones of Mississippian age; (4) Ordovician age aquifers which include Jefferson City Dolomite, Roubidoux Formation, and Gasconade Dolomite; and (5) aquifers of the Cambrian system (U.S. Air Force, 1988a).

Water-bearing properties of the surface alluvium are largely uncertain, however this groundwater likely is not economical to develop due to the water's limited distribution and seasonal movement. The Cherokee Group is seldom used as a source for water due to unreliable yields. Likewise, the Mississippian age limestones are not commonly used as water sources due to low yields and the presence of higher quality, more reliable sources lying deeper. The Ordovician age aquifers provide moderate to good supplies of water. Most municipal systems, however, derive their water from the aquifers of the Cambrian system (for example, the Eminence Dolomite and the Lamotte Formation), the deepest hydrogeologic units, which serve as reliable sources of good quality water (U.S. Air Force, 1988a and 1988b; Missouri Geological Survey and Water Resources, 1961).

3.9 BIOLOGICAL RESOURCES

3.9.1 Vegetation

Most of the area around Whiteman AFB was originally native prairie grassland and woodland, but now consists primarily of heavily grazed land and cropland occupied by introduced grasses and plant species. Riparian woodlands occupy many of the drainages, and typically at all the sites, fields are separated by wooded areas. These wooded areas contain many native species, and some tree species planted as wind-breaks or property delineators. In the discussion below, all species nomenclature follows Steyermark (1963).

Among the grasses present at the sites, the major species are meadow fescue (*Festuca elatior* L. var. *elatior*), yellow foxtail (*Setaria glauca* (L.) Beauv.), red-top (*Agrostis alba* L.), goose grass (*Eleusine indica* (L.) Gaertn.), and others such as *Panicum clandestinum* L. and *Digitaria sanguinalis* (L.) Scop. var. *sanguinalis*. Common weedy and roadside species present around and at the sites include wild carrot (*Daucus carota* L. ssp. *carota*), red clover (*Trifolium pratense* L. var. *pratense*), butterfly weed (*Asclepias tuberosa* L.), chicory (*Cichorium intybus* L. ssp. *intybus*), hogwort (*Croton capitatus* Michx. var. *capitatus*), daisy fleabane (*Erigeron strigosus* Muhl. var. *strigosus*), and horse nettle (*Solanum carolinense* L. ssp. *albiflorum* Benke.). Common trees in the region include elms, oaks, hickories, maples, locusts, sycamores, cottonwoods, sweet gum, and basswoods. Shrubs such as cherries, hawthorns, hackberries, sassafras, dogwoods, mulberries, redbuds, and sumachs including poison ivy, occur in the understory of forested areas.

Threatened and endangered species possibly present at the sites are fragrant (Mead's) milkweed (*Asclepias meadii* Torr.) and pale green orchid (*Habenaria flava* (L.) R.Br. var. *flava*), both of which are state-endangered species. *Habenaria flava* var. *herbiola* (R.Br.) is not endangered, but is on a watch-list category. Sources of these data are the Missouri Department of Conservation branches in Jefferson City and Warrensburg. None of these species was located at any of the sites during a field survey in July 1988, and is not known to be present at these locations (see Appendix A).

Knob Noster

The Knob Noster site consists of grazed fields and some wooded areas over undulating terrain (Figure 3.9-1). A stock pond is present in the southern part of the area. Knob Noster State Park is situated to the south of the proposed housing site, and is a thickly wooded park with many native plant species in different habitats. Wooded areas at the site include tree species such as pin oak (*Quercus palustris* Muenchh.), blackjack oak (*Quercus marilandica* Muenchh.), catalpa (*Catalpa speciosa* Warder), and shagbark hickory (*Carya ovata* (Mill.) K. Koch ssp. *ovata*), among others. The understory of the forested area is quite dense, but no rare species were found.

Sedalia

The site at Sedalia is the largest of the four proposed housing locations, and is occupied in the western part by minor drainages that are densely wooded (Figure 3.9-2). The majority of the site consists of grazed fields, and some land that is planted with white sweet clover (*Melilotus albus* Desr.), used for pasture and fodder.

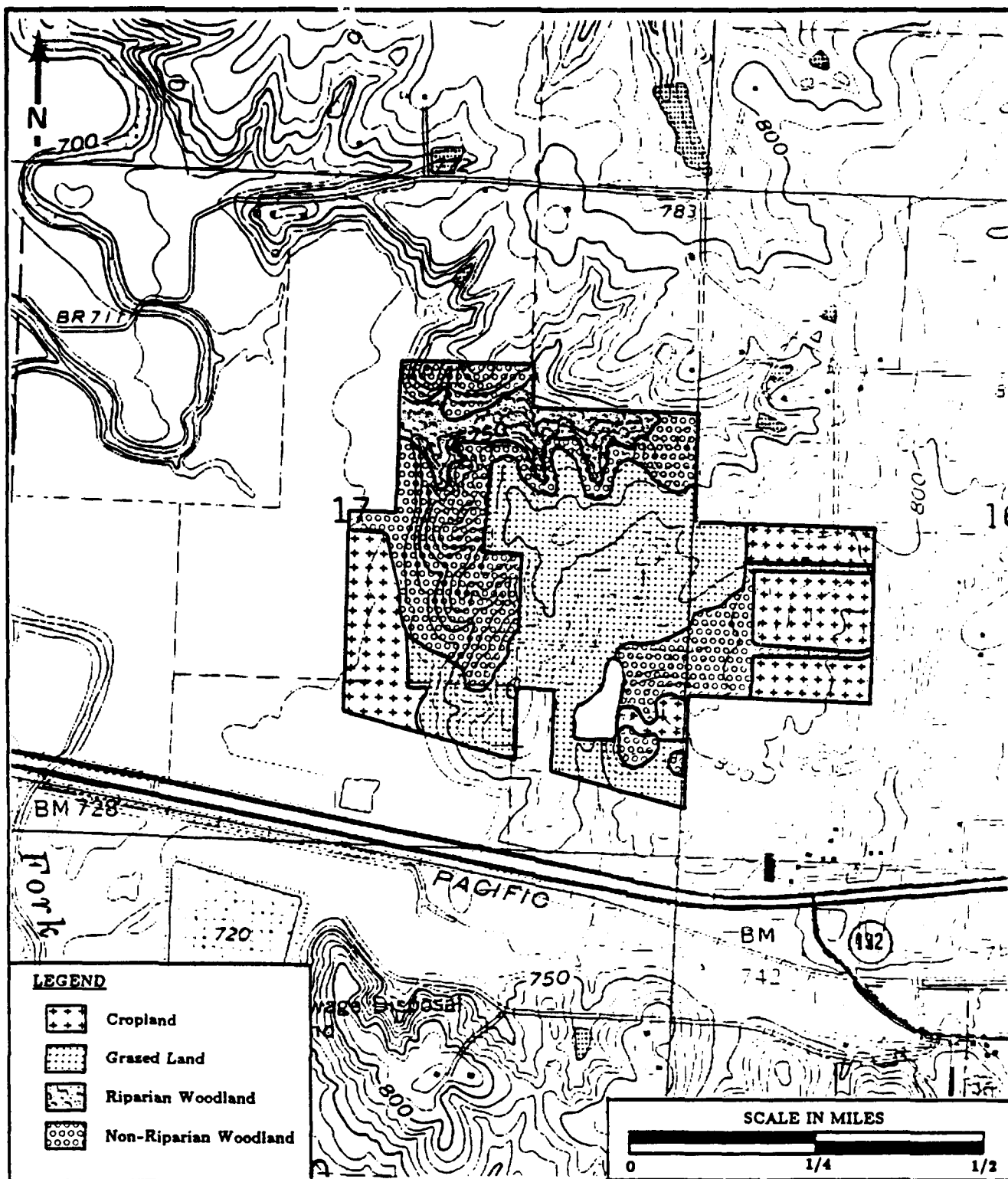


Figure 3.9-1
VEGETATION DISTRIBUTION AT KNOB NOSTER SITE

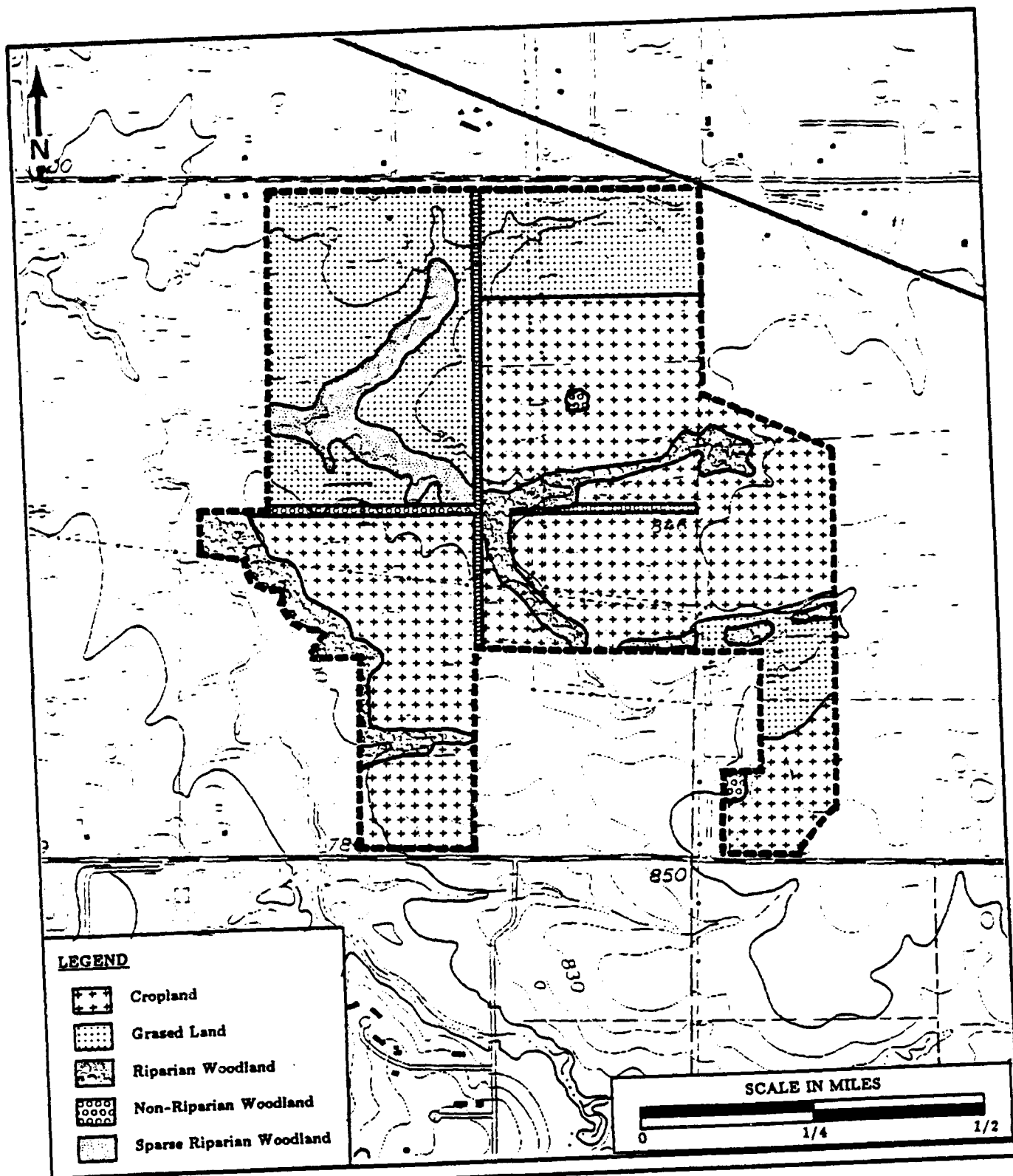


Figure 3.9-2
VEGETATION DISTRIBUTION AT SEDALIA SITE

Wooded areas on the Sedalia site include species such as honey locust (*Gleditsia triacanthos* L. f. *triacanthos*), persimmon (*Diospyros virginiana* L. var. *pubescens* (Pursh.) Dippel f. *pubescens*), shingle oak (*Quercus imbricaria* Michx.), pin oak, hackberry (*Celtis occidentalis* L. var. *canina* (Raf.) Sarg.), big tree plum (*Prunus mexicana* S. Wats.) and cottonwoods (*Populus* spp.). Mesic creek drainages are occupied by peach-leaved willow (*Salix amygdaloides* Anders.), slippery elm (*Ulmus rubra* Muhl.), river birch (*Betula nigra* L.) and tall bellflower (*Campanula americana* L.), in addition to the other tree and herb species.

A population of the state-endangered species, fragrant milkweed, has been located in Paint Brush Prairie, a natural reserve 9-10 miles south of the city. It was not, however, located on the proposed housing site.

Warrensburg

The proposed site at Warrensburg is occupied primarily by corn, sorghum and soybean fields in the southern part, and is particularly heavily grazed in the northern part (Figure 3.9-3). A minor creek in the middle of the site, a tributary to the East Fork Post Oak Creek, is occupied by willows (*Salix* spp.), cottonwoods, and silver maple (*Acer saccharinum* L.) -- poison ivy, white mulberry (*Morus alba* L.), brambles (*Rubus* sp.), and smooth sumac (*Rhus glabra* L. var. *glabra*) are dense in the understory. No rare or endangered plants were observed.

Windsor

A number of shrubby and tree species are present in wooded areas at the Windsor site (Figure 3.9-4), including slender mountain mint (*Pycnanthemum tenuifolium* Schrad.), ironweed (*Vernonia baldwini* Torr. var. *baldwini*), wild bergamot (*Monarda fistulosa* L. var. *mollis* (L.) Benth.), pokeweed (*Phytolacca americana* L.), and wood sage (*Teucrium canadense* var. *virginicum* (L.)). Taller shrubs include winged sumac (*Rhus copallina* L. var. *latifolia* Engler) and black cherry (*Prunus serotina* Ehrh.). Swamp white oak (*Quercus bicolor* Willd.) is present in the overstory, and other oak hybrids may be present in the area. River birch occurs in a mesic location. Most of the field area was lying fallow at the time of the field survey (July 1988) and has been taken over by ragweed (*Ambrosia artemisiifolia* L.). In addition to meadow fescue, purple love-grass (*Eragrostis spectabilis* (Pursh.) Steud. var. *spectabilis*) and timothy (*Phleum pratense* L. var. *pratense*) were located on the site. No rare or endangered plants were found at the site.

3.9.2 Wildlife

Wildlife exists primarily in the wooded areas at each of the proposed military family housing sites, however, since most of the areas currently are occupied by pasture or croplands, and are consequently disturbed to a large extent, natural habitats are limited. Some of the wildlife species in the region are bobwhite quail, ringneck pheasant, wild turkey, mourning dove, red and gray fox, cottontail rabbit, plains pocket gopher, fox and gray squirrels, raccoon, and white-tailed deer. Table 3.9-1 lists the sensitive species that potentially could occur at the sites. None of these species was located at the housing sites during field visits in July 1988; and they are also not known by local wildlife officials to occur in these specific areas (see Appendix A).

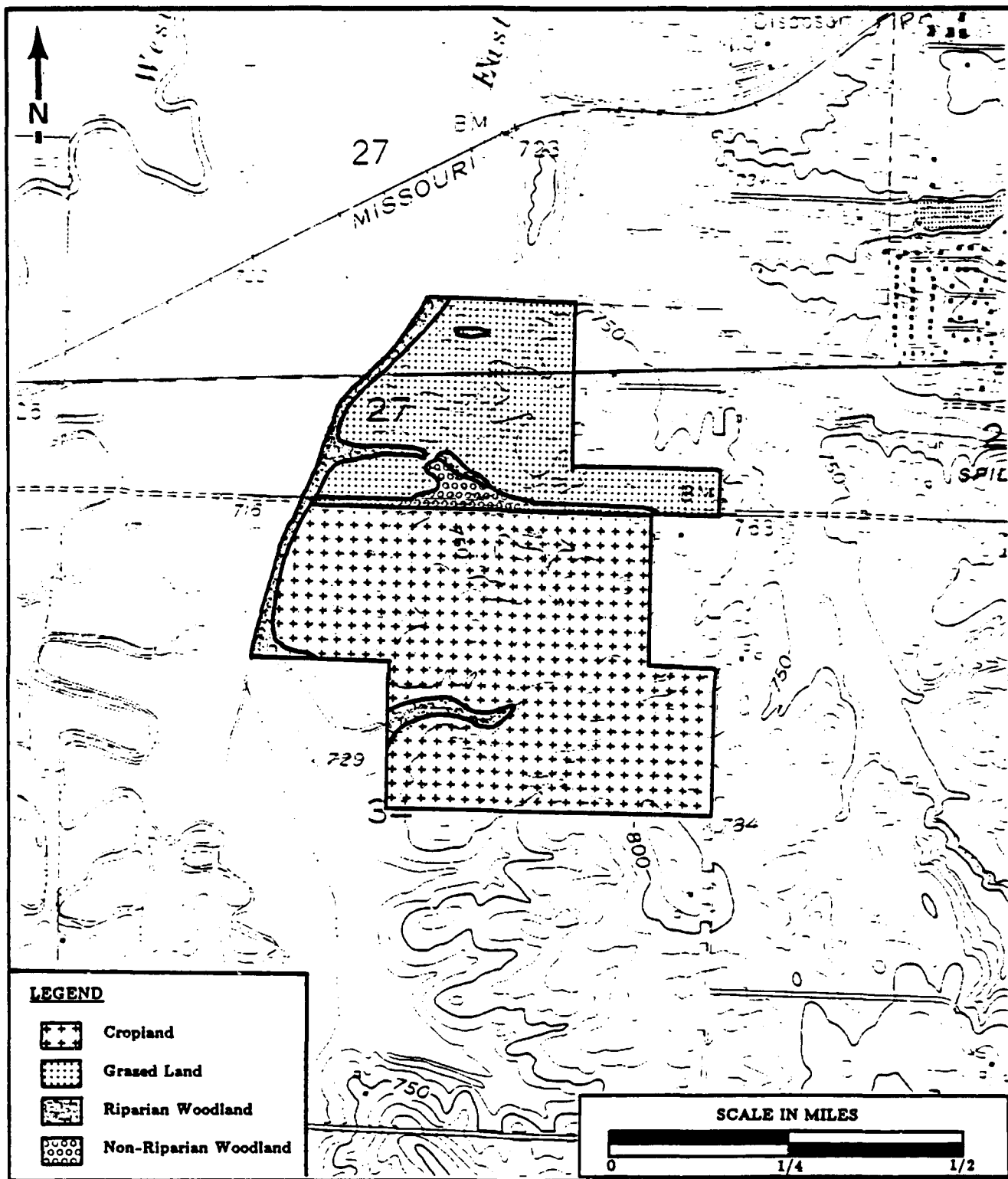


Figure 3.9-3
VEGETATION DISTRIBUTION AT WARRENSBURG SITE

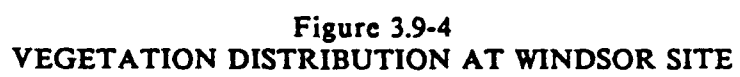


Table 3.9-1

FEDERAL AND STATE LISTED RARE,
THREATENED OR ENDANGERED WILDLIFE SPECIES
POSSIBLY PRESENT IN THE REGION AROUND WHITEMAN AFB

Scientific Name	Common Name	Federal* Status	State** Status	Habitat and Distribution
1. <i>Accipiter cooperii</i>	Cooper's hawk	-	E	wooded areas, migrant
2. <i>Accipiter striatus</i>	Sharp-shinned hawk	-	E	open woodlands, migrant
3. <i>Bartramia longicauda</i>	Upland Sandpiper	-	E	grasslands
4. <i>Falco peregrinus anatum</i>	American peregrine falcon	E	E	cliffs, dunes, near water, transient
5. <i>Falco peregrinus tundrius</i>	Arctic peregrine falcon	T	E	cliffs, dunes, near water, transient
6. <i>Haliaeetus leucocephalus</i>	Bald eagle	E	R	transient
7. <i>Lepus californicus</i>	Black-tailed jackrabbit	-	R	open fields
8. <i>Mustela nivalis</i>	Least weasel	-	R	dense grass stands
9. <i>Mustela frenata</i>	Long-tailed weasel	-	R	forest edge, streams
10. <i>Myotis grisescens</i>	Gray bat	T	E	caves
11. <i>Myotis sodalis</i>	Indiana bat	E	E	caves, floodplains
12. <i>Opheodrys vernalis blanchardi</i>	Western smooth green snake	-	E	moist situations, grassy openings
13. <i>Tympanuchus cupido</i>	Greater Prairie chicken	-	R	open grasslands
14. <i>Tyto alba</i>	Barn owl	-	E	barns, deep woods

Key: * E = endangered T = threatened
 ** E = endangered R = rare

Of greatest concern in the region around Whiteman AFB is the Greater Prairie Chicken (*Tympanuchus cupido*). Much literature exists on this bird through the Missouri Department of Conservation, and it is the subject of active study, protection and conservation procedures. Its population has declined considerably over the years due to range fragmentation, and loss of grassland habitat, which leads to a loss of nesting and brood-rearing cover. The prairie chicken is extensively monitored in different parts of the state, and is known to survive and adapt in a variety of landscapes, although the species prefers to occupy open ground where visibility is extensive. The Greater Prairie Chicken occurred on Whiteman AFB as a population of about 9-10 individuals, but these were removed from the site by the Air Force, with approval of the Missouri Department of Conservation, due to potential hazards to aircraft. Prairie chickens have also been sighted south of Knob Noster, and east of the Windsor site (Kathy Cooper, Missouri Department of Conservation, Warrensburg, personal communication, 1988).

Knob Noster

Knob Noster State Park is occupied by a number of different wildlife species. The variety of habitats in the area, including hilly landscapes, creeks and drainages, forest and prairie environments are occupied by whitetail deer, fox, raccoon, gray squirrels, woodchucks, opossum, wild turkey, barred owl, pileated woodpecker and great blue heron (Sheila Larrabee, Park Naturalist). Of these species present in the natural environment, small mammals such as squirrels and rabbits were observed at the proposed military family housing site at Knob Noster. None of the species listed in Table 3.9-1 were observed at the site.

Sedalia

Habitats at the site at Sedalia are mainly cropland and grazed land, and are disturbed. Wooded areas are occupied by examples of wildlife common to the area, such as white-tailed deer, red fox, northern bobwhite and gray squirrels, among others. The wooded areas bordering fields and creek drainages provide habitat for a number of bird species also. Species listed in Table 3.9-1 were not sighted at this proposed housing location.

Warrensburg

Wooded areas at Warrensburg are of very small acreage compared to the other proposed family housing sites, and consequently, this site is relatively poor in terms of faunal variation compared to more natural areas, such as at Knob Noster State Park. Typical species include quail, woodchucks, squirrels, raccoons, rabbits and other small mammals. No rare, threatened or endangered species were seen at the site.

Windsor

As at most of the other sites and in the region around Whiteman AFB, commonly-observed species at the site include white-tailed deer, quail, opossum and raccoons. No rare species were sighted in the area. Most wildlife occupies the wooded areas that border disturbed fields and cropland. Although the Greater Prairie Chicken has been monitored east of Windsor, it was not observed at the housing site.

3.10 CULTURAL RESOURCES

The four proposed housing sites examined in this study are located physiographically within the Lamine Locality of the Northwest Prairie Region of Missouri (Chapman, 1975, pp.3-4). This locality is characterized by prairie with dissecting streams and associated concentrations of mixed deciduous forests. Aboriginal adaptation in the region throughout the past apparently involved seasonal rounds centered upon these main environmental zones.

In general, the area of current interest contains relatively few archaeological remains, with most well-defined cultures in Missouri from Paleoindian through Historic times located elsewhere (Chapman, 1975, 1980). For example, contingents of the Osage tribe, which inhabited western Missouri during the 17th and 18th centuries, focused their activities near larger rivers to the north (Missouri River) and southwest (Little Osage and Osage rivers) of the area of present interest (Swanton, 1910; Burns, 1984, p.3). Notable aboriginal remains present in the Lamine Locality include limited surface evidence of Dalton Period (Hunter-Forager Tradition; 7,000-8,000 B.C.) occupation (Chapman, 1975, p.102), and evidence of the Sedalia Complex (Late Archaic; 1,000-2,000 B.C.) near the modern city of Sedalia (Chapman, 1975, p.232; Seelen, 1961). In response to the westward movement of whites as well as other aboriginal groups, the last Native Americans in the general vicinity -- the Osage -- relocated westward during the early 19th century into what presently are the states of Oklahoma and Kansas. Homesteaders began moving into the area of interest during the late 1820s.

An assessment of cultural resources on the four proposed housing parcels was conducted during July and August of 1988. That assessment involved a two-step process. One step consisted of a search of archaeological site files for the areas of interest, conducted by the staff of the Archaeological Survey of Missouri (ASM), to determine if known prehistoric or historic sites were present on any of the parcels. A second step of the cultural resource assessment involved a field examination of each proposed housing area. The latter was conducted by an archaeologist who visited each parcel. Areas which provided surface visibility -- primarily fields recently plowed, and fields planted in corn -- were traversed at 25 yard intervals; walls of erosion channels, road cuts, and creek beds were also inspected when encountered. As described in greater detail below under each proposed housing parcel, the search of site files revealed the presence of three small sites located on the proposed locations of 801 housing developments, and three others located near the parcels. The field investigation discovered an additional small site.

Knob Noster

The proposed Knob Noster housing area comprises roughly 205 acres of land covered predominantly by mixed grasses (used for pasture) and mixed deciduous forest -- the latter found on the southeastern, north-central, and northwestern sections of the parcel. A search of ASM site files revealed the presence of one site, a scatter of lithic material (flakes and flake fragments) presumably dating to prehistoric times, located on the western portion of the parcel. Two additional lithic scatters located several hundred yards to the west of the proposed housing parcel were also encountered in the record search. The field survey was hindered by generally poor surface visibility, though roughly 70 percent of the parcel (excluding the heavily forested areas) was examined. No additional remains of cultural resources were encountered on the Knob Noster parcel.

Sedalia

The proposed location of 801 housing west of the city of Sedalia consists of approximately 432 acres of land west of the city currently covered by mixed grasses (used largely as pasture in the northern one-half of the parcel), agricultural crops (predominantly corn, with some clover, in the southern portion of the parcel), and a small amount of mixed deciduous forest scattered throughout. The search of ASM site files revealed the presence of no cultural resources on the proposed housing parcel; one known prehistoric (Sedalia Complex) site, defined by lithic artifacts and debitage, is located several hundred yards to the east of the proposed housing parcel. Although a relatively large portion of the southern half of the parcel (planted in corn at the time of the project field visit) provided good surface visibility, no remains of cultural resources were encountered. Surface visibility in the northern portion of the housing parcel was much more limited, and its examination largely confined to stream channel cuts and erosion channels. Again, no remains of cultural resources were encountered.

Warrensburg

The parcel of land southwest of Warrensburg proposed for 801 housing development comprises roughly 240 acres, and currently is covered by both mixed grasses (largely the northern one-third of the parcel, which is used for pasture, but also scattered throughout the remaining area) and agricultural crops (predominantly corn at the time of the project visit). The search of ASM site files revealed the presence of a single archaeological site, defined by surface scatter of lithic artifacts, at the southwestern edge of the proposed housing parcel. The field survey discovered a possible historic house site at the top of a small bluff in the north-central portion of the parcel. An informant noted that local legend places a house on the site in the late 19th century. However, the limited amount of surface remains, as well as the nature of these remains (a few fragments of 8-inch concrete blocks, some wire, fragments of wood with modern nails, and a heavy wire grating in or near a small depression at the top of the bluff), were judged as insufficient evidence to define this as a historic house site as opposed to a dump for assorted farm debris. No additional remains of cultural resources were encountered.

Windsor

The Windsor housing parcel consists of approximately 108 acres on the western edge of the town of Windsor. At present, virtually all of the parcel is used for agricultural purposes, either planted in corn or fallow -- with much of the latter recently plowed at the time of the field visit. A search of ASM files revealed the presence of a single site at the southeastern edge of the housing parcel, described as a series of "footprints" (possibly petroglyphs) in sandstone. The field investigation discovered an additional site in the western portion of the parcel, consisting of a scatter of white chert debitage (both reduction and sharpening flakes) and utilized flakes over an area of roughly 270 square yards.

4. ENVIRONMENTAL CONSEQUENCES

4.1 LAND USE

4.1.1 Methodology

This section analyzes the impact of the proposed action on existing land uses and examines potential consistency and compatibility with current and future base, county, and municipal land use plans, policies, and trends. The City of Warrensburg Comprehensive Plan (Show-Me Regional Planning Commission, 1987), the Whiteman AFB Comprehensive Plan (U.S. Air Force, 1988c), and Whiteman AFB AICUZ report (U.S. Air Force, 1976) were examined for compatibility and consistency.

4.1.2 Impacts and Mitigations

Development of the 801 housing is compatible with Air Force aircraft operations and the proposed uses for Whiteman AFB regional lands since it does not include uses that have been determined to be unacceptable to the Air Force -- tall buildings that would create obstacles to aircraft, industrial operations that would emit clouds of smoke or gases into the air causing visibility problems for pilots, and other uses such as mining and heavy manufacturing.

Housing development on the parcels proposed for the 801 housing program are consistent with the Whiteman AFB AICUZ report recommendations that housing should lie outside of accident potential zones and beyond the 65 dBA noise contours of the base airfield. ✓
Whiteman AFB policies, presented in the AICUZ report and comprehensive plan, also discourage housing development in the 100-year flood plains of streams; this acreage could, however, be developed as recreation or park land. The proposed development sites also are compatible with existing development patterns in their respective areas.

Knob Noster

The proposed site lies at the northwestern edge of the community's development with easy access to U.S. Highway 50. New commercial development has already begun on adjacent property. Although improvement of the land would require conversion of prime farmland to nonagricultural uses, similar farmland is abundant throughout the county and this particular farmland is not considered unique.

Sedalia

Development of the 801 housing program is consistent and compatible with land uses surrounding the proposed Sedalia site. Commercial, institutional, residential, and recreational uses already surround the site. Improvement of the land would require conversion of prime farmland to nonagricultural uses, however similar farmland is abundant throughout the county and this particular farmland is not considered unique. Although Pettis County has no comprehensive general plan to guide growth, the Sedalia-Pettis County Development Corporation, a nonprofit organization with city, county, and private sponsorship that assists in municipal growth, supports the development as logical and needed by the city and county.

Warrensburg

The proposed site is located at the southwest edge of development radiating from the city of Warrensburg. Residential development already exists to the east of the site and transportation between the site and Whiteman AFB (Hale Lake Road, the western extension of Route DD) is currently under improvement. Although the site lies outside the Warrensburg city limits, development of 801 housing on the site is compatible with the city's development plan which pursues future annexations; development of this site has been supported by Warrensburg city officials. Improvement of the land would require conversion of prime farmland to nonagricultural uses, however, similar farmland is abundant throughout the county and this particular farmland is not considered unique.

Windsor

Development of 801 housing at the Windsor would be consistent and compatible with land use bordering the site. The proposed site already surrounds residential development of similar densities (>1 unit per acre) to the east. Although improvement of the land would require conversion of prime farmland to nonagricultural uses, similar farmland is abundant throughout the county, this particular farmland is not considered unique, and residential use of the site is agreed to be logical and consistent development for the area (Soil Conservation Service, Clinton, personal communication, 1988; Hon. Ben Mangina, Mayor of Windsor, personal communication, 1988).

4.1.3 Impacts of the Alternatives

Increased Site Development Alternative

Impacts under the increased site development alternative would correspond with impacts of the proposed action. The sites would be developed with the similar land uses as the proposed action, however more acreage would be converted to residential uses.

No Action Alternative

Under the no action alternative, improvement of the sites with residential uses would not occur and impacts to land use on and in the vicinity of the sites would not be expected.

4.2 GROWTH AND HOUSING

4.2.1 Methodology

Economic and housing growth effects of the proposed action were analyzed using estimates of the amount of project-related expenditures in the local economy from constructing the 801 housing units. Indirect effects on each county's economy were estimated using indirect output and employment multipliers.

4.2.2 Impacts and Mitigations

Economic Activity

Development of the proposed 801 housing would provide a stimulus to the economy of the three counties. The infusion of money into each of the counties would have a small, short-term, growth-inducing impact as the construction project expenditures and construction workers' payrolls are spent in the local area. After completion of construction, spending by residents of the family housing would also produce a small long-term stimulus in each of the local areas.

The construction period would probably last approximately one year at each site except at Sedalia, where construction would more likely last about two years. Estimates of project-related employment are based on the assumption that annual project expenditures would be approximately \$8.8 million at the Knob Noster site, \$15.8 million at the Warrensburg site, \$14.9 million at the Sedalia site, and \$8.8 million at the Windsor site. Employment estimates also take into account the projection that the average level of output per worker in the U.S. construction industry will be approximately \$91,000 by 1990 (U.S. Department of Labor, 1987). Hence, in Johnson County, the proposed project would support approximately 270 direct construction-related jobs for a year. In Pettis County, approximately 160 construction jobs would be supported directly over a period of two years, and in Henry County, about 100 direct jobs would be provided for one year.

Johnson, Pettis, and Henry counties have indirect output multipliers of 1.57, 1.70, and 1.62, respectively, in the residential construction industry (Construction Engineering Research Laboratory, 1987). Therefore, indirect output in each of the counties would be about \$38.5 million, \$25.3 million, and \$14.1 million annually. The average level of output per worker in all U.S. industries combined is projected to be approximately \$79,000 by 1990 (U.S. Department of Labor, 1987). Thus, spending for construction materials and supplies coupled with spending for normal goods and services by the direct project workers would support about 490 indirect jobs during the construction period in Johnson County, 320 indirect jobs in Pettis County, and 180 indirect jobs in Henry County. By comparison, there were 530, 1,290, and 527 construction sector jobs in Johnson, Pettis, and Henry counties, respectively, in 1986.

The total number of direct and indirect jobs supported by the construction project in each county, in relation to the total number of 1986 jobs, represents 3.9 percent for Johnson County, 2.4 percent for Pettis County, and 2.8 percent for Henry County. These figures provide an assessment of the relative magnitude of the proposed construction in the local area.

Demographics and Housing

New housing would be a direct result of the proposed project although very little direct population growth, if any, would be attributable to the project because if the 801 housing is not constructed, other private sector housing would likely be built to meet the demand created by new military residents. Housing growth represents approximately 2.5, 2.8, and 1.4 percent of the 1980 housing stock in each of the counties, respectively.

4.2.3 Impacts of the Alternatives

Increased Site Development Alternative

Beneficial economic and housing impacts would result in slightly greater magnitude than for the proposed project at each of the sites due to increased site development. The increase at each site would be proportional to the additional number of units planned under this alternative.

No Action Alternative

The beneficial economic and housing impacts would likely occur regardless of the proposed project since the private sector in each of the local counties would likely construct new housing independently to meet demand by newly-stationed military personnel at Whiteman AFB. The relative magnitude in each county may change if the proportion of residents between sites changes -- a likely occurrence without the 801 program.

4.3 PUBLIC SERVICES AND FINANCE

4.3.1 Methodology

Currently, the four proposed sites for 801 housing are located in unincorporated areas; hence, the sites are presently under county jurisdiction (except the Windsor site, which is partially in the City of Windsor). Each site, however, is adjacent or relatively close to city boundaries, therefore, annexation by each of the nearby cities is likely to occur either before or soon after project completion. It is assumed in this analysis that public services would be provided by each of the local cities. City water and sewerage plant and system capacities were studied to determine the ability to provide adequate service to each site. Capacities of the school districts servicing each site were also analyzed to determine whether existing schools could adequately handle project-generated enrollment increases. Impacts to local jurisdictions were considered significant if an expenditure burden is placed on a city or school district without a corresponding proportionate increase in revenues.

The response capability of city police and fire departments for each local jurisdiction appears adequate, although there are differences in the quality of service provided which were discussed in Section 3. According to the *Community Impact Assistance Study*, a report prepared to study defense-related growth effects on small communities, fire protection services are typically provided by volunteer fire fighters in communities with a population of up to approximately 3,700 (President's Economic Adjustment Committee, 1981). Growing communities typically convert to hiring paid professionals when populations reach levels greater than 3,700. Windsor and Knob Noster are expected to approach this population threshold due to the B-2 mission-related growth and both communities will likely study the possibility of hiring full-time fire protection personnel to augment their present services. If these communities were to switch to a combination of volunteer and paid fire fighters, as in Sedalia and Warrensburg, additional expenditures for salaries would be required. This could be offset somewhat from additional revenues from property, sales, and other taxes and charges collected from new residents. According to the *Community Impact Assistance Study*, local residents could also expect some savings in property insurance premiums since a conversion to fire protection by paid professionals usually leads to a reduction in the fire insurance ratings.

4.3.2 Impacts and Mitigations

City of Knob Noster

Water and sewerage treatment facilities in Knob Noster have adequate capacity to provide service to residents of the proposed development of 125 military family housing units under the 801 housing program (Figure 4.3-1). The project is estimated to increase the current water consumption rate by approximately 64,286 gallons per day (gpd) and increase the load on the sewerage treatment plant by about 45,000 gpd. This assumes an average of 3.6 persons per household would occupy each of the units, the average water use per capita would be 143 gpd, and the average sewerage produced per capita would be 100 gpd. With the proposed project, the remaining excess capacity of the water system would be over 355,000 gpd, which is more than 53 percent of total capacity. The City has indicated that it is planning expansion of the water system with an additional well and additional storage capacity. The remaining excess capacity of the sewerage plant would be more than 135,000 gpd, or 30 percent of total capacity. The City has indicated that expansion of the wastewater treatment capacity is

possible, if necessary, by expanding the operating hours at the existing wastewater treatment facility and there is also available acreage for expansion of flow overland capacity.

City government finances are expected to be affected by both increased revenues and expenditures as a result of the proposed project. The assessed value of taxable real property within the city would increase (assuming the 801 housing site is annexed by the city), thereby increasing the property tax base. Additional income from water and sewer service fees would also be collected. Spending by construction workers during the short-term and by 801 housing residents during the long-term would increase tax revenue from retail sales and proportionate increases in other taxes and fees also would be collected. At the same time, increases in expenditures would be necessary to provide additional services to new residents. Since no major capital improvements would be required at the water and sewerage treatment facilities, it is anticipated that additional revenues would at least equal additional expenditures.

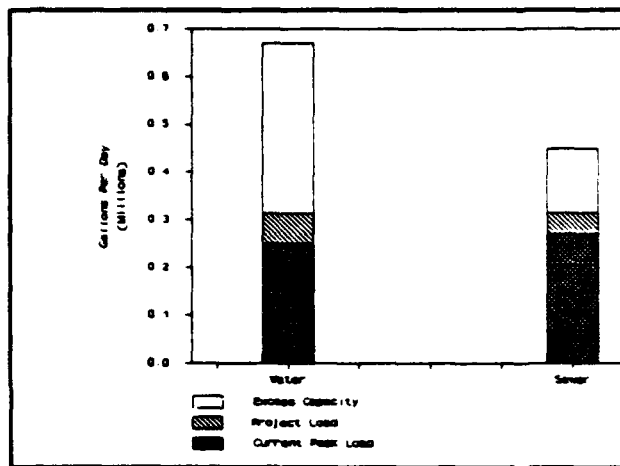


Figure 4.3-1
WATER AND SEWERAGE PLANT CAPACITIES
CITY OF KNOB NOSTER, MISSOURI

Knob Noster R-VIII School District

Classroom facilities in the Knob Noster R-VIII School District have adequate capacity to provide educational services to residents of the proposed 125 military family housing units (Figure 4.3-2). The project is estimated to increase enrollments by 58 in grades K-5, 29 in grades 6-8, and 38 in grades 9-12. These enrollment projections assume that an average of one school-age child per household would occupy the units, with an even distribution of students across grades K-12. With the proposed project, there would be enough capacity at the elementary school level to accommodate an additional 135 students, which is approximately 12 percent of total capacity. At the middle school level, there would be space for 78 additional 6-8 grade students, or about 17 percent of total capacity. At the high school level, there would be space for 112 additional 9-12 grade students, leaving a margin of about 21 percent of total capacity. The capacity limits for the schools within the district include the availability of existing classroom space in permanent buildings; the school district has indicated that additional students in excess of the capacity limits shown in the figure could also be accommodated using portable classrooms and other existing facilities.

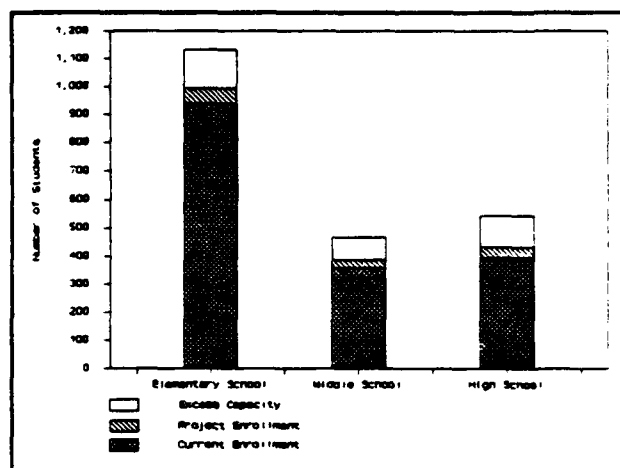


Figure 4.3-2
SCHOOL CAPACITIES
KNOB NOSTER R-VIII SCHOOL DISTRICT

School district finances are expected to be affected both by increased revenues and expenditures from development of 801 housing at the Knob Noster site. Assessed value of taxable real property within the district would increase, broadening the district's property tax base. Additional income from state and federal sources based on average daily attendance in the district would also rise. Increases in expenditures, would be required to provide additional services to new students, but since no major capital improvements would be needed, it is expected that rising revenues would at least equal new expenditures.

City of Sedalia

Sedalia water and sewerage treatment facilities have adequate capacity to provide service to residents of the proposed 425 military family housing units (Figure 4.3-3). The project is estimated to increase the current water consumption rate by approximately 218,571 gpd and increase the load on the sewerage treatment plant by about 153,000 gpd, using the same assumptions as those discussed above for the City of Knob Noster. With the proposed project, the remaining excess capacity of the water system would be over 2,129,000 gpd, which is almost 27 percent of total capacity. The remaining excess capacity of the sewerage plant, at 1,847,000 gpd, would be greater than 28 percent of total capacity.

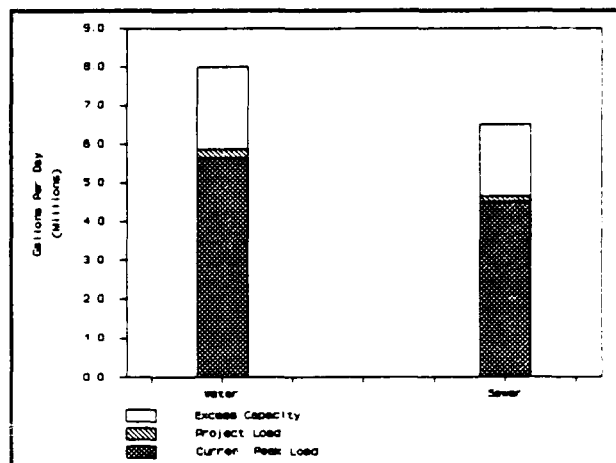


Figure 4.3-3
WATER AND SEWERAGE PLANT CAPACITIES
CITY OF SEDALIA, MISSOURI

Sedalia's city government finances would be affected both by increased revenues and expenditures as a result of the proposed 801 housing development. If the 801 housing site is annexed by the city -- as appears very likely -- the city's assessed value of taxable real property would escalate considerably, thus, increasing the property tax base. Additional collections of water and sewer user fees also would be made. Construction worker and housing resident spending would increase tax revenue from retail sales. In addition, proportionate increases in other taxes and fees would be collected. On the other hand, increases in expenditures would be required for the provision of additional services to new city residents. Other than those already planned, no major capital improvements would be required at the water and sewerage treatment facilities, so additional revenues are expected to meet increased expenditures.

Sedalia #200 School District

In the Sedalia #200 School District there is adequate capacity to provide educational services to residents of the proposed 425 military family housing units, although the elementary schools would be nearing capacity levels with the newly-created enrollments (Figure 4.3-4). The proposed project is estimated to increase enrollments by 196 students in grades K-5, 98 students in grades 6-8, and 131 students in grades 9-12, using the same assumptions as those discussed above for the Knob Noster R-VIII School District. With the proposed project,

there would be enough capacity at the elementary school level to accommodate an additional 218 students, leaving approximately 9 percent of total capacity. This margin could be increased if the housing units at the Sedalia site were designed for older families with fewer elementary school age children. At the middle school level, there would be space for 201 additional 6-8 grade students, which is about 17 percent of total capacity; and at the high school level, there would be enough space for 263 more 9-12 grade students -- also about 17 percent of total capacity.

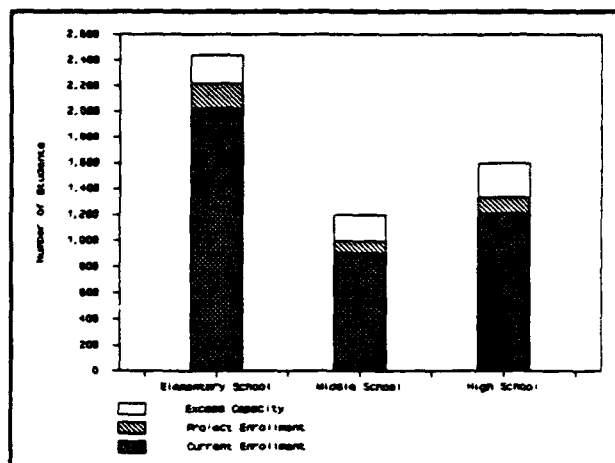


Figure 4.3-4
SCHOOL CAPACITIES
SEDALIA #200 SCHOOL DISTRICT

District finances would experience both revenue gains and increased expenditures from the 801 housing development at the Sedalia site. The district's property tax base would increase along with the rise in assessed value of taxable real property. Additional income from state and federal sources based on average daily attendance within the district also would expand.

Increases in expenditures, however, would be required to provide additional educational services to new students. Since funding has already been approved for two new elementary schools and no other major capital improvements appear immanently necessary, it is anticipated that additional revenues would equal or surpass expenditure increases.

City of Warrensburg

In Warrensburg, the water and sewerage treatment facilities presently have capacity to provide service to residents of the proposed 225 military family housing units, but very little excess capacity would remain (Figure 4.3-5). The project is estimated to increase the current water consumption rate by approximately 115,714 gpd and increase the load on the sewerage treatment plant by about 81,000 gpd. With the proposed project, the remaining excess capacity of the water system would be over 384,000 gpd, which is less than 13 percent of total capacity. The remaining excess capacity of the sewerage plant would be 109,000 gpd; this would leave only about 5 percent of total capacity unused. The City of Warrensburg has capital improvement plans for expansion of the plant scheduled for fiscal year 1989-90 which would provide additional excess capacity.

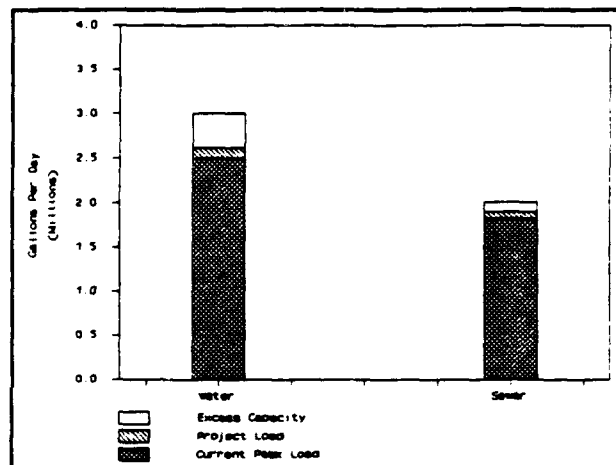


Figure 4.3-5
WATER AND SEWERAGE PLANT CAPACITIES
CITY OF WARRENSBURG, MISSOURI

Warrensburg city government revenues and expenditures both are expected to increase from development of the proposed project. Assuming the 801 housing site is annexed by the city, the property tax base would increase. Additional income from water and sewer user fees would accrue, as well as tax revenue from retail sales and other taxes and fees. Increases in expenditures would be necessary to provide additional services to the new residents. As long as no major capital improvements are required immediately at the sewerage treatment facilities to increase capacity, added revenues should at least equal additional expenditures.

Warrensburg R-VI School District

The Warrensburg R-VI School District has adequate capacity at the elementary and high school levels to provide educational services to residents of the proposed 225 military family housing units, but the Warrensburg Middle School is currently above its design capacity (Figure 4.3-6). At the elementary school level the proposed project would cause enrollments to near capacity. The project is estimated to increase enrollments by 104 in grades K-5, 52 in grades 6-8, and 69 in grades 9-12. With the proposed project, there would be enough capacity at the elementary school level to accommodate an additional 116 students, which is approximately 8 percent of total capacity. At the 6-8 grade level, 52 additional students would increase enrollment at the Warrensburg Middle School to 567, exceeding total capacity by 67 students, or 13 percent. This problem may be alleviated somewhat if families with fewer middle school age children and more high school age children were to be housed at this site. The recently built high school has enough space for 231 additional 9-12 grade students; available capacity is almost one quarter (23 percent) of total capacity.

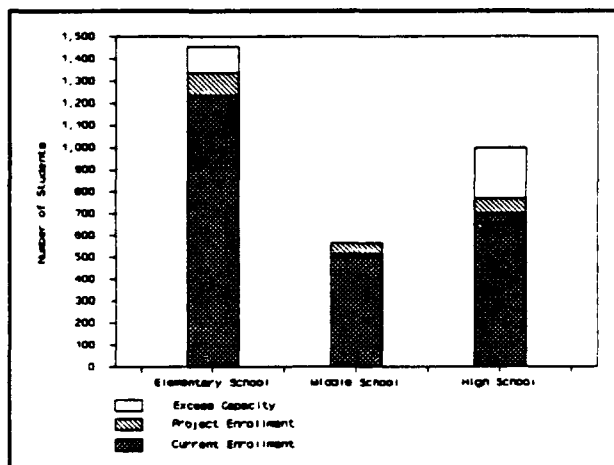


Figure 4.3-6
SCHOOL CAPACITIES
WARRENSBURG R-VI SCHOOL DISTRICT

Both district revenues and expenditures would increase from the proposed development. The district's property tax base would rise along with income from state and federal sources based on average daily attendance within the district. Concomitantly, increases in expenditures also would be required to provide additional educational services to new students. Some capital improvements may be needed to accommodate the new students at Warrensburg Middle School, and this necessity presents a potential financial burden for the district. If the number of military families with middle school students housed at Warrensburg can be minimized, it is anticipated that new revenues would be sufficient to cover additional expenditures.

City of Windsor

In Windsor, water facilities have the capacity to provide service to residents of the proposed 125 family housing units, but much less excess capacity exists at the sewerage treatment facility (Figure 4.3-7). The project is estimated to increase the current water consumption

rate by approximately 64,286 gpd and increase the load on the sewerage treatment plant by about 45,000 gpd. With the proposed project, the remaining excess capacity of the water system would be nearly 1,207,000 gpd -- more than 68 percent of total capacity. In addition, the City of Windsor indicates there are three additional wells which have been drilled but are presently not used. The remaining excess capacity of the sewerage plant, however, would be only 47,300 gpd, which is approximately 12 percent of the total system capacity. The City of Windsor has indicated that, if required, capital improvement plans for expansion of the plant could be made to provide additional excess capacity.

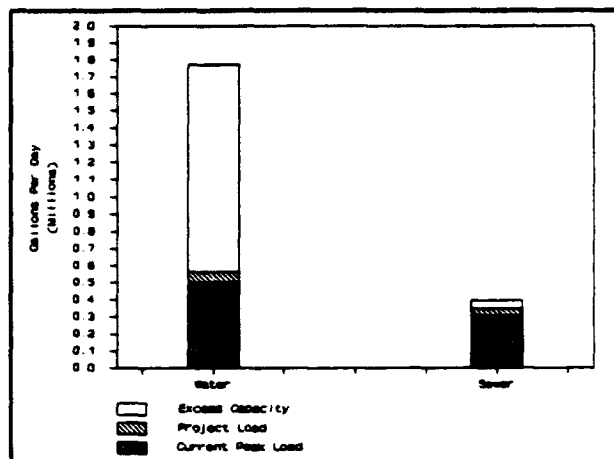


Figure 4.3-7
WATER AND SEWERAGE PLANT CAPACITIES
CITY OF WINDSOR, MISSOURI

Windsor's revenues and expenditures are expected to increase from the new housing development. The property tax base would broaden and additional income from water and sewer service fees would be collected. Increased tax revenue from retail sales and other taxes and fees also would be collected. With the increase revenue, additional expenditures would be required to provide services to new residents. Since no major capital improvements would appear immediately necessary at the water and sewerage treatment facilities, it is anticipated that additional revenues would at least equal additional expenditures.

Henry County R-I School District

The Henry County R-I School District has adequate capacity to provide educational services to residents of the proposed 125 family housing units (Figure 4.3-8). The project is estimated to increase enrollments by 67 in grades K-6 and 58 in grades 7-12. With the proposed project, there would be enough capacity at the elementary school level to accommodate an additional 195 students, which is approximately 31 percent of total capacity. At the junior and senior high school level, there would be space for 252 additional 7-12 grade students -- about 38 percent of total capacity.

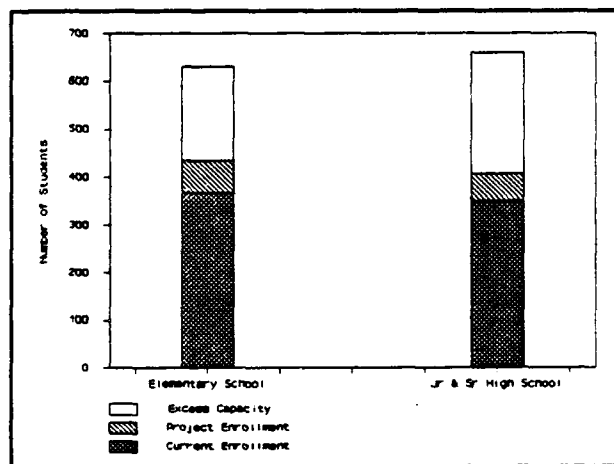


Figure 4.3-8
SCHOOL CAPACITIES
HENRY COUNTY R-I SCHOOL DISTRICT

School district revenues and expenditures would increase from the proposed development. The district's property tax base would expand along with income from state and federal sources due to increased average daily attendance within the district. Likewise, increased expenditures would be required to provide additional educational services to new students. But with one third or more excess

capacity remaining after accounting for project-related increased enrollments, it is unlikely that major capital improvements would be required in the near future. Therefore, it is anticipated that additional expenditures could easily be met by the expected rise in revenues.

4.3.3 Impacts of the Alternatives

Increased Site Development Alternative

Water and Sewerage

Impacts to water providers from increased site development at each of the four sites are not substantially different from those of the proposed project. In Knob Noster the remaining excess capacity would be 47 percent of total capacity, compared to 53 percent for the proposed project. In Sedalia, excess capacity remaining after completion of the increased number of military family housing units would be 25 percent, compared to 27 percent for the proposed action. In Warrensburg, the remaining capacity would change from 13 to 12 percent; and in Windsor, excess capacity would decrease from 68 to 66 percent.

Sewerage treatment service providers in Knob Noster and Sedalia would experience greater demand under the increased site development alternative, but overall no substantial changes to excess capacities would result. In Knob Noster, the remaining capacity would drop from 30 percent with the proposed project to 24 percent with the alternative development. In Sedalia, the percentage change is much smaller -- from 28 percent with the proposed development plan to 27 percent with the alternative.

Since adequate water and sewerage treatment capacity exists in Knob Noster and Sedalia, adverse financial impacts to those city's governments are not expected.

Substantial changes would result in Warrensburg and Windsor for sewerage treatment service providers from the increased development alternative. In Warrensburg, the change is relatively small (from 5 to 4 percent), but the fact that there would be very little excess capacity in either case, warrants some cause for concern. In Windsor, the remaining capacity is expected to change from 12 to 5 percent. The margin for accommodating the sewerage treatment demand from additional growth is very small in both Warrensburg and Windsor, and both communities would require some enhancement to their existing systems before another project of similar size to the 801 housing development could be accommodated.

In Warrensburg and Windsor, therefore, city governments may experience some financial problems depending on the cost of any needed sewage treatment facility enhancements. It should be noted, however, that at this level of analysis financial projections for these cities are extremely difficult to assess and future growth-related financial problems may not occur. X

Schools

The increased development alternative would not substantially change the impact to middle and high school enrollments in the Knob Noster R-VIII School District, but increased enrollments would affect the elementary schools by reducing excess capacity to less than 10 percent of total capacity. Under the proposed project, 12 percent of the total elementary school space would still be available, while under the increased development alternative, 9

increased development alternative, respectively. At the high school level, the change would be from 21 to 16 percent.

In the Sedalia #200 School District, increased development would not substantially change the impact to middle and high school enrollments, but elementary schools would be affected by the additional amount of growth. Under the proposed project, 9 percent of the total elementary school space would still be available, while under the increased development alternative, 3 percent of total elementary classroom space would be left. Under either the proposed project or the alternative, only a small margin would remain for additional growth in the community. At the middle school level, these percentages would change from 22 with the proposed project, to 20 percent under the increased development alternative. At the high school level, the change would be from 17 to 10 percent.

Increased development would not substantially change the impact to high school enrollments in the Warrensburg R-VI School District, but elementary and middle schools would be affected by the additional amount of growth. Under the proposed project, 8 percent of the total elementary school space would still be available, while under the increased development alternative, approximately 6 percent of total elementary classroom space would be vacant. Only a small margin for additional growth in the community would be left under either the proposed project or the alternative. At the 6-8 grade level, the Warrensburg Middle School would be in excess of total capacity by 13 percent under the proposed project, and would be over capacity by 17 percent with the increased development alternative. At the high school level, with the proposed project, 23 percent of the total capacity would remain available, while under the increased development alternative, 21 percent of total capacity would remain.

The increased development alternative would not substantially change the impact to elementary or junior and senior high school enrollments in the Henry County R-I School District. Under the proposed project, 31 percent of the total elementary school space would remain for growth, while under the increased development alternative, 25 percent of total elementary classroom space would still be available. At the junior and senior high school level, these percentages would change from 38 to 33 percent, under the proposed project and the increased development alternative, respectively.

X In summary, three of the school districts are not expected to require any capital improvements in the near future as a result of the increased development alternative, and therefore, financial impacts would be minimal. In Warrensburg, however, the capacity of the middle school may have to be increased to accommodate any additional growth. Hence, the district may experience some financial problems, depending on the cost of any facility enhancements that may be required. There may be some way to redistribute students among existing facilities so that major enhancements would not be necessary. This option potentially could alleviate any negative financial impacts.

No Action Alternative

Under the no action alternative impacts to local governments and school districts would probably be similar to the proposed project, since the private sector would likely provide additional housing for new military personnel stationed at Whiteman AFB. Impacts, in fact, may be greater if private development occurs in localities which do not have adequate capacity to accommodate additional growth. The Air Force has worked to distribute the 801 housing among the four communities so as to minimize the need for each community to alter its major existing infrastructure, but private developers may not achieve this end.

4.4 PUBLIC HEALTH AND SAFETY

4.4.1 Methodology

The current known extent of hazardous materials was established and assessed for potential contamination of the environment or disruption of safety at each site proposed for the 801 housing program. Soil samples were taken from locations at each proposed housing parcel, including identified sites of debris fills, refuse heaps, and background areas. Samples were analyzed by the Kansas City Testing Laboratory for toxic metal content using the Extraction Process (EP) Toxic Metals test. Herbicide and pesticide, and petroleum hydrocarbon content were determined by Langston Laboratories, Inc. Test results are presented in Appendix B.

4.4.2 Impacts and Mitigations

Knob Noster

With the exception of barium, the EP Toxic Metals test found no toxic metals above detection limits. Barium levels, recorded at 3.4 mg/l, are well below the threshold level of 100 mg/l identified as characteristic of EP toxicity. The Herbicide-Pesticide Screen indicated no detectable level of most common herbicides and pesticides, with the exception of insignificant amounts of MCP (0.634 mg/kg) and Dicamba (0.600 mg/kg). Results of the Petroleum Hydrocarbon test show levels of 530 mg/kg at the site, well within the background levels for this area and not considered significant (see Appendix B).

Prior to construction, contents of the small sewage lagoon associated with the abandoned trailer site should be cleared as site preparation. Potential development of the site should include planning during construction and operation of housing units which ensures that Air Force easements surrounding the hardened intersite communications system cable would not be obstructed.

Sedalia

The EP Toxic Metals test found no toxic metals, except barium, above detection limits. The barium level, recorded at 2.9 mg/l, is well below the threshold level of 100 mg/l identified as characteristic of EP toxicity. The Herbicide-Pesticide Screen indicated no detectable level of most common herbicides and pesticides, with the exception of MCP (1.24 mg/kg) and Dicamba (1.17 mg/kg); these concentrations are not considered significant (see Appendix B).

Possible development at the site should include planning, during construction and operation of housing units, which ensures that easements surrounding the high voltage power lines would not be obstructed.

Warrensburg

The EP Toxic Metals test found no toxic metals above detection limits at the site. The Herbicide-Pesticide Screen indicated no detectable level of most common herbicides and pesticides, with the exception of insignificant amounts of MCP (0.944 mg/kg) and Dicamba (0.689 mg/kg). Results of the Petroleum Hydrocarbon test show levels between 200 and 240

mg/kg at the site, well within the background levels for this area and not considered significant (see Appendix B).

Prior to construction, contents of the debris fill should be completely removed as site preparation. Since the debris fill is located in an eroding, intermittent streambed, preservation of the watercourse would best be approached by seeding the streambed with quick-growing vegetation cover and replanting shrub cover around the banks to stabilize the soil and limit continued erosion.

Windsor

The EP Toxic Metals test found no toxic metals above detection limits at the site. The Herbicide-Pesticide Screen indicated no detectable level of most common herbicides and pesticides, with the exception of insignificant amounts of MCP (1.14 mg/kg) and Dicamba (1.54 mg/kg); these concentrations are not considered significant. Results of the Petroleum Hydrocarbon test show levels of 320 mg/kg at the site, well within the background levels for this area and not considered significant (see Appendix B).

4.4.3 Impacts of the Alternatives

Increased Site Development Alternative

Impacts created under the increased site development alternative would require the same treatment as under the proposed action. The debris fill at Warrensburg would still need to be cleared, and the cable and power line easements, at Knob Noster and Sedalia, would still need to be respected.

No Action Alternative

Under the no action alternative, easements for the Knob Noster cable and Sedalia power lines would remain unaffected. The small sewage lagoon at the Knob Noster site and debris fill at the Warrensburg site, however, would not likely be cleared.

4.5 TRAFFIC

4.5.1 Methodology

The analysis of traffic impacts resulting from the proposed 801 housing project at Whiteman AFB is based on recently published summaries of service ratings for various portions of the affected network (Missouri Highway and Transportation Department, 1987a, 1987b, 1988b). These summaries provide data such as capacities and current traffic counts for U.S. Highways, Missouri State Highways, and bridges. The various components of the transportation network are also evaluated to isolate areas of inadequate service. For bridges, such evaluations focus upon measures of sufficiency, safety, and structural condition -- where poor ratings on either of these scales suggest a need for attention. Roads, in turn, are evaluated in terms of Levels of Service, a standardized scale which ranges from 'free flow' conditions to 'jammed' conditions (Table 4.5-1). In addition to examining published sources, individuals within the Missouri Highway and Transportation Department, the U.S. Air Force, and various local governments familiar with the transportation systems of the area also were consulted.

The procedure for estimating traffic associated with the proposed 801 housing developments involved a two-step method. The first step was to generate anticipated increases in local traffic due to the developments, using trip-generation factors published by the U.S. Department of Transportation (Klinger *et al.*, 1982). Following the suggestions in a recent study of variables used to forecast traffic (Hamburg *et al.*, 1983), the anticipated number of vehicle trips per household was based upon household income. By conservatively approximating the income structure of the personnel who would inhabit the 801 housing, an average of 5.4 daily trips (or 10.8 trip ends) per household was determined (Klinger *et al.* 1982). Trip generation was based on the proposed distribution for the 801 project: 125 units at Knob Noster (1,350 daily trip ends), 425 units at Sedalia (4,590 daily trip ends), 225 units at Warrensburg (2,430 daily trip ends), and 125 units at Windsor (1,350 daily trip ends).

The second step in the analysis of project-related traffic impacts was to assign the trips generated to links in the associated transportation network. For any particular housing parcel, the links focused upon were those which would carry traffic to and from the parcel in all directions -- thus incorporating both travel to and from work at Whiteman AFB, as well as transportation about the area for other reasons. In lieu of well-founded data on directional tendencies of travel for the various housing tracts, the study considered worst case scenarios which assumed that all vehicles could take each possible route.

Traffic impacts resulting from the 801 housing were analyzed both for bridges and roads. In the case of bridges, an impact deserves attention if it involves a situation where increased traffic would cause the bridge to become deficient, or if it involves a bridge that is already deemed inadequate. Impacts on roads were assessed by comparing the estimated traffic changes with the capacities and LOS ratings published in the referenced Missouri Highway and Transportation Department studies. Road-related impacts were deemed important if they would cause a link with a current LOS rating C or above to deteriorate to a rating of D, E, or F, or if they would cause a road with a rating of D or below to deteriorate even further.

4.5.2 Impacts and Mitigations

Before proceeding with a discussion of the traffic impacts associated with each of the four housing sites, the anticipated impacts in two other contexts are examined briefly:

Table 4.5-1

LEVEL OF SERVICE DESCRIPTIONS

Level of Service	Traffic Flow Characteristics
A	Low volumes and high speeds, with speeds not restricted by other vehicles; 'free flow'.
B	Driving speeds beginning to be affected by other vehicles, though operation is still stable; 'rural design'.
C	Driving behavior contingent upon that of other vehicles, though overall operation is still stable; 'urban design'.
D	Driving behavior greatly determined by the behavior of other drivers; with frequent waiting through one red cycle at an intersection, this is the lower limit of tolerance for many drivers; 'maximum urban design'.
E	Near or at capacity, representing the maximum volume of traffic an intersection can accommodate; all drivers wait through at least one signal cycle; 'capacity'.
F	Traffic flow is unstable, characterized by long queues often back through more than one intersection; 'jammed conditions'.

(1) construction period impacts; and (2) impacts in the vicinity of Whiteman AFB, as a consequence of developing all of the parcels and modifying the patterns of access to the base.

The construction of the housing developments and associated components -- such as streets systems within the developments -- is anticipated to produce traffic impacts at all four parcels. These impacts are expected to result from the delivery of materials and equipment to the construction sites, and the daily travel of the construction crews. However, such movements can be planned around peak periods of local traffic. Moreover, construction-related traffic would be temporary rather than a permanent characteristic of the area. Potential traffic impacts associated with the construction phase of the project are thus not anticipated to be serious.

With regard to impacts in the vicinity of Whiteman AFB, the main concern is the interaction between traffic entering and leaving the base and the traffic on the surrounding transportation network. The focus of attention is, therefore, on the three gates currently in operation. In estimating increased gate traffic, it is assumed that each housing unit would send one vehicle daily to the base. Because future patterns of gate use with the new housing developments are uncertain, worst case scenarios were developed. The Knob Noster gate was assumed to provide access to the base from both the Sedalia and Knob Noster housing tracts; the Warrensburg gate was assumed to provide access from both the Warrensburg and Knob Noster sites; and the Windsor gate was assumed to provide access from the Windsor and Sedalia sites. Resulting estimates suggest that up to 6,989 vehicles per day could use the Knob Noster gate, 4,797 vehicles the Warrensburg gate, and 1,279 the Windsor gate.

Neither the Knob Noster nor the Warrensburg gates have been cited as experiencing any traffic flow problems under current conditions (Harlan Bartholomew & Associates, Inc., 1986). It is not expected, therefore, that the projected increases in traffic at these gates, although substantial, would produce serious impacts. However, the Windsor gate presently is open only during morning and afternoon peak hours; moreover, the projected increase in volume could be roughly seven times that currently documented.

As a mitigation measure for the impact at the Windsor gate, suggested improvements in both the gate system and transportation network on the base should enable the accommodation of increased traffic volume (Harlan Bartholomew & Associates, Inc., 1986). Of particular importance are the previously suggested improvements in the road system on the southern portion of the base, and the installation of at least one gate along the southern edge of the base which functions throughout the day.

Knob Noster

Project-related increases in traffic on several links in the general vicinity of Whiteman AFB and Knob Noster are anticipated (Table 4.5-2). None of these links should experience traffic volumes beyond their capacities. Nevertheless, growth in traffic on several components of the network are noteworthy.

One concern is with the two bridges ("G-966" and "L-649") on Missouri Highway 132 between U.S. Highway 50 and Missouri Highway DD. Currently, these bridges are felt to have both design and structural deficiencies (Missouri Highway and Transportation Department, 1987a). Additional traffic would in all likelihood cause this situation to deteriorate further, yielding serious impacts.

Table 4.5-2

1987 TRAFFIC DATA AND PROJECTED IMPACTS, KNOB NOSTER SITE

Route	Location	24-hour Capacity	Present Avg. Daily Traffic	LOS	Projected Avg. Daily Traffic
DD	West of Rte. 132	13,200	2,604	C	3,954
J	South of Knob Noster	18,400	6,196	D	7,546
MM	North of Rte. 50	11,300	210	A	1,560
23	North of Rte. 50	12,600	1,690	B	3,040
50	West of Rte. 132	45,600	9,080	A	10,430
50	East of Knob Noster	45,600	8,130	A	9,480
132	South of Business 50	15,200	3,140	C	4,490
132	North of Rte. DD	16,100	5,264	D	6,614

Sources: Missouri Highway and Transportation Department, 1987b, 1988a, 1988b. Projected Average Daily Traffic Estimated by R.D. Niehaus, Inc., 1988.

A second concern focuses upon particular transportation links near the housing parcel, most notably Missouri Highways 132 and J, south of U.S. Highway 50. Both are experiencing low LOS ratings at present, and these would worsen with anticipated increases in traffic to and from the 801 housing development on the Knob Noster parcel.

As noted in Section 3, improvements in the transportation network in the vicinity of Knob Noster currently are being implemented. Several of these improvements will serve as mitigations for the anticipated problems discussed above. For present purposes, the most important changes concern the widening and realignment of Missouri Highway 132 between U.S. Highway 50 and Missouri Highway DD, and the construction of a diamond interchange at the intersection of U.S. Highway 50 and Missouri 132. The realignment of Missouri Highway 132 will require that the worst of the two bridges previously mentioned (G-966) be relocated; and it is assumed that during the widening of Missouri 132 deficiencies in the second bridge (L-649) also will be addressed. At present, changes to Missouri Highway J are not planned. However, the substantial improvement of Missouri Highway 132 is expected to attract traffic from Highway J, greatly reducing the anticipated impacts associated with the 801 housing project.

Sedalia

Growth in traffic due to the proposed 801 housing is not expected to cause link capacities in the Sedalia area to be exceeded, but certain components of the transportation network associated with the site deserve attention (Table 4.5-3). The first directly concerns the increased traffic volumes anticipated on Missouri Highway Y. This link currently has an LOS rating of C between the housing parcel and the city of Sedalia -- a rating expected to decline due to project-related increases in traffic volume. West of the housing parcel the daily traffic volume on Missouri Highway Y is quite low, and the LOS rating currently is A. However, under a worst case scenario, traffic would increase by more than 15 times as a result of the project -- to nearly half the link's capacity. The second traffic impact of interest concerns a bridge ("P-611") on Missouri Highway Y west of the housing parcel. Presently, this bridge has a safety rating below acceptable levels (Missouri Highway and Transportation Department, 1987a), although the nature of the problem is not specified.

The most desirable mitigation strategy for traffic impacts at the Sedalia site would be to direct as much project-related traffic as possible towards U.S. Highway 50 instead of Missouri Highway Y. The former is a main link capable of accommodating increases in traffic with little difficulty. It is uncertain if such a route preference would occur naturally, since both U.S. 50 and Missouri Highway Y provide direct access to Whiteman AFB as well as the city of Sedalia. To help ensure this traffic distribution, special attention should be paid to providing particularly easy access to the northern portion of the housing parcel, and an intersection with U.S. Highway 50 capable of handling large numbers of vehicles efficiently.

Warrensburg

Traffic volume increases as a result of developing the 801 housing at Warrensburg would not exceed any link capacities (Table 4.5-4). Nevertheless, serious impacts are likely. Noteworthy impacts are expected on Missouri Highway DD, which provides the most direct access to Whiteman AFB; current LOS ratings of C along sections of this link are expected to decline if daily traffic doubles, as is projected in the worst case.

Table 4.5-3

1987 TRAFFIC DATA AND PROJECTED IMPACTS, SEDALIA SITE

Route	Location	24-hour Capacity	Present Avg. Daily Traffic	LOS	Projected Avg. Daily Traffic
Y	West of 801 Tract	11,700	300	A	4,890
Y	East of 801 Tract	25,300	2,980	C	7,570
50	West of 801 Tract	54,700	8,980	A	13,570
50	East of 801 Tract	123,800	10,820	A	15,410
65	North of Rte. 50	62,600	6,420	A	11,010
65	South of Rte. 50	91,000	8,240	A	12,830

Sources: Missouri Highway and Transportation Department, 1987b, 1988a, 1988b. Projected Average Daily Traffic Estimated by R.D. Niehaus, Inc., 1988.

Table 4.5-4

1987 TRAFFIC DATA AND PROJECTED IMPACTS, WARRENSBURG SITE

Route	Location	24-hour Capacity	Present Avg. Daily Traffic	LOS	Projected Avg. Daily Traffic
DD	West of Maguire St.	18,500	2,233	B	4,663
DD	East of Maguire St.	13,200	2,571	C	5,000
13	North of Rte. 50	33,800	6,260	D	8,690
50	West of Rte. 13	58,100	12,360	A	14,790
50	East of Rte. 13	46,300	10,350	A	13,780
Young Ave.	East of Maguire St.	28,000	12,600	E	15,030
Young Ave.	West of Maguire St.	25,000	7,540	D	9,530
Maguire	South of Young Ave.	33,800	5,070	E	7,500

Sources: Missouri Highway and Transportation Department, 1987b, 1988a, 1988b. Projected Average Daily Traffic Estimated by R.D. Niehaus, Inc., 1988.

Additional impacts are anticipated throughout the community of Warrensburg, between Missouri Highway DD and U.S. Highway 50. A number of streets within the town currently are experiencing traffic problems, with LOS ratings of D and E at several sections on the network. Traffic associated with the Warrensburg housing development would worsen these conditions.

Included within the DARP are improvements to Missouri Highway DD between Warrensburg and Whiteman AFB. These improvements would change the grade of this route in certain problem areas, and widen its shoulders -- increasing capacity slightly, and possibly enabling the accommodation of project-related traffic impacts within acceptable LOS ratings. An associated mitigation measure is the proposed extension of Missouri Highway DD (Hale Lake Road) westward of its present termination point to connect with the proposed housing site.

More demanding mitigation measures concern the problems currently experienced on the road system within the town of Warrensburg. Major trunk roads currently are among those experiencing difficulties. The expansion of these trunks, and the establishment of additional main north-south and east-west arteries, appear to be the only means of addressing these problems.

Windsor

The road network in the vicinity of the Windsor housing parcel currently supports traffic volumes well below its theoretical capacity (Table 4.5-5). Nevertheless, the construction of 801 housing on the western edge of Windsor would generate two types of impacts which deserve some attention.

The first impact concerns bridges -- in particular, two bridges ("K-231" and "K-232") which lie on Missouri Highway 2 between its intersections with Missouri Highways WW and D. Although specific problems were not identified, both of these bridges were rated below desirable safety levels in the most recent state assessment (Missouri Highway and Transportation Department, 1987a). Increased traffic, created as a consequence of the proposed 801 housing development at Windsor, presumably would further decrease the safety ratings of these bridges.

The second impact concerns increased traffic volumes on the relatively small roads in the vicinity of the Windsor parcel. Most of these roads currently have LOS ratings of B. Although project-related traffic increases are not anticipated to push these ratings to unacceptable levels, some links would experience substantial relative increases in daily vehicle use. For example, Missouri Highway WW may experience traffic volumes three times its current level, while Missouri Highway D may experience traffic roughly four times that presently recorded; both of these roads are relatively narrow and winding, and both provide important access northward to Whiteman AFB. In this case, impacts are anticipated to be noticeable, but not serious.

The only mitigation measures which may be required in relation to development at this site concern the two bridges mentioned above. Potential improvements should be considered to increase their safety ratings.

Table 4.5-5

TRAFFIC DATA AND PROJECTED IMPACTS, WINDSOR SITE

Route	Location	24-hour Capacity	Present Avg. Daily Traffic	LOS	Projected Avg. Daily Traffic
D	North of Rte. 2	12,900	390	B	1,740
WW	North of Rte. 2	11,900	624	B	1,974
2	West of Windsor	12,500	1,380	A	2,730
2	At Rte. WW	15,600	2,016	B	3,366
52	At Rte. 2	10,200	1,931	B	3,281

Sources: Missouri Highway and Transportation Department, 1987b, 1988a, 1988b. Projected Average Daily Traffic Estimated by R.D. Niehaus, Inc., 1988.

4.5.3 Impacts of the Alternatives

Increased Site Development Alternative

To analyze the increased site development alternative, the same approach as that used to examine the proposed action was employed. Trips were generated based upon the maximum numbers of units at each parcel: 200 units at Knob Noster (2,160 daily trip ends), 750 units at Sedalia (8,100 daily trip ends), 300 units at Warrensburg (3,240 daily trip ends), and 200 units at Windsor (2,160 daily trip ends). Vehicles were then assigned to the various transportation links using worst case scenarios.

Impacts associated with the increased site development alternative are expected generally to resemble those associated with the proposed action -- differing primarily in degree rather than kind. For the majority of the links examined, which are greatly underutilized, the additional traffic associated with the increased development alternative still should not produce serious impacts. Similarly, for links either experiencing LOS problems, or approaching the threshold of such problems, the increased traffic volumes would generate impacts which are both noteworthy and more serious than those associated with the proposed action. The most serious traffic impacts to result from the increased development option are anticipated to occur in the following areas:

- o along Missouri Highways 132 and J, south of U.S. Highway 50 near Knob Noster;
- o along Missouri Highway Y, between the Sedalia housing parcel and U.S. Highway 65;
- o along Missouri Highway DD, between Whiteman AFB and Warrensburg; and
- o along several streets in the community of Warrensburg, particularly between Missouri Highway DD and U.S. Highway 50.

No Action Alternative

Under the no action alternative, it is assumed that no additional housing would be provided by the federal government through the 801 program for personnel and their families who would move to the region in support of the B-2 mission. The individuals for whom the 801 housing is intended, therefore, would have to be accommodated through purely private sector development -- most likely located in or near the four communities discussed in this study. Specific predictions about the distribution of housing demand have not been made, but it is arguable, given current trends among Whiteman AFB personnel, that Warrensburg and Knob Noster would be the two most heavily impacted locations. Currently, the transportation networks in these two areas are experiencing the most serious traffic problems of any examined in this document. Although it is impossible to predict the specific nature of the impacts under the no action alternative, the probability that the Warrensburg and Knob Noster areas would be affected most substantially suggests the possibility for impacts more serious than those discussed, in Section 4.5.2, under the proposed action.

4.6 AIR QUALITY

4.6.1 Methodology

The effects on air quality from the proposed development at the four sites were determined by identifying the various sources of air pollution emissions resulting from construction and operation of the housing units and indicating the types of contaminants that would be emitted from each of the sources.

4.6.2 Impacts and Mitigations

Short-Term Impacts

There would be two main sources of air pollutant emissions during site preparation and construction; air pollutants from vehicle and equipment exhaust and from dust generated by heavy equipment at each of the construction sites. Emissions would be greatest during initial site preparation when heavy earth moving equipment would be operating. Since these construction-related impacts would be temporary and the region is in attainment with NAAQS criteria pollutant levels, such impacts would be relatively minor. Normal building practices, such as proper maintenance and tuning of equipment and periodic watering for dust prevention, would minimize the emission of air pollutants during construction.

Long-Term Impacts

During normal operation of the 801 housing units, there would be three main sources of air pollutant emissions: on-site use of natural gas for cooking and heating, off-site generation of electric power, and the use of motor vehicles. The burning of natural gas would produce emissions of nitrogen oxides and carbon monoxide. Air pollutants typically emitted by fossil fuel-burning electrical generation plants that would supply power to the 801 housing units include sulfur and nitrogen oxides. Motor vehicle emissions, mainly comprised of carbon monoxide, nitrogen oxides, reactive organic gases, and total suspended particulate, would also result from the 801 housing development. The total amount of long-term air pollution emissions associated with the proposed housing, however, would be negligible.

4.6.3 Impacts of the Alternatives

Increased Development Alternative

The total amount of both short- and long-term air pollution emissions associated with the increased development alternative would be negligible.

No Action Alternative

If the 801 housing development is not constructed as proposed, it is likely that other private housing would be constructed within the region to accommodate the increased staffing levels at Whiteman AFB. Therefore, approximately the same amount of air pollution emissions would probably be produced at other locations under the no action alternative.

4.7 NOISE

4.7.1 Methodology

The impact analysis considers potential project-generated noise levels, the reduction of noise levels as a function of distance, and the existing uses and noise environments of the receptor areas.

Although no consensus exists for land use restrictions in areas with average noise exposure levels from 65-75 dB, standard guidelines for establishing the compatibility of noise levels with land uses are provided in Table 4.7-1. The Whiteman AFB AICUZ report documents compatibility of land uses in the area surrounding the base airfield.

4.7.2 Impacts and Mitigations

The major sources of noise directly related to the proposed action would be noise generated from construction activities at the proposed sites. Construction noise would occur intermittently during development. The following noise levels are typically associated with construction phases that do not require blasting or piling (County of Santa Barbara, 1984):

Ground clearing and grading	83 dBA
Excavation	88 dBA
Foundations	81 dBA
Erection	81 dBA
Finishing	88 dBA

Homes in the vicinities of the proposed sites (existing residential development surrounded by the Windsor site, homes south of the Sedalia site, and farm houses near the Knob Noster and Warrensburg sites) are close enough to the proposed development sites to be disturbed periodically by construction noise.

Construction noise impacts may be partially mitigated by limiting building activities to the hours between 8 am and 6 pm. Operative mufflers could be applied to all equipment, and whenever possible, lower noise emission equipment should be substituted for relatively high noise-emission equipment. In cases where construction would take place in close proximity to sensitive receptors (for example, near established housing tracts at the proposed Windsor or Sedalia sites), noise barriers around the construction site may be necessary.

All project sites are located outside the 65 dB noise contour of the Whiteman AFB airfield as identified by the Whiteman AFB AICUZ report (U.S. Air Force, 1976) (Figure 3.7-1); therefore, residential use of the land is compatible with the airfield. Long-term impacts from development of any of the sites are expected to be minimal, since the residential use of this land is not expected to be a substantial generator of noise.

Environmental noise at all the proposed sites do not exceed levels that would restrict housing development. Two sites, however, may experience slightly higher ambient noise levels due to air and highway traffic:

Table 4.7-1

LAND USE COMPATIBILITY CHART FOR COMMUNITY NOISE

	Land Uses	CNEL or Ldn Value (dBA)							
		50	55	60	65	70	75	80	85
Noise Sensitive Receptor	Residential Land Uses: Single and Multiple Family Dwellings, Group Quarters, Mobilehomes	A	A	B	C	D			
	Transient Lodging: Hotels, Motels	A	B	C	D				
	School Classrooms, Libraries, Churches, Hospitals, Nursing Homes, etc.	A	B	C	D				
	Recreational Land Uses: Golf Courses, Open Space Areas with walking, bicycling or horseback riding trails, water based recreation areas where motorized boats and jet-skis are prohibited.	A	B	C	D				
	Office Buildings, Personal, Business and Professional Services	A	B	C	D				
	Auditoriums, Concert Halls, Amphitheaters, Music Shell (maybe noise sensitive or noise producer)	A	A	B	C	D			
Noise Producer	Sports Arenas, Outdoor Spectator Sports	A	A	B	C	D			
	Recreational Land Uses: Playgrounds, Neighborhood Ball Parks, Motorcycle Parks, and Water-based Recreation Areas where motorized boats and jet-skis are permitted.	A	B	C	D				
	Commercial Land Uses: Retail Trade, Movie Theaters, Restaurants, bars, entertainment related commercial activities, services.	A	B	C	D				
	Commercial Land Uses: Wholesale, Industrial/ Manufacturing, Transportation, Communications and Utilities.	A	B	C	D				
		A	B	C	D				

Explanation of Land Use Consequences:

A Normally Acceptable. With no special noise reduction requirements assuming standard construction.

B Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of the noise reduction requirement is made and needed noise insulation features included in the design.

C Generally Unacceptable. New construction is discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

D Land Use Discouraged. New construction or development should generally not be undertaken.

Source: County of Riverside, 1986.

Knob Noster. Due to its location west of the base and the northeast-southwest orientation of the base runway away from the Knob Noster site, increased noise associated with the B-2 will not likely affect the Knob Noster site unless the associated noise contours are dramatically widened perpendicularly to the flight path. Since U.S. Highway 50 lies more than 300 yards from the southern boundary of the site, noise generated from traffic along the highway would not likely exceed 65 dBA on the site. However, to reduce noise levels generated by highway traffic, noise barriers (that could also act as walls or fences) could be erected at the southern edge of site development.

Sedalia. Restriction of construction within 100 feet of U.S. Highway 50 or establishment of noise barriers beside the highway would reduce noise levels generated from highway traffic.

4.7.3 Impacts of the Alternatives

Increased Site Development Alternative

Under the increased site development alternative, construction of housing units would last for a longer period and expose neighboring residences to construction-related noise for a longer period. Similar mitigations to those of the proposed action (such as limiting construction hours and use of noise barriers) employed for a longer period would mitigate these impacts.

No Action Alternative

Under the no action alternative, noise impacts would not occur at any of the four proposed sites.

4.8 EARTH RESOURCES

4.8.1 Methodology

The following methodologies are based on field surveys at the proposed project sites and comprehensive review, analysis, and synthesis of existing baseline environmental data from Henry, Johnson, and Pettis counties, the Missouri Department of Natural Resources, the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and Whiteman AFB Installation Restoration Program (IRP) reports.

Geology and Topography

Geologic hazards that could affect the proposed construction and potential development were evaluated. Impacts are assessed based on the likelihood of a hazardous geologic or seismic event occurring during the project lifetime, the sensitivity of the project elements to such an event, and the potential effects to the vicinity.

Soils

Soil stability, erosion potential, water retention, and shrink-swell characteristics were analyzed in relation to potential grading activities; the impacts these soil properties may have on the proposed action were determined. Specifically, soil limitations affecting building construction were reviewed, assessed, and presented for the soils found on each proposed parcel to determine restrictions that should be considered prior to site improvement. Project-related impacts were investigated for any possible contributions to increased soil erosion, degradation of the existing soil conditions, or soil instability that could threaten project operations.

Hydrology and Water Quality

Drainage characteristics and hydrologic conditions were examined in relation to excess water generated by development on the site. Possible impacts of decreased infiltration rates, increased runoff, and surface and subsurface drainage flow of water leading to deterioration of natural drainages, disruption of current drainage patterns, or degradation of water quality were assessed. Flooding hazards based on 100-year flood plain information were reviewed.

4.8.2 Impacts and Mitigations

Geology and Topography

The proposed project sites present no geologic hazard that cannot be addressed using standard construction procedures. There are no known faults or seismic activity in the area (Missouri Department of Natural Resources, 1979; Missouri Geological Survey and Water Resources, 1961; U.S. Air Force, 1988b).

Soils

General construction procedures associated with development of residential units would disturb soils on all of the proposed sites. Grading for construction preparation may lead to soil compaction and expose the soil to increased surface wind and water erosion on level and rolling topography or may lead to more severe gully erosion on steeper slopes. These actions, however, would likely be short term, lasting only until landscaping has been established.

To minimize the impacts associated with general construction on any of the proposed sites, care should be taken not to disturb surrounding soils during foundation excavation. Loose or disturbed soils should be replaced with compacted material. Cuts and fills necessary on steeper slopes should be given adequate protection. Mulch or straw should be applied over exposed soil, and quick-rooting vegetation should be planted to stabilize the soil. Long-term erosion impacts are not anticipated once vegetation has reestablished itself.

The degree and kind of soil limitations that affect building development have been reviewed for soils found at each proposed site (Tables 3.7-1, 3.7-2, 3.7-3, and 3.7-4). Ratings of building limitations (slight, moderate, or severe) are based on soil properties, site features, and observed performance of the soils. According to the Soil Conservation Service (1976, 1980, and 1988), there are soils found on each site that may present severe limitations to housing development. That is, soil properties or site features may exist that are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and increased maintenance may be required. Despite the fact that these conditions are considered to present severe limitations to construction, soils with these properties have been developed as building sites in the surrounding areas. Only where these limiting characteristics are compounded by restricting factors, such as steep topography or frequently inundated flood plains, have these conditions curtailed development.

Soil properties restrictive to development include shrink-swell potential, low soil strength, shallow depth to bedrock, flooding, high water table/wetness, or slope steepness. Construction procedures and maintenance should anticipate and accommodate these conditions through proper design and installation. Soils rated with moderate to high shrink-swell potential can damage roads, building foundations, and other structures; foundations and footings should be designed to prevent structural damage from shrinking and swelling. Soils with low strength may not support loads placed upon them; surface layers may be replaced with suitable base material of higher strength. Shallow depth to bedrock, flooding, and wetness affect the ease of excavation and construction; nonrippable bedrock near the surface could require blasting for removal. Artificial drainages could be established to keep soil from becoming saturated under wet or perched water table conditions. Steep slopes require grading to allow for construction; steepness may also exacerbate surface and gully erosion.

Knob Noster. Approximately 60 percent of the Knob Noster site is covered by four soil series (Macksburg, Bremer, Norris, and Lightning) that potentially present severe limitations to building construction and maintenance (Soil Conservation Service, 1980). The Macksburg and Bremer series, found on the site's uplands, may inhibit construction due shrink-swell, wetness, and low strength properties. These properties should be examined and necessary construction designs should be adopted. The Norris series is found on steep slopes (14-35 percent) with shallow, weak underlying shale beds paralleling the surface. Construction on this series would likely require bedrock removal and extensive grading. The Lightning series is found in the flood plain of Clear Fork; development on these soils could be limited to recreational facilities to minimize damage associated with flooding.

Sedalla. Between 50 and 60 percent of the site is occupied by four soils series (Greenton, Grundy, Macksburg, and Hoberg) considered to have potentially severe limitations to building development (Soil Conservation Service, 1988). The Greenton, Grundy, and Macksburg series may encumber construction due to wetness and shrink-swell properties. Such characteristics should be examined and accommodated for in construction design. The Hoberg series, found near the Coon Creek streambed, is susceptible to wetness; such streambed areas, which also host sensitive riparian vegetation, could be dedicated to recreational or park uses which would minimize potential soil-related construction hazards.

Warrensburg. Four of the six soil series on the Warrensburg site (Sampsel, Snead, Norris, and Blackoar), covering half the site, present potentially severe limitations for building construction (Soil Conservation Service, 1980). The Sampsel and Snead series, found on the site's uplands, may encumber construction through shrink-swell and low strength properties. The Norris series, occupying less than five percent of the site, may limit development due to steep slopes and low strength. The Blackoar series, found on terraces and the flood plain of the East Fork of Post Oak Creek, may experience occasional flooding and wetness; development there could be restricted to recreational facilities to minimize potential damage associated with flooding and wetness.

Windsor. Three of the five soil series found on the Windsor site (Hartwell, Lightning, and Verdigris) present potentially severe limitations for building and site development (Soil Conservation Service, 1976). These series occupy approximately 55 percent of the site. Although structures have been built on the Hartwell series in the Windsor area, the potentially hazardous shrink-swell and seasonally perched water table characteristics of the soil should be considered and accommodated for in construction design. The Lightning and Verdigris series are found primarily in the streambeds and flood plains of tributaries to the Tebo Creek system; development on these soils could be limited to recreational facilities to minimize damage associated with flooding.

Hydrology and Water Quality

To minimize the hazard of flooding or bank failure due to undercutting, structures should not be built in flood plains, streambeds, or near the brow of the banks. Such action would comply with housing construction policies of Whiteman AFB and the city of Warrensburg. Although flood plain data is largely unavailable for the proposed Windsor, Warrensburg, and Knob Noster sites, soils indicative of flood plains (Verdigris, Lightning, Bremer, and Blackoar series) should be given special consideration with respect to construction.

During construction of buildings and associated improvements, exposure, compaction, and disruption of soils would likely occur at all of the proposed sites and possibly lead to decreased soil infiltration and increased runoff volume. These effects could cause temporary sharp increases in surface erosion and streamwater sedimentation, lasting the duration of housing construction. Immediate replanting of quick-rooting vegetation following construction could minimize sedimentation to the streams. Additionally, improvement of these sites currently used for agriculture could lead to increased surface runoff over the long term due to the introduction of impermeable surfaces.

No measurable impacts to groundwater quality are expected to result from the proposed action.

4.8.3 Impacts of the Alternatives

Increased Site Development Alternative

Impacts associated with the increased site development alternative would differ from those of the proposed action only in that they would potentially affect more acreage at each site. Construction mitigations to address soil properties and hydrologic conditions would cover these larger areas and therefore may lead to increases in total construction costs in proportion to the additional number of units.

No Action Alternative

Under the no action alternative, no site would be developed and no impacts to earth resources would be expected at any of the four sites.

4.9 BIOLOGICAL RESOURCES

4.9.1 Methodology

Vegetation

The botanical analysis focused on potential impacts of the project on the vegetation and flora of the four sites. Impacts on botanical resources are a function of the number of acres disturbed; the sensitivity of the disturbed habitat determines the consequence of the impact. The four sites were surveyed in the field for vegetation, flora and the possible presence of sensitive species, by walking the areas. Natural habitats such as riparian woodland and non-riparian wooded areas were examined in more detail wherever possible for the presence of listed species, compared to obviously disturbed areas such as fields and grazed land. Local botanists were consulted wherever possible for information on rare botanical resources and commonly occurring species. In particular, the Missouri Department of Conservation offices were consulted for localized occurrences of all species.

Wildlife

Impacts of project construction and operation on wildlife at the sites were analyzed for potential habitat disruption, range restriction, and permanent displacement leading to reduction in wildlife numbers. Special attention was given to determine if these project-related impacts would affect endangered, threatened, or rare species. As in the botanical analysis, local wildlife scientists were consulted to gain the benefit of their specialized knowledge of the area.

4.9.2 Impacts and Mitigations

Vegetation

Construction of housing on the proposed sites would eliminate much of the existing vegetation. The loss of riparian habitat could be avoided by not building in these areas, and by concentrating construction on land that is already disturbed. However, since no sensitive plant species have been identified on any of the sites, the vegetation communities at these locations are not considered sensitive habitat and, though their loss is of concern, it would not be substantial.

Wildlife

Construction on the four sites would temporarily eliminate much of the resident wildlife. These species would be displaced to suitable habitat in adjacent or nearby areas during the course of construction, but some would likely reinhabit the sites following project completion. Although some sensitive wildlife species, particularly migrant birds (bald eagle, peregrine falcons and hawks; see Table 3.9-1) pass through the area, the presence of large undeveloped areas in the vicinity of each of the sites, suggests that these species would not be affected considerably by a reduction in their home ranges or foraging grounds.

4.9.3 Impacts of the Alternatives

Increased Site Development Alternative

Impacts under the increased site development alternative would be the same as the impacts under the proposed action. The loss of additional natural areas occupied by local flora and fauna species is not anticipated to have negative effects on the area to an appreciably greater extent, due to the lack of sensitive species and habitats at the sites.

No Action Alternative

Under the no action alternative, the natural habitats, vegetation and wildlife at the four sites would not be disturbed, and impacts to them would not be expected.

4.10 CULTURAL RESOURCES

4.10.1 Methodology

A search of site records for the State of Missouri, maintained at the University of Missouri by the ASM, was requested to determine if any known cultural resources are located on the four proposed housing parcels. A field survey of each tract was also conducted, in an attempt to locate additional remains of cultural resources; a full description of the single archaeological site discovered by this survey was sent to the ASM, in compliance with ASM and Missouri Department of Natural Resources regulations. Finally, Mr. Chester E. Ellis, Jr., director of the Heart of America Indian Foundation and a spokesperson for Native Americans in the general vicinity of western Missouri, was asked to evaluate the significance of the cultural resources present on the housing tracts on behalf of Native Americans. Coordination with the State Historic Preservation Office is currently underway regarding the status of the single archaeological site discovered in project field work as well as the four sites described in ASM files.

Project-related impacts were analyzed to determine if any affected site has (1) the potential to yield (or has already yielded) information important to understanding the past, or (2) a sacred importance to pertinent Native American groups.

4.10.2 Impacts and Mitigations

None of the impacts on cultural resources located on the four proposed housing parcels were considered to be of major importance. If additional cultural resources are encountered on any parcel, a qualified archaeologist should be consulted before continuing development.

Knob Noster

One archaeological site is located on the proposed Knob Noster housing tract. Because these remains are located on poor soil in a sloping area which would be relatively undesirable for housing, it may be possible to preserve the site. However, based upon present knowledge even the destruction of this site would not represent a significant impact. Although covering a relatively large area, the limited amount of information provided by the site (surface or shallow lithic scatters which cannot be dated), the large number of such sites already documented within the state of Missouri, and the non-significance of this site to Native American groups limit its importance.

Sedalia

To date no cultural resources are known to exist on the proposed Sedalia housing tract. The development of this parcel is not anticipated to have any impacts on cultural resources.

Warrensburg

A single archaeological site is known to exist at the very edge of the proposed Warrensburg housing tract. Although not deemed sacred by Native Americans, because this site contains

datable artifacts (probably Late Archaic) in a deposit of unknown depth, its destruction would be highly undesirable. Fortunately, the site's known location at the edge of the proposed housing tract would ensure its preservation by not developing this portion of the parcel. Air Force environmental representatives have stated that the limits of the site would be defined as clearly as possible before any construction begins to guarantee that it is not disturbed.

The precise nature of the historic remains near the center of the Warrensburg parcel is unknown, but they do not appear to represent a historic house site. At present the destruction of this portion of the tract in the process of its development is not anticipated to produce a significant impact on cultural resources. Nevertheless, development of this area should be approached with care, and a qualified archaeologist should be notified if any subsurface remains are discovered.

Windsor

Two archaeological sites currently are known to exist on the Windsor housing tract. One, a possible petroglyph site, is located along an edge of the parcel slated for development. This site was not judged sacred by the Native Americans consulted. However, given the nature of the site and the general desirability to preserve such remains, coupled with its location on the edge of the housing tract, development could be designed to avoid this portion of the housing tract. A second archaeological site lies near another edge of the parcel, and likewise could be avoided and preserved. However, due to the nature of this second site -- namely, a shallow, undatable deposit of debitage and utilized flakes -- and its lack of importance to Native Americans, its destruction is not anticipated to present a significant impact on cultural resources.

4.10.3 Impacts of the Alternatives

Increased Site Development Alternative

In the context of cultural resources, the increased site development alternative will not change the essence of the assessment stated above. Even when assuming the highest densities possible for each of the housing tracts under the increased development alternative, there still should be minimal difficulty in avoiding the archaeological sites located on the edges of the Warrensburg and Windsor parcels. It should similarly be possible to avoid the single site present on the Knob Noster tract, particularly since that area is less desirable for development due to soil and topographic conditions. No significant impacts on cultural resources are anticipated at any of the four proposed housing parcels under the increased site development alternative.

No Action Alternative

Under the no action alternative, military family housing for Whiteman AFB personnel would not be constructed under the 801 program on any of the four parcels presently considered. As a consequence of this alternative, there would be no impacts on cultural resources at any of these locations.

REFERENCES

- Brummel, J. 1988. Letter from Knob Noster R-VIII School District Superintendent John Brummel to Col. Thomas E. Kuenning, Jr., dated July 6, 1988, concerning school district's capacity levels. Knob Noster, MO.
- Burns, L.F. 1975. *Osage Indian Bands and Clans*. Ciga Press, Fallbrook, CA.
- Chapman, C.H. 1975. *The Archaeology of Missouri, I*. University of Missouri Press, Columbia, MO.
- Chapman, C.H. 1980. *The Archaeology of Missouri, II*. University of Missouri Press, Columbia, MO.
- Construction Engineering Research Laboratory. 1988. *Environmental Technical Information System, Economic Impact Forecast System, Version 3.0, Automated Input-Output Multiplier System*. Urbana, IL.
- Foster, L.G. 1988. Letter from City of Sedalia Mayor Larry G. Foster to Col. Thomas E. Kuenning, Jr., dated July 8, 1988, concerning water and sewerage treatment facility's capacity levels. Sedalia, MO.
- Griffey, B. 1988. Letter from Sedalia #200 School District Assistant Superintendent Bob Griffey to Col. Thomas E. Kuenning, Jr., dated July 5, 1988, concerning school district's capacity levels. Sedalia, MO.
- Hamburg, J., G.T. Lathrop, and E.J. Kaiser. 1983. *Forecasting Inputs to Transportation Planning*. Transportation Research Board, National Research Council, Washington, DC.
- Harlan Bartholomew & Associates, Inc. 1985. *Roadway and Parking Area Supplement to the Base Comprehensive Plan, Whiteman Air Force Base, Missouri*. Harlan Bartholomew & Associates, St. Louis, MO.
- Harlan Bartholomew & Associates, Inc. 1986. *Future Development Plan Supplement to the Base Comprehensive Plan, Whiteman Air Force Base, Missouri*. Harlan Bartholomew & Associates, St. Louis, MO.
- Henry County R-I School District. 1987. *Audit for the Period Ended June 30, 1987*. Prepared by James E. Taylor, Certified Public Accountant. Windsor, MO.
- Hudson, C. 1988. Data on planned transportation network improvements in the vicinity of Whiteman Air Force Base. Provided by C. Hudson, Planning Department, Missouri Highway and Transportation Department, Jefferson City, MO.
- J.F. Davidson Associates, Inc. 1987. *Traffic Report for Air Force Village West, March Air Force Base, California*. Riverside, CA.

- Jinks, M.W. 1988. Letter from Warrensburg R-VI School District Superintendent Michael W. Jinks to Col. Thomas Kuenning, dated July 7, 1988, concerning school district's capacity levels. Warrensburg, MO.
- Klinger, D., J.R. Kuzmyak, and S. Liss. 1982. *1977 Nationwide Personal Transportation Study (NPTS), Report 9: Household Travel*. U.S. Department of Transportation, Federal Highway Administration, Washington, DC.
- Knob Noster, City of, 1988. *Compiled Financial Statements*. Six months ended June 30, 1988. Prepared by Davis, Lynn, & Moots, Certified Public Accountants. Knob Noster, MO.
- Knob Noster R-VIII School District, 1987. *Auditors' Report For The Year Ended June 30, 1987*. Prepared by Kingsolver & Morris, CPA's. Knob Noster, MO.
- Krause, M.D. 1988. Letter from City of Knob Noster Mayor Maurice D. Krause to Col. Thomas E. Kuenning, Jr., dated July 11, 1988, concerning water and sewerage treatment facility's capacity levels. Knob Noster, MO.
- Missouri Department of Natural Resources. 1979. *Geologic Map of Missouri*. Rolla, MO.
- Missouri Division of Community and Economic Development. 1984. *Community Profile, Knob Noster, Missouri, Johnson County*. Jefferson City, MO.
- Missouri Division of Community and Economic Development. 1986. *Community Profile, Warrensburg, Missouri*. Jefferson City, MO.
- Missouri Division of Community and Economic Development. 1987a. *Community Profile, Sedalia, Missouri*. Jefferson City, MO.
- Missouri Division of Community and Economic Development. 1987b. *Community Profile, Windsor, Missouri*. Jefferson City, MO.
- Missouri Division of Employment Security. 1988. *Annual Labor Area Labor Force Report (Place of Residence)*. Civilian Labor force, employment, unemployment, and unemployment rates, 1970-1987. Research and Analysis Section. Jefferson City, MO.
- Missouri Geological Survey and Water Resources. 1961. *The Stratigraphic Succession in Missouri*. Department of Business and Administration, Division of Geological Survey and Water Resources. Rolla, MO.
- Missouri Highway and Transportation Department. 1987a. *1987 Service Ratings for Bridges*. Missouri Highway and Transportation Department, Jefferson City, MO.
- Missouri Highway and Transportation Department. 1987b. *1987 Service Ratings for Supplementary Systems of Highways*. Missouri Highway and Transportation Department, Jefferson City, MO.

Missouri Highway and Transportation Department. 1988a. Assorted data on traffic volumes and planned transportation network improvements for areas near the four proposed 801 housing parcels. Provided by the Missouri Highway and Transportation Department, Jefferson City, MO.

Missouri Highway and Transportation Department. 1988b. *1988 Service Ratings for Interstate and Primary System*. Missouri Highway and Transportation Department, Jefferson City, MO.

President's Economic Adjustment Committee. 1981. *Community Impact Assistance Study*. Washington, DC.

National Flood Insurance Program. 1983. *Flood Hazard Boundary Map, County of Pettis, Missouri (unincorporated areas), Panel 200 of 300*. Community-Panel Number 390823 0200 A. Federal Emergency Management Agency. Washington, DC.

Santa Barbara, County of. 1984. *Environmental Impact Report for the Hyatt Resort and Hotel*. Prepared by Environmental Science Associates, Inc. Santa Barbara, CA.

Sedalia, City of, 1977. *Audited Financial Statements and Other Financial Information*. Year ended June 30, 1987. Prepared by Feyh, Brown, and Greene, Certified Public Accountants, P.C. Sedalia, MO.

Sedalia #200 School District, 1987. *Financial Statements With Accountants' Report*. Year ended June 30, 1987. Prepared by Underwood & Meyers, Certified Public Accountants. Sedalia, MO.

Seelen, R.M. 1961. A Preliminary Report of the Sedalia Complex. *Missouri Archaeological Society Newsletter*, No. 153.

Show-Me Regional Planning Commission. 1987. *City of Warrensburg, Missouri. Comprehensive Plan Update*. Warrensburg, MO.

Snider, C.R. 1988. Letter from Henry County R-I School District Superintendent Charles R. Snider to City of Windsor Mayor Ben Mangina, dated July 8, 1988, concerning school district's capacity levels. Windsor, MO.

Soil Conservation Service. 1976. *Soil Survey of Henry County, Missouri*. U.S. Department of Agriculture Soil Conservation Service in cooperation with Missouri Agricultural Experiment Station. Washington, DC.

Soil Conservation Service. 1980. *Soil Survey of Johnson County, Missouri*. U.S. Department of Agriculture Soil Conservation Service in cooperation with Missouri Agricultural Experiment Station. Washington, DC.

Soil Survey of Pettis County. 1988 (in preparation). Maps and keys of the *Soil Survey of Pettis County, Missouri*. U.S. Department of Agriculture Soil Conservation Service. Sedalia, MO.

Steyermark, J.A. 1983. *Flora of Missouri*. The Iowa State University Press, Ames, IA.

- Swanton, J.R. 1910. Osage. In *Handbook of American Indians North of Mexico, Volume 2*, edited by F.W. Hodge, pp. 156-159. Bulletin 20, Bureau of American Ethnology, Washington, DC.
- Ulrich, R.A. 1988. Letter from City of Warrensburg Mayor Robert A. Ulrich to Col. Thomas E. Kuenning, Jr., dated July 13, 1988, concerning water and sewerage treatment facility's capacity levels. Warrensburg, MO.
- U.S. Air Force. 1976. *Air Installation Compatible Use Zone (AICUZ), Whiteman Air Force Base, Mo.* Prepared by Whiteman AFB, MO.
- U.S. Air Force. 1987. *Community Coordination Plan for Basing the B-2 Bomber at Whiteman Air Force Base, Missouri.* Prepared for Headquarters Strategic Air Command, Offutt Air Force Base, NE.
- U.S. Air Force. 1988a. *Final Report, Installation Restoration Program, Phase II: Confirmation/Quantification, Stage I, Whiteman Air Force Base, Knob Noster, Missouri.* Volume I: Report. Prepared for Headquarters Strategic Air Command, Offutt Air Force Base, NE.
- U.S. Air Force. 1988b. *Draft Environmental Impact Statement, Peacekeeper Rail Garrison Program.* Washington, DC.
- U.S. Air Force. 1988c. *Base Comprehensive Plan, Whiteman Air Force Base, Missouri.* Prepared for HQ 351st Strategic Missile Wing by H. Bartholomew & Associates. St. Louis, MO.
- U.S. Council of Economic Advisors. 1988. *Annual Report.* U.S. Government Printing Office, Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 1963. *U.S. Census of Housing: 1960.* Volume I, States and Small Areas. Part 5, Michigan-New Hampshire. U.S. Government Printing Office. Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 1972. *Census of Housing: 1970.* Volume I, Housing Characteristics for States, Cities, and Counties. Part 27, Missouri. U.S. Government Printing Office. Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 1982a. *1980 Census of Housing.* Volume I, Characteristics of Housing Units. Chapter A, General Housing Characteristics. Part 27, Missouri. U.S. Government Printing Office. Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 1982b. *1980 Census of Population.* Volume I, Characteristics of the Population. Chapter A, Number of Inhabitants. Part 27, Missouri. U.S. Government Printing Office. Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. 1988. *Estimates of the Population of Missouri Counties and Metropolitan Areas: July 1, 1981 to 1985.* Current population reports. Washington, DC.

- U.S. Department of Commerce, Bureau of Economic Analysis. 1988. *Regional Economic Information System*. Machine-readable data tapes; Tables CA5 and CA25, Personal Income and Employees by Industry, 1969-1986, U.S., States, and Counties. Washington, DC.
- U.S. Department of Labor, Bureau of Labor Statistics. 1987. *Output and Employment Data Base*. 1958-1986 output and employment and low, moderate, and high projections of output and employment for 1995 and 2000. Office of Economic Growth. Washington, DC.
- U.S. Environmental Protection Agency. 1980. *Profile of Environmental Quality*. Missouri. Office of External Affairs, Region VII. Kansas City, MO.
- Warrensburg, City of, 1987. *Audited General Purpose Financial Statements and Other Financial Information*. Year ended September 30, 1987. Prepared by Ernst & Whinney. Warrensburg, MO.
- Warrensburg R-VI School District, 1988. 1987-88 Financial Summary (Annual Secretary of the Board's Report). Warrensburg, MO.
- Windsor, City of, 1987. *Report on Examination of Financial Statements For The Year Ended September 30, 1987*. Prepared by McBride, Lock & Associates, Certified Public Accountants. Windsor, MO.
- White, C. L., E. J. Foscue, and T. L. McKnight. 1985. *Regional Geography of Anglo-America*. Prentice-Hall, Inc. Englewood Cliffs, NJ.
- Wiley, W. 1988. Data on Defense Access Roads Program in the vicinity of Whiteman Air Force Base. Provided by W. Wiley, HQ SAC/DEV, Offut AFB, NE.
- Zimmerman, M.H. 1988. Letter from E.T. Archer Corporation engineer Michael H. Zimmerman, P.E. to City of Windsor Mayor Ben Mangina, dated July 11, 1988, concerning water and sewerage treatment facility's capacity levels. Kansas City, MO.

PERSONS AND ORGANIZATIONS CONTACTED

Organization	Person Contacted
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Agricultural Stabilization and Conservation Service, Warrensburg	Staff
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Central Electric Power Cooperative	Don Shaw <i>Engineer</i>
City of Knob Noster	Staff
City of Sedalia	Pat Allen <i>Controller/Treasurer</i>
City of Warrensburg	J. Jeff Hancock <i>City Manager</i> Marvin "Slim" Coleman <i>Building Inspector</i>
City of Windsor	Hon. Ben Mangina <i>Mayor</i>
Headquarters Strategic Air Command	Capt. Cliff Fetter <i>Civil Engineering, Programs</i> Larry Crouch <i>Housing, Program Manager</i> Wayne Wiley <i>Environmental Engineering, Community Planner</i>
Heart of America Indian Foundation	Chester E. Ellis, Jr. <i>Director</i>
Henry County	Gene Pogue <i>County Clerk</i>
Henry County R-I School District	Charles Snyder <i>Superintendent</i>
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Anuja Parikh	Ph.D.	Biological Resources
Robert M. Silsbee	B.A.	Socioeconomics Air Quality Analysis

APPENDIX A

LETTER FROM MISSOURI DEPARTMENT OF CONSERVATION



MISSOURI DEPARTMENT OF CONSERVATION

MAILING ADDRESS:
P.O. Box 180
Jefferson City, Missouri 65102-0180

STREET LOCATION:
2901 West Truman Boulevard
Jefferson City, Missouri

Telephone: 314/751-4115
JERRY J. PRESLEY, Director

August 3, 1988

Dr. Anuja K. Parikh, Ecologist
Robert D. Niehaus, Inc.
3704 State St., Ste. 200
Santa Barbara, California 93105

Re: Whiteman AFB
Military Family Housing

Dear Dr. Parikh:

Thank you for your letter of July 17, 1988 regarding threatened and endangered species within the proposed project area.

Department staff examined map files and data storage and determined that no sensitive species or communities occur on the immediate site or surrounding area. Therefore, no adverse impacts are expected from the project.

Sincerely,

DAN F. DICKNEITE
ENVIRONMENTAL ADMINISTRATOR

cc: Mr. Joe Tieger
U. S. Fish and Wildlife Service
Columbia, MO

COMMISSION

JEFF CHURAN
Chillicothe

JAY HENGES
Earth City

JOHN POWELL
Rolla

RICHARD REED
East Prairie

APPENDIX B
ANALYSIS OF SOIL SAMPLES

Memo For Record: Environmental Testing at '801 Housing Sites'.

24 Jan 89

The following tests were run on surface soil samples (within 4-10 inches of the ground surface) at all four of the Whiteman AFB '801 Housing' Sites. Original lab results are attached:

EP Toxic Metals Extraction
Herbicide-Pesticide Screening
Petroleum Hydrocarbons

All tests indicated no EP toxic metals above the detection limits, with the exception of Knob Noster #1 and Sedalia #1. These two samples contained 2.9 mg/L and 3.4 mg/L Barium. This level is well within the threshold level of 100 mg/L (See attached Maximum concentration levels for EP Toxic Characteristic). The EP Toxic Metals analysis includes an extraction of the material with a weakly acidic solution (to simulate conditions in a typical landfill). This extracted solution is analyzed for a series of toxic metals. If any of these concentrations are evident in excess of the threshold limit, the sampled material is then considered a 'Hazardous Waste, by the characteristic of EP Toxicity'.

The Herbicide-Pesticide Screen indicated no detectable levels of most common herbicides or pesticides, with the exception of MCPP and Dicamba. These levels ranged from 0.600 mg/L to 1.24 mg/L and were present in all samples. Mr Steve Johnson, of the Missouri Dept of Natural Resources, was contacted on 24 Jan 89 to inquire if these levels were significant. Mr Johnson replied that these chemicals are no longer used by themselves, however they could be present as a breakdown component of other chemicals. Mr Johnson indicated that concentrations less than 100 mg/L would not be considered significant.

The Petroleum Hydrocarbons test results ranged from 200 mg/L to 530 mg/L. These levels are within background levels for this area and are not considered significant. Several samples tested as part of the Whiteman AFB Installation Restoration Program (IRP) have shown similar levels of Petroleum Hydrocarbons where no significant contamination was present. Mr Steve Johnson, of MDNR, was also consulted and stated that these levels were well within background levels for this area and these tests results do not indicate any significant contamination.

Kenyon R. Warbritton
KENYON R. WARBRITTON
Environmental Engineer



CHEMICAL DIVISION

KANSAS CITY TESTING LABORATORY

1669 JEFFERSON

A.C. 816-842-7350

KANSAS CITY, MISSOURI 64108

January 09, 1989

Whiteman Air Force Base
Base Civil Engineer/DEEV
MRK FOR: F73CES 89M8037
Bldg. 705
Whiteman AFB, MO 65305

Attention: Ken Warbritton

Reference: Five soil samples submitted for
testing on December 16, 1989.

Dear Sirs:

Kansas City Testing Laboratory has completed the analysis on the
above referenced samples. Please find our results enclosed on the
following pages.

Kansas City Testing Laboratory appreciates the opportunity to serve
your analytical needs. If there are any questions, please feel free
to call.

Sincerely-
Kansas City Testing Laboratory, Inc.


Jeffrey L. Jenkins
Laboratory Manager

JLJ/jls

KANSAS CITY TESTING LABORATORY

January 09, 1989

KCTL # - C81216C

Whiteman Air Force Base

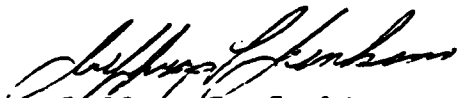
SAMPLE IDENTIFICATION: #1 - Sedalia

<u>PARAMETER</u>	<u>METHOD</u>	<u>DET. LIMIT</u>	<u>CONCENTRATION</u>
EP TOX	1310		
-Arsenic	6010	0.019 mg/l	-----ND-----
-Barium	7080	0.5 mg/l	2.9 mg/l
-Cadmium	7130	0.05 mg/l	-----ND-----
-Chromium	7190	0.05 mg/l	-----ND-----
-Lead	7420	0.1 mg/l	-----ND-----
-Mercury	7470	0.001 mg/l	-----ND-----
-Selenium	6010	0.057 mg/l	-----ND-----
-Silver	7760	0.05 mg/l	-----ND-----

SAMPLE IDENTIFICATION: #1 - Knob Noster

<u>PARAMETER</u>	<u>METHOD</u>	<u>DET. LIMIT</u>	<u>CONCENTRATION</u>
EP TOX	1310		
-Arsenic	6010	0.019 mg/l	-----ND-----
-Barium	7080	0.5 mg/l	3.4 mg/l
-Cadmium	7130	0.05 mg/l	-----ND-----
-Chromium	7190	0.05 mg/l	-----ND-----
-Lead	7420	0.1 mg/l	-----ND-----
-Mercury	7470	0.001 mg/l	-----ND-----
-Selenium	6010	0.057 mg/l	-----ND-----
-Silver	7760	0.05 mg/l	-----ND-----

Submitted by Kansas City Testing Laboratory, Inc.


Jeffrey L. Jenkins
Laboratory Manager

JLJ/jls

KANSAS CITY TESTING LABORATORY

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SAMPLE IDENTIFICATION: #1 - Warrensburg

<u>PARAMETER</u>	<u>METHOD</u>	<u>DET. LIMIT</u>	<u>CONCENTRATION</u>
EP TOX	1310		
-Arsenic	6010	0.019 mg/l	-----ND-----
-Barium	7080	0.5 mg/l	-----ND-----
-Cadmium	7130	0.05 mg/l	-----ND-----
-Chromium	7190	0.05 mg/l	-----ND-----
-Lead	7420	0.1 mg/l	-----ND-----
-Mercury	7470	0.001 mg/l	-----ND-----
-Selenium	6010	0.057 mg/l	-----ND-----
-Silver	7760	0.05 mg/l	-----ND-----

SAMPLE IDENTIFICATION: #2 - Knob Noster

<u>PARAMETER</u>	<u>METHOD</u>	<u>DET. LIMIT</u>	<u>CONCENTRATION</u>
EP TOX	1310		
-Arsenic	6010	0.019 mg/l	-----ND-----
-Barium	7080	0.5 mg/l	-----ND-----
-Cadmium	7130	0.05 mg/l	-----ND-----
-Chromium	7190	0.05 mg/l	-----ND-----
-Lead	7420	0.1 mg/l	-----ND-----
-Mercury	7470	0.001 mg/l	-----ND-----
-Selenium	6010	0.057 mg/l	-----ND-----
-Silver	7760	0.05 mg/l	-----ND-----

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Jeffrey L. Jenkins
Laboratory Manager

JLJ/jls

KANSAS CITY TESTING LABORATORY

January 09, 1989

KCTL # - C81216C

Whiteman Air Force Base

SAMPLE IDENTIFICATION: Windsor

<u>PARAMETER</u>	<u>METHOD</u>	<u>DET. LIMIT</u>	<u>CONCENTRATION</u>
EP TOX	1310		
-Arsenic	6010	0.019 mg/l	-----ND-----
-Barium	7080	0.5 mg/l	-----ND-----
-Cadmium	7130	0.05 mg/l	-----ND-----
-Chromium	7190	0.05 mg/l	-----ND-----
-Lead	7420	0.1 mg/l	-----ND-----
-Mercury	7470	0.001 mg/l	-----ND-----
-Selenium	6010	0.057 mg/l	-----ND-----
-Silver	7760	0.05 mg/l	-----ND-----

Submitted by Kansas City Testing Laboratory, Inc.


Jeffrey L. Jenkins
Laboratory Manager

JLJ/jls



LANGSTON LABORATORIES, INC.

Research • Testing • Problem Solving

2005 W. 103rd Terrace (B) • Leawood, KS 66206-2695 • Ph./FAX 913-341-7800

LABORATORY REPORT

CLIENT: Whiteman Air Force Base
351 CSG/DEEV
Whiteman AFB, MO 65305
ATTN: Ken Warbritton

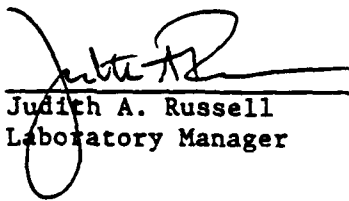
RECEIVED: December 16, 1988
COMPLETED: January 13, 1989

LLI NO.: 88-9348
P. O. NO.: F2360689M8068

SAMPLE DESCRIPTION: Soil Samples

<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>RESULTS</u>	<u>CHEMIST</u>	<u>DATE ANALYZED</u>
Windsor	Petroleum Hydrocarbons	320 mg/kg	JR	1/13/89
Knob Noster	Petroleum Hydrocarbons	530 mg/kg	JR	1/13/89
Warrensburg #1	Petroleum Hydrocarbons	200 mg/kg	JR	1/13/89
Warrensburg #2	Petroleum Hydrocarbons	240 mg/kg	JR	1/13/89

APPROVED:


Judith A. Russell
Laboratory Manager

SAMPLE DESCRIPTION: Soil Samples

<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>RESULTS</u>	<u>CHEMIST</u>	<u>DATE ANALYZED</u>
Knob Noster	2,4-D	< 0.10 mg/kg	CG	12/20/88
	2,4-DB	< 0.10 mg/kg	CG	12/20/88
	2,4,5-T	< 0.10 mg/kg	CG	12/20/88
	2,4,5-TP	< 0.01 mg/kg	CG	12/20/88
	MCPP	0.634 mg/kg	CG	12/20/88
	MCPA	< 0.10 mg/kg	CG	12/20/88
	Dicamba	0.600 mg/kg	CG	12/20/88
	Pesticides			
	Alpha-BHC	< 0.01 mg/kg	CG	12/28/88
	Beta-BHC	< 0.01 mg/kg	CG	12/28/88
	Delta-BHC	< 0.01 mg/kg	CG	12/28/88
	Gamma-BHC	< 0.01 mg/kg	CG	12/28/88
	Heptachlor	< 0.01 mg/kg	CG	12/28/88
	Aldrin	< 0.01 mg/kg	CG	12/28/88
	Heptachlor Epoxide	< 0.01 mg/kg	CG	12/28/88
	Alpha-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Beta-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Dieldrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDD	< 0.01 mg/kg	CG	12/28/88
	Endrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDE	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDT	< 0.01 mg/kg	CG	12/28/88
	Endosulfan Sulfate	< 0.01 mg/kg	CG	12/28/88
	Methoxychlor	< 0.01 mg/kg	CG	12/28/88
	Endrin Aldehyde	< 0.01 mg/kg	CG	12/28/88
	Toxaphene	< 0.10 mg/kg	CG	12/28/88
	Chlordane	< 0.01 mg/kg	CG	12/28/88
	PCB-1221	< 0.10 mg/kg	CG	12/28/88
	PCB-1232	< 0.10 mg/kg	CG	12/28/88
	PCB-1242	< 0.10 mg/kg	CG	12/28/88
	PCB-1248	< 0.10 mg/kg	CG	12/28/88
	PCB-1254	< 0.10 mg/kg	CG	12/28/88
	PCB-1260	< 0.10 mg/kg	CG	12/28/88
	PCB-1016	< 0.10 mg/kg	CG	12/28/88

SAMPLE DESCRIPTION: Soil Samples

<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>RESULTS</u>	<u>CHEMIST</u>	<u>DATE ANALYZED</u>
Sedalia H-P #1	2,4-D	< 0.10 mg/kg	CG	12/20/88
	2,4-DB	< 0.10 mg/kg	CG	12/20/88
	2,4,5-T	< 0.10 mg/kg	CG	12/20/88
	2,4,5-TP	< 0.01 mg/kg	CG	12/20/88
	MCPD	1.24 mg/kg	CG	12/20/88
	MCPA	< 0.10 mg/kg	CG	12/20/88
	Dicamba	1.17 mg/kg	CG	12/20/88
	Pesticides			
	Alpha-BHC	< 0.01 mg/kg	CG	12/28/88
	Beta-BHC	< 0.01 mg/kg	CG	12/28/88
	Delta-BHC	< 0.01 mg/kg	CG	12/28/88
	Gamma-BHC	< 0.01 mg/kg	CG	12/28/88
	Heptachlor	< 0.01 mg/kg	CG	12/28/88
	Aldrin	< 0.01 mg/kg	CG	12/28/88
	Heptachlor Epoxide	< 0.01 mg/kg	CG	12/28/88
	Alpha-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Beta-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Dieldrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDD	< 0.01 mg/kg	CG	12/28/88
	Endrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDE	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDT	< 0.01 mg/kg	CG	12/28/88
	Endosulfan Sulfate	< 0.01 mg/kg	CG	12/28/88
	Methoxychlor	< 0.01 mg/kg	CG	12/28/88
	Endrin Aldehyde	< 0.01 mg/kg	CG	12/28/88
	Toxaphene	< 0.10 mg/kg	CG	12/28/88
	Chlordane	< 0.01 mg/kg	CG	12/28/88
	PCB-1221	< 0.10 mg/kg	CG	12/28/88
	PCB-1232	< 0.10 mg/kg	CG	12/28/88
	PCB-1242	< 0.10 mg/kg	CG	12/28/88
	PCB-1248	< 0.10 mg/kg	CG	12/28/88
	PCB-1254	< 0.10 mg/kg	CG	12/28/88
	PCB-1260	< 0.10 mg/kg	CG	12/28/88
	PCB-1016	< 0.10 mg/kg	CG	12/28/88

SAMPLE DESCRIPTION: Soil Samples

<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>RESULTS</u>	<u>CHEMIST</u>	<u>DATE ANALYZED</u>
Warrensburg	2,4-D	< 0.10 mg/kg	CG	12/20/88
	2,4-DB	< 0.10 mg/kg	CG	12/20/88
	2,4,5-T	< 0.10 mg/kg	CG	12/20/88
	2,4,5-TP	< 0.01 mg/kg	CG	12/20/88
	MCPP	0.944 mg/kg	CG	12/20/88
	MCPA	< 0.10 mg/kg	CG	12/20/88
	Dicamba	0.689 mg/kg	CG	12/20/88
	Pesticides			
	Alpha-BHC	< 0.01 mg/kg	CG	12/28/88
	Beta-BHC	< 0.01 mg/kg	CG	12/28/88
	Delta-BHC	< 0.01 mg/kg	CG	12/28/88
	Gamma-BHC	< 0.01 mg/kg	CG	12/28/88
	Heptachlor	< 0.01 mg/kg	CG	12/28/88
	Aldrin	< 0.01 mg/kg	CG	12/28/88
	Heptachlor Epoxide	< 0.01 mg/kg	CG	12/28/88
	Alpha-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Beta-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Dieldrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDD	< 0.01 mg/kg	CG	12/28/88
	Endrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDE	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDT	< 0.01 mg/kg	CG	12/28/88
	Endosulfan Sulfate	< 0.01 mg/kg	CG	12/28/88
	Methoxychlor	< 0.01 mg/kg	CG	12/28/88
	Endrin Aldehyde	< 0.01 mg/kg	CG	12/28/88
	Toxaphene	< 0.10 mg/kg	CG	12/28/88
	Chlordane	< 0.01 mg/kg	CG	12/28/88
	PCB-1221	< 0.10 mg/kg	CG	12/28/88
	PCB-1232	< 0.10 mg/kg	CG	12/28/88
	PCB-1242	< 0.10 mg/kg	CG	12/28/88
	PCB-1248	< 0.10 mg/kg	CG	12/28/88
	PCB-1254	< 0.10 mg/kg	CG	12/28/88
	PCB-1260	< 0.10 mg/kg	CG	12/28/88
	PCB-1016	< 0.10 mg/kg	CG	12/28/88

SAMPLE DESCRIPTION: Soil Samples

<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>RESULTS</u>	<u>CHEMIST</u>	<u>DATE ANALYZED</u>
Windsor	2,4-D	< 0.10 mg/kg	CG	12/20/88
	2,4-DB	< 0.10 mg/kg	CG	12/20/88
	2,4,5-T	< 0.10 mg/kg	CG	12/20/88
	2,4,5-TP	< 0.01 mg/kg	CG	12/20/88
	MCPP	1.14 mg/kg	CG	12/20/88
	MCPA	< 0.10 mg/kg	CG	12/20/88
	Dicamba	1.54 mg/kg	CG	12/20/88
	Pesticides			
	Alpha-BHC	< 0.01 mg/kg	CG	12/28/88
	Beta-BHC	< 0.01 mg/kg	CG	12/28/88
	Delta-BHC	< 0.01 mg/kg	CG	12/28/88
	Gamma-BHC	< 0.01 mg/kg	CG	12/28/88
	Heptachlor	< 0.01 mg/kg	CG	12/28/88
	Aldrin	< 0.01 mg/kg	CG	12/28/88
	Heptachlor Epoxide	< 0.01 mg/kg	CG	12/28/88
	Alpha-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Beta-Endosulfan	< 0.01 mg/kg	CG	12/28/88
	Dieldrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDD	< 0.01 mg/kg	CG	12/28/88
	Endrin	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDE	< 0.01 mg/kg	CG	12/28/88
	4,4'-DDT	< 0.01 mg/kg	CG	12/28/88
	Endosulfan Sulfate	< 0.01 mg/kg	CG	12/28/88
	Methoxychlor	< 0.01 mg/kg	CG	12/28/88
	Endrin Aldehyde	< 0.01 mg/kg	CG	12/28/88
	Toxaphene	< 0.10 mg/kg	CG	12/28/88
	Chlordane	< 0.01 mg/kg	CG	12/28/88
	PCB-1221	< 0.10 mg/kg	CG	12/28/88
	PCB-1232	< 0.10 mg/kg	CG	12/28/88
	PCB-1242	< 0.10 mg/kg	CG	12/28/88
	PCB-1248	< 0.10 mg/kg	CG	12/28/88
	PCB-1254	< 0.10 mg/kg	CG	12/28/88
	PCB-1260	< 0.10 mg/kg	CG	12/28/88
	PCB-1016	< 0.10 mg/kg	CG	12/28/88

RCRA WASTE CODES

Code Waste description

Characteristic Hazardous Waste (A description of the characteristic hazardous wastes can be found at 40 CFR 261.21-261.24, July 1, 1986. Listed in the box below is the maximum concentration of contaminants for the characteristic of EP toxicity.)

D001	Ignitable waste
D002	Corrosive waste
D003	Reactive waste
D004	Arsenic
D005	Barium
D006	Cadmium
D007	Chromium
D008	Lead
D009	Mercury
D010	Selenium
D011	Silver
D012	Endrin(1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethano-naphthalene)
D013	Lindane (1,2,3,4,5,6-hexa-chlorocyclohexane, γ isomer)
D014	Methoxychlor (1,1,1-trichloro-2,2-bis [p-methoxyphenyl]ethane)
D015	Toxaphene (C ₁₀ H ₁₀ Cl ₈ , technical chlorinated camphene, 67-69% chlorine)
D016	2,4-D (2,4-dichlorophenoxyacetic acid)
D017	2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)

MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY

A solid waste exhibits the characteristic of EP toxicity if, using EP toxicity test methods, the extract from a representative sample of the waste contains any of the contaminants listed below at a concentration equal to or greater than the value given.

RCRA Waste Code	Contaminant	Maximum concentration (milligrams per liter)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
D012	Endrin(1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethano-naphthalene)	0.02
D013	Lindane (1,2,3,4,5,6-hexa-chlorocyclohexane, γ isomer)	0.4
D014	Methoxychlor (1,1,1-trichloro-2,2-bis [p-methoxyphenyl]ethane)	10.0
D015	Toxaphene (C ₁₀ H ₁₀ Cl ₈ , technical chlorinated camphene, 67-69% chlorine)	0.5
D016	2,4-D (2,4-dichlorophenoxyacetic acid)	10.0
D017	2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid)	1.0