Final Environmental Assessment

Construction of New Arnold Village Sewage Treatment Plant

Arnold Air Force Base, Tennessee

Prepared for:

DEPARTMENT OF THE AIR FORCE
Arnold Air Force Base, Tennessee

May 2004

CH2MHILL

E032004022ATL

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAY 2004		**00-00-2004 to 00-00-2004**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Final Environmental Assessment Construction of New Arnold Village Sewage Treatment Plant Arnold Air Force Base, Tennessee	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **CH2M HILL,9191 South Jamaica Street,Englewood,CO,80112**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**92**	

Finding of No Significant Impact
Arnold Air Force Base, Tennessee

Construction of New Arnold Village Sewage Treatment Plant

Arnold Air Force Base (Arnold AFB) has prepared an Environmental Assessment (EA) (April2004) that evaluates the potential environmental and socioeconomic impacts associated with the construction and operation of a new Arnold Village Sewage Treatment Plant (AVSTP). The Proposed Action would replace the existing sewage treatment plant and maintain the same treatment capacity and discharge permit limits. An engineering analysis was performed to evaluate options for replacing the existing treatment facility (Burns & McDonnell, December 2003). The engineering analysis report included reviews of three treatment options, three onsite disposal options, and discharge to a publicly owned treatment facility.

Description of the Proposed Action

The objective of the Proposed Action would be to replace the existing facility, which has exceeded its original design life and repairs will not be approved by the Tennessee Department of Environment and Conservation (TDEC), with an upgraded facility using newer technology. The receiving water for both the existing and proposed facility is Woods Reservoir. Woods Reservoir is a drinking water source for Arnold Village and the new facility would provide an added measure of security for the drinking water source compared to the existing facility. The EA examines the potential for impacts to the environment that would result from the construction and operation of the new AVSTP. The new AVSTP would use recirculating sand filter (RSF) technology and ultraviolet (UV) light disinfection to treat domestic wastewater produced by Arnold Village. The proposed construction site is located approximately 500 feet north of the existing sewage treatment plant and is approximately 20 feet higher in elevation. Construction would occur during 2004 and the facility would be operational beginning in January 2005. The new AVSTP would occupy approximately 1.1 acres and would have a treatment capacity of 30,000 gallons per day (gpd). New sewer line would be installed under North Shore Road to connect this facility to the existing discharge line that discharges to Woods Reservoir. The new facility would operate under the existing facility's National Pollutant Discharge Elimination System (NPDES) permit. Unlike the existing facility, the new AVSTP would use UV light rather than chlorine for disinfection. The use of UV light as a disinfectant would eliminate the potential adverse environmental effects that chlorine could produce.

Alternative Action

The Alternative Action would use the same RSF treatment system, but would not use UV light as a disinfectant. The treated effluent would be disposed of through a drip disposal system covering 12 acres located adjacent to the new AVSTP. The drip disposal system would utilize perforated pipes installed in trenches with porous media (gravel or rock) bottoms. Wastewater would flow through the pipes and be distributed over the entire width of the trench through the porous media. The wastewater would infiltrate into the soil beneath the porous media, where soil microorganisms and plants would utilize the components in the treated effluent for nutrients. Cumulatively, six lateral fields would provide approximately 218,000 square feet of infiltration area for the drip disposal system. A portion of land designated for the drip disposal system would require a cultural resources survey to ensure the construction activities would not have a negative impact on important cultural resources.

No Action Alternative

Under the No-Action Alternative, the existing treatment plant would continue discharging chlorine-treated effluent into Woods Reservoir and a new treatment plant would not be constructed. The current sewage treatment plant has exceeded its original design life and is in need of extensive repair or replacement. However, TDEC will not approve repair to the existing plant and recommends construction of a new plant. As a result, the No-Action Alternative does not meet the stated objective.

Environmental Consequences

No significant negative environmental or socioeconomic consequences were identified in the EA for the proposed project. Potential impacts to water quality could result from construction activities and associated runoff, but project design features including appropriate best management practices would eliminate or minimize these potential impacts. Local traffic flow would be affected for a portion of the construction period (an estimated 2-3 days). The use of detours and onsite traffic control would be used during road closures and construction. It was determined that the proposed project would benefit the environmental mission at Arnold AFB by replacing chlorine with UV light as a disinfectant.

Restrictions

No restrictions are necessary for the Proposed Action.

Conclusion

The attached EA was prepared pursuant to Air Force Instruction (AFI) 32-7061, 32 Code of Federal Regulations (CFR) 989, and U.S. Council on Environmental Quality (CEQ) regulations (Title 40, U.S. Code, Parts 1500-1508) for implementing the procedural requirements of the National Environmental Policy Act (NEPA). The Proposed Action, the Alternative Action, and the No Action Alternative were reviewed and found to have no significant impact on the human or natural environment.

A public notice for the intent to sign a FONSI was made on 17 May 2004. The draft FONSI and EA were made available to the public upon request.

FINDING OF NO SIGNIFICANT IMPACT

Based on the evaluation of the attached EA and information discussed above, a Finding of No Significant Impact to the environment is concluded for the Proposed Action, the Alternative Action, and the No Action Alternative and no Environmental Impact Statement (EIS) is required. The Proposed Action is selected as the preferred action for implementation.

Date: 18 Jun 04

Charles H. King
Chief, Environmental Management Division
Arnold AFB, TN

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Acronyms and Abbreviations

µg/cm^3	Micrograms per cubic centimeter
AEDC	Arnold Engineering Development Center
AF	Air Force
AFB	Air Force Base
AFI	Air Force Instruction
AFOSH	Air Force Environmental and Occupational Safety
AICUZ	Air Installation Compatible Use Zone
ATA	Aerospace Testing Alliance
AVSTP	Arnold Village Sewage Treatment Plant
BMP	Best Management Practice
BOD	biochemical oxygen demand
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFUs	Colony Forming Units
CWA	Clean Water Act
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EO	Executive Order
ESHQ	Environmental Safety Health and Quality
ESA	Endangered Species Act
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
FY	Fiscal Year
gpd	gallons per day
gpm	gallons per minute
HQ CEV	Headquarters Civil Engineering, Compliance
IEMP	Integrated Ecosystem Management Plan
IRP	Installation Restoration Program
MAJCOM	Major Command

NCGP	No Consumption-General Public
NCO	non-commissioned officer
NEPA	National Environmental Policy Act
NH_3-N	ammonia
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O&M	operating and maintenance
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PM_{10}	10-Micron Particulate Matter
PPM	Parts per Million
PSD	Prevention of Significant Deterioration
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RSF	recirculating sand filter
SAF	Secretary of the Air Force/Environmental Security
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
TRI	Toxics Release Inventory
TSCA	Toxic Substance Control Act
TSS	total suspended solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USC	U.S. Code
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
UTSI	University of Tennessee Space Institute
UV	ultraviolet
VOC	Volatile Organic Compound
VOQ	visiting officers quarters
WQA	Water Quality Act

1.0 Purpose and Need for Action

1.1 Arnold Engineering Development Center (AEDC) Background

AEDC is located on Arnold AFB in Coffee and Franklin Counties in Middle Tennessee. The center is approximately 70 miles southeast of Nashville, the state capitol. Positioned near the towns of Manchester, Tullahoma, and Winchester, AEDC is the largest employer in the two-county area (Figure 1-1).

Arnold AFB occupies 39,081 acres including the 3,632-acre Woods Reservoir, which contains approximately 26 billion gallons of water. Woods Reservoir provides cooling and a drinking water source water for facilities in the industrial area. On Arnold AFB, there are 5,785 acres of cultivated pine forests and 23,492 acres of hardwood forests. Grasslands and early-successional habitats in utility rights-of-way occupy 1,479 acres on the installation and provide habitat for numerous rare species (Call, 2003).

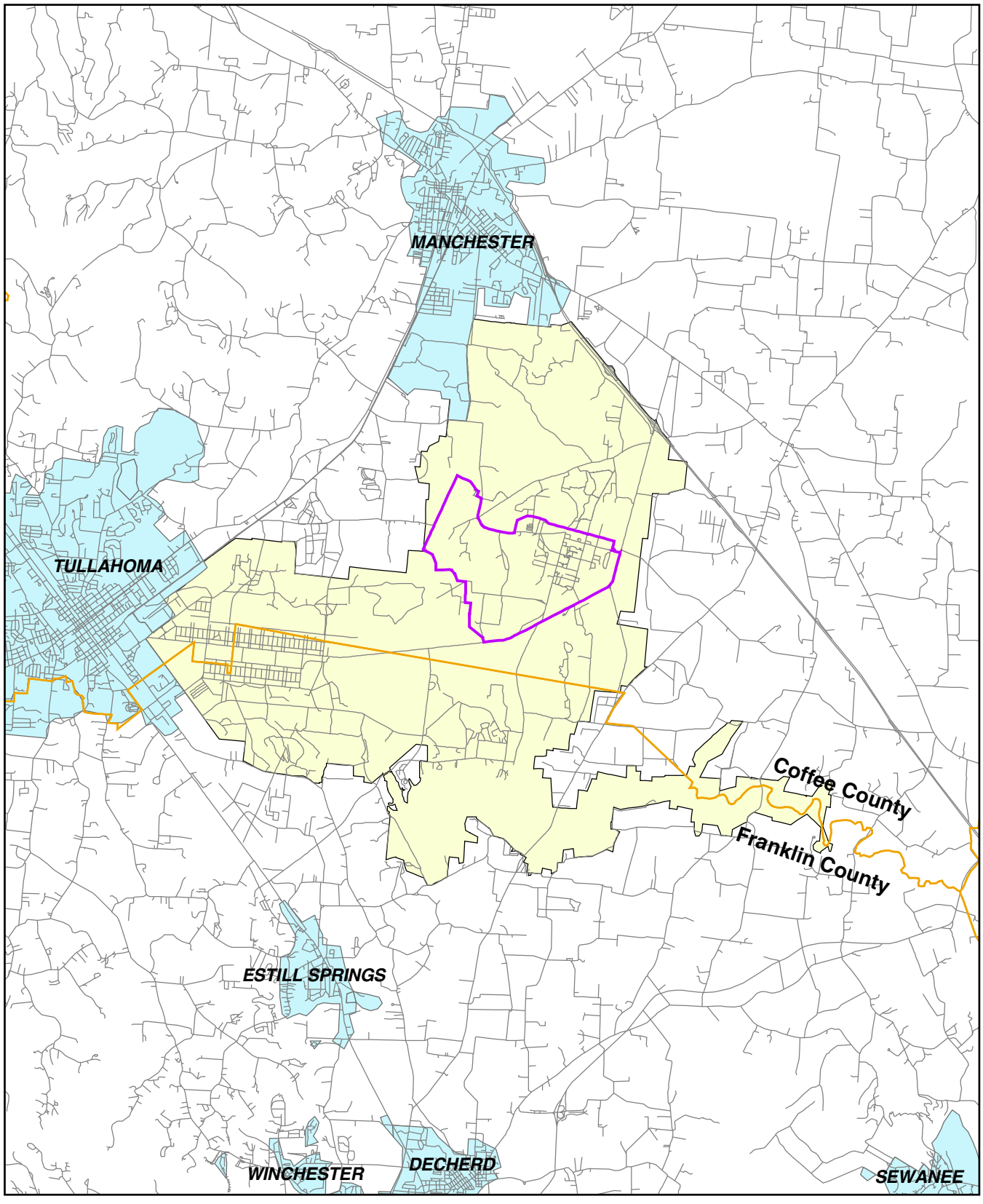
1.1.1 AEDC Operations

AEDC is the most advanced and largest complex of flight simulation test facilities in the world, with 53 aerodynamic and propulsion wind tunnels, rocket and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges, and other specialized units. Facilities can simulate flight conditions from sea level to altitudes of more than 100,000 feet, and from subsonic velocities to those well over Mach 20. Twenty-seven of the center's test units have capabilities unmatched in the world. AEDC has contributed to the development of nearly every top national aerospace program since the 1950s. Customers include the U.S. Air Force (AF), the Army and Navy, the National Aeronautics and Space Administration, the Federal Aviation Administration, private industry, allied foreign governments, and U.S. government and educational institutions.

AEDC is AF-owned and managed through a contractor work force. The AEDC commander is responsible for accomplishing the center's mission. The commander's staff of military personnel and civil service employees is responsible for the overall planning, direction, scheduling, assignment, and funding associated with mission requirements. Under staff supervision, the management, operation, and maintenance of test facilities, real property, and related equipment and utilities are accomplished by contract.

1.1.2 AEDC History

AEDC is named for the late Henry H. “Hap” Arnold. At the close of WW II, General Arnold, Commander of the Army Air Forces, asked Dr. Theodore von Karman, Chief Scientific Advisor to the AF and one of history's great aeronautical test scientists, to form a Scientific Advisory Group to chart a long-range research and development course for the future USAF. Dr. von Karman sent a task force from his newly formed group to Germany



0 1.25 2.5 Miles

N

LEGEND

Road Centerline
County Boundaries
AEDC Boundary
Local Cities
Arnold AFB Boundary

Figure 1-1

Arnold Air Force Base and General Vicinity

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to determine how the Germans had made such rapid progress in developing high-performance jet aircraft and rocket-powered missiles. One member of the task force, Dr. Frank Wattendorf, was responsible for surveying wind tunnels and ground test facilities. On his flight home, Dr. Wattendorf wrote a memo that proposed using captured German test facilities to establish a new engineering development center. The new center would consolidate the best civilian and military scientists as well as state-of-the-art test facilities to properly test and evaluate the weapon systems needed to guarantee the United States' superior airpower and thereby the national security. Dr. Wattendorf's "trans-Atlantic memo" became the blueprint for AEDC.

In 1949, Congress authorized $100 million for the construction of AEDC. A site was selected for the new center at the Army's old Camp Forrest near Tullahoma, and construction began in June 1950. The site was chosen because of the availability of land, water, and power, and to buffer surrounding communities from expected test hazards and noise. Water was needed to cool the rapidly flowing air and hot exhaust gases, and electricity was required to power the huge motordrive systems. The large land acquisition was necessary to accommodate growth for future test facilities and its remote location provided the security required by the size of the installation.

On June 25, 1951, one year after General Arnold's death, President Harry S Truman dedicated the AEDC and renamed it in honor of General Arnold. Anticipating the role this national facility would play in developing key weapon systems, President Truman said, "Never again will the United States ride the coattails of other countries in the progress and development of the aeronautical art. The genius that was General Arnold's is manifest in this installation which now bears his name."

1.1.3 AEDC Military Mission

The mission of AEDC is to support the development of aerospace systems by testing hardware in facilities that simulate flight conditions. The center also conducts a research and technology program to develop advanced test techniques and instrumentation and to support the design of new test facilities. The official mission at AEDC is:

> ***To provide our customers with the world's most effective and affordable aerospace ground test and evaluation, and simulation products and services. To ensure AEDC ground test facilities, technologies, and knowledge fully support today's and tomorrow's customers.***

Implicit within this mission is the need to anticipate and plan for growth of the test facilities at AEDC. Ecosystem management provides the framework for the careful assessment of environmental impacts, allowing for the planning and development of new facilities, while at the same time protecting the natural and cultural resources.

The implementation of ecosystem management at AEDC is also in direct support of the overall Department of Defense (DoD) mission. The DoD mission requires that natural resources be managed to provide for the environmental security necessary to support the military mission of national defense. By conserving biodiversity, ecosystem management contributes to national security by helping maintain the natural resources upon which this country's strength depends. Ecosystem management also helps maintain natural

landscapes for military training. Combat readiness is founded on the ability of the armed forces to sustain realistic military training now and into the future.

1.2 Proposed Action

The Proposed Action is for AEDC to construct and operate a new Arnold Village Sewage Treatment Plant (AVSTP). The new AVSTP would use recirculating sand filter (RSF) technology and ultraviolet (UV) light disinfection to treat domestic wastewater from Arnold Village. The proposed site is located approximately 500 feet north of the existing AVSTP and is approximately 20 feet higher in elevation. Construction would occur during 2004 and the facility would be operational beginning in January 2005. The proposed new AVSTP would occupy approximately 1.1 acres, and approximately 400 linear feet of new line would connect this facility to the existing discharge line. The new facility would use the same discharge point as the current treatment plant, which is in Woods Reservoir, and would have a treatment capacity of 30,000 gallons per day (gpd). The Proposed Action would replace the existing AVSTP and maintain the same treatment capacity and discharge permit limits. The new facility would operate under the current facility's existing National Pollutant Discharge Elimination (NPDES) permit.

1.3 Need for Proposed Action

Arnold Village is a housing and recreational area located approximately 4 miles from AEDC and is next to the Woods Reservoir. Arnold Village includes housing units, a visiting officers quarters (VOQ), a combined non-commissioned officers (NCO) and officers club, a marina, a sports field, a laundry facility, AEDC cooling water lift station, and other miscellaneous support structures.

Currently, Arnold AFB operates a 30,000-gpd wastewater treatment system that uses an activated sludge system for biological treatment of domestic wastewater from Arnold Village. The AVSTP effluent is chlorinated for disinfection and discharged into Woods Reservoir. The original AVSTP was installed in 1965 with a rated capacity of 15,000 gpd. In 1975 the AVSTP was upgraded by adding a second 15,000-gpd package activated sludge system to operate in parallel with the existing system. The AVSTP has exceeded its original design life and is in need of extensive repair or replacement. The Tennessee Department of Environment and Conservation (TDEC) has made it clear that approval will not be given to repair the existing plant and TDEC recommends construction of a new plant (Burns & McDonnell, 2003).

1.4 Objectives of Proposed Action

The objective of constructing a new AVSTP would be to replace that existing 30,000-gpd facility, which has exceeded its original design life. A new AVSTP with the same average annual daily treatment capacity would be constructed to serve Arnold Village. This project would provide reliable treatment of domestic wastewater. The new facility would discharge into Woods Reservoir at the same location as the existing AVSTP discharge. The existing AVSTP discharge is permitted under AEDC NPDES Permit No. TN003751.

1.5 Related Environmental Documents

The following documents were used in the preparation of this EA:

- Integrated Ecosystem Management Plan (IEMP) for Arnold Integrated Ecosystem Management Plan for Arnold Air Force Base. The IEMP was prepared by G. Call, Aerospace Testing Alliance (ATA), in 2003 for Environmental Management, Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.
- "Historic Building Survey and Evaluation, Arnold Air Force Base, Coffee and Franklin Counties, Tennessee," Draft Report, December 2001, submitted by TRC Garrow Associates, Inc., Atlanta, Georgia, and CH2M HILL, Atlanta, Georgia; M. Todd Cleveland, Architectural Historian and Author, Jeffrey L. Holland, Historian and Author
- Preliminary Engineering Report On Arnold Village Wastewater Treatment Plant Replacement, 2003. Prepared by Burns & McDonnell for Arnold Engineering Development Center Arnold AFB.

1.6 Decision to Be Made

The decision to be made is whether to construct a new AVSTP to replace the existing AVSTP, which has exceeded its design life, or to continue using the outdated facility. Additionally, if the decision is made to replace the existing AVSTP, a second decision must be made to determine whether the treated effluent from new AVSTP will be discharged into Woods Reservoir or be disposed of through a drip disposal system.

1.7 Applicable Regulatory Permitting and Coordination

1.7.1 Environmental Policy

The National Environmental Policy Act (NEPA) of 1969 and Title 40 of the Code of Federal Regulations (CFR), Parts 1500-1508 (40 CFR 1500-1508), require federal agencies to consider the potential environmental consequences of proposed actions and alternatives. DoD Directive 6050.1 (32 CFR 214) provides DoD policies and procedures to supplement 40 CFR 1500-1508. Air Force Instruction (AFI) 32-7061 describes specific tasks and procedures for complying with the NEPA through the Environmental Impact Analysis Process (EIAP), including responsibilities, compliance requirements, and document preparation and processing as specified at 32 CFR, Part 989. Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality (amended by EO 11991), provides policy directing the federal government to take leadership in protecting and enhancing the environment.

1.7.2 Biological Resources (Vegetation and Habitat, Wildlife, and Threatened and Endangered Species)

The Endangered Species Act of 1973 (16 U.S. Code [USC] 1531-1543), as amended (ESA), provides policy for federal agencies (with the assistance of the Secretaries of the Interior and Commerce) to ensure that their actions do not jeopardize the continued existence of any

threatened or endangered species, or result in the destruction or adverse modification of critical habitat of such species.

The Fish and Wildlife Coordination Act, (16 USC 661, et seq.), as amended, provides policy for the Secretary of the Interior (through the U.S. Fish and Wildlife Service [USFWS]) and for the National Marine Fisheries Service (NMFS) (through the Secretary of Commerce) to assist and cooperate with federal, state, and public or private agencies and organizations in the conservation and rehabilitation of wildlife.

The Migratory Bird Treaty Act (16 USC 701, et seq.) provides for the protection of migratory birds. It forbids, among other things, the taking, importing, possessing, purchasing, or selling of migratory birds, with the exception of government-sanctioned hunting and capturing of birds. Although recent court rulings have resulted in the USFWS ceasing to issue permits to other federal agencies for incidental takings of migratory birds, the USFWS is developing an EO that will clarify the responsibilities of federal agencies with regard to the taking of migratory birds. The AF has issued interim guidance for complying with the Migratory Bird Treaty Act (memorandum dated 12 September 1997), effective until the EO is issued. The guidance requires the evaluation of non-lethal control measures, consultation with the USFWS regarding potential protected species issues, compliance with treaties, consultation with appropriate state agencies, proper oversight of contractors and volunteers, and compliance with the NEPA.

1.7.3 Wetlands

The Clean Water Act (CWA) of 1977 and the Water Quality Act (WQA) of 1987 (33 USC 1251 et seq., as amended) provide policy for protecting wetlands and other waters of the United States. Section 404 of the CWA requires permits from the U.S. Army Corps of Engineers (USACE) to discharge dredged or fill material into such systems. EO 11990, Protection of Wetlands, requires federal agencies to minimize or avoid adverse impacts to wetlands and to preserve and enhance their beneficial values. AFI 32-7061 requires that EAs prepared for actions for which the AF has wetlands compliance responsibilities go through Headquarters Civil Engineering, Compliance to the Secretary of the Air Force/Environmental Security (HQ CEV to SAF/MIQ) for approval.

1.7.4 Land Use

EO 12372, Intergovernmental Review of Federal Programs, directs federal agencies to consult with and solicit concerns and comments from state and local governments that have jurisdiction over an area within which a federal action is proposed. The Farmland Protection Act of 1981 (7 USC 4201 et. seq., as amended) requires federal agencies to consult with the Natural Resources Conservation Service (NRCS) to ensure that preservation/conservation of important farmlands is considered in federal actions.

DoD 4165.57, Air Installation Compatible Use Zone (AICUZ), identifies policy on achieving compatible use of public and private lands in the vicinity of military airfields. DoD 4165.57 defines required restrictions on the uses and heights of natural and man-made objects in the vicinity of air installations to provide for flight safety and to assure that people and facilities are not concentrated in areas susceptible to aircraft accidents. It also defines desirable restrictions on land use to assure compatibility with the characteristics, including noise, of

air installation operations and describes the procedures by which the AICUZ land uses may be defined. DoD 4165.57 provides policy on the extent of Government interest in real property within AICUZ that may be retained or acquired to protect the operational capability of active military airfields.

1.7.5 Hazardous Substances

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (as amended by the Superfund Amendments and Reauthorization Act [SARA] of 1986) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and cleanup of inactive hazardous substance disposal sites.

The Resource Conservation and Recovery Act (RCRA) of 1976 provides policy for proper disposal of solid waste and establishes standards and procedures for the handling, storage, treatment, and disposal of hazardous wastes.

The Toxic Substance Control Act (TSCA) provides policy for proper handling of polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint. State and local regulations should be consulted when engaging in activities that involve these substances on civil works projects or properties.

1.7.6 Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 (16 USC 470 et seq., as amended) provides policy for the protection of historic resources from federal actions. Protection of Historic Properties (36 CFR 800) Act provides specific procedures that federal agencies must implement, such as consulting with the State Historic Preservation Office (SHPO), to ensure compliance with the NHPA.

The Archeological Resources Protection Act of 1979 requires federal agencies to conduct archaeological investigations on lands under their jurisdiction to determine the nature and extent of the protected cultural resources present and to help manage extant resources in accordance with permit and enforcement provisions of the Act.

1.7.7 Water Resources

The CWA of 1977 and the WQA of 1987 provide federal policy on maintaining and restoring water quality to protect and enhance waters of the United States. Section 404 of the CWA requires permits from USACE to discharge dredged or fill material into waters of the United States.

EO 11988, Floodplain Management, provides federal policy for reducing flood damage risk, minimizing the impacts of floods potentially resulting from a federal action, and preserving the natural and beneficial values provided by floodplains/floodways. EO 11988 specifies that "Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain--for major Federal actions significantly affecting the quality of the human environment, the evaluation required below will be included in any statement prepared under Section 102(2)(C) of the National Environmental Policy Act." Proposed actions covered under this order include "Federally undertaken, financed, or assisted construction and improvements." Floodplains are defined as "the lowland and relatively

flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, including at a minimum, that area subject to a 1 percent or greater chance of flooding in any given year."

AFI 32-7061, Environmental Impact Analysis Process, requires HQ CEV to SAF/MIQ approval of EAs prepared for actions for which the AF has floodplain compliance responsibilities. A Finding of No Practicable Alternative (FONPA) must be submitted to HQ USAF/CEV when the alternative selected is located in wetlands or floodplains. The FONPA must discuss why no other practicable alternative exists to avoid impacts.

AFI 32-7064, Integrated Natural Resources Management, requires SAF/MIQ or other designated official to approve the FONPA before any action within a floodplain may proceed as specified in Secretary of the Air Force Order 790.1. In preparing the FONPA, the AF must consider the full range of practicable alternatives which meet justified program requirements, are within the legal authority of the AF, meet technology standards, are cost-effective, do not result in unreasonable adverse environmental impacts, and other pertinent factors. Only after the practicality of alternatives has been fully assessed should a statement regarding the FONPA be made in the associated Finding of No Significant Impact (FONSI) or Record of Decision (ROD). The Chairperson of the Major Command (MAJCOM) Environmental Protection Committee has the approval authority for FONSIs containing a FONPA for floodplains.

1.7.8 Air Quality

The Clean Air Act (CAA) (42 USC 7401 et seq., as amended) provides policy directing federal agencies to protect and enhance air quality. The CAA also requires agencies to verify that proposed actions conform to state implementation plans for attaining air quality goals.

1.7.9 Noise

The Noise Control Act of 1972 provides policy that directs federal agencies to limit noise emissions to within compliance levels.

1.7.10 Social Issues

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, provides policy directing federal agencies to evaluate the effects of proposed actions on minority communities and low income communities. Effects are to be evaluated to determine whether there are adverse impacts to human health, social conditions, environmental quality, and economic conditions.

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, provides policy directing federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children.

1.8 Scope of the Environmental Assessment

This document was prepared in accordance with the requirements of the NEPA of 1969, the Council on Environmental Quality (CEQ) regulations of 1978, and 32 CFR Part 989. To

initiate the environmental analysis, the proponent (Arnold AFB) submitted an AF Form 813, Request for Environmental Impact Analysis (Appendix A).

1.8.1 Issues Eliminated from Further Analysis

Since the new AVSTP would make use of many existing features, the Proposed Action would not have the potential for significant impacts to all resource areas on Arnold AFB. Consequently, the resource areas discussed below have been eliminated from further analysis.

1.8.1.1 Air Installation Compatible Use Zone

The project site is over 3 miles from the airfield (Figure 1-2) and not within a designated AICUZ. The nearest AICUZs are the Accident Potential Zones extending southwest from the airfield. Construction and operation of the new AVSTP at the proposed location would not impact airfield operations and would not violate any AICUZ restrictions. Therefore, AICUZ was eliminated from further analysis.

1.8.1.2 Geology

None of the activities considered in the Proposed Action or the Alternative Action would affect the underlying geology at Arnold AFB. Therefore, geology was eliminated from further analysis.

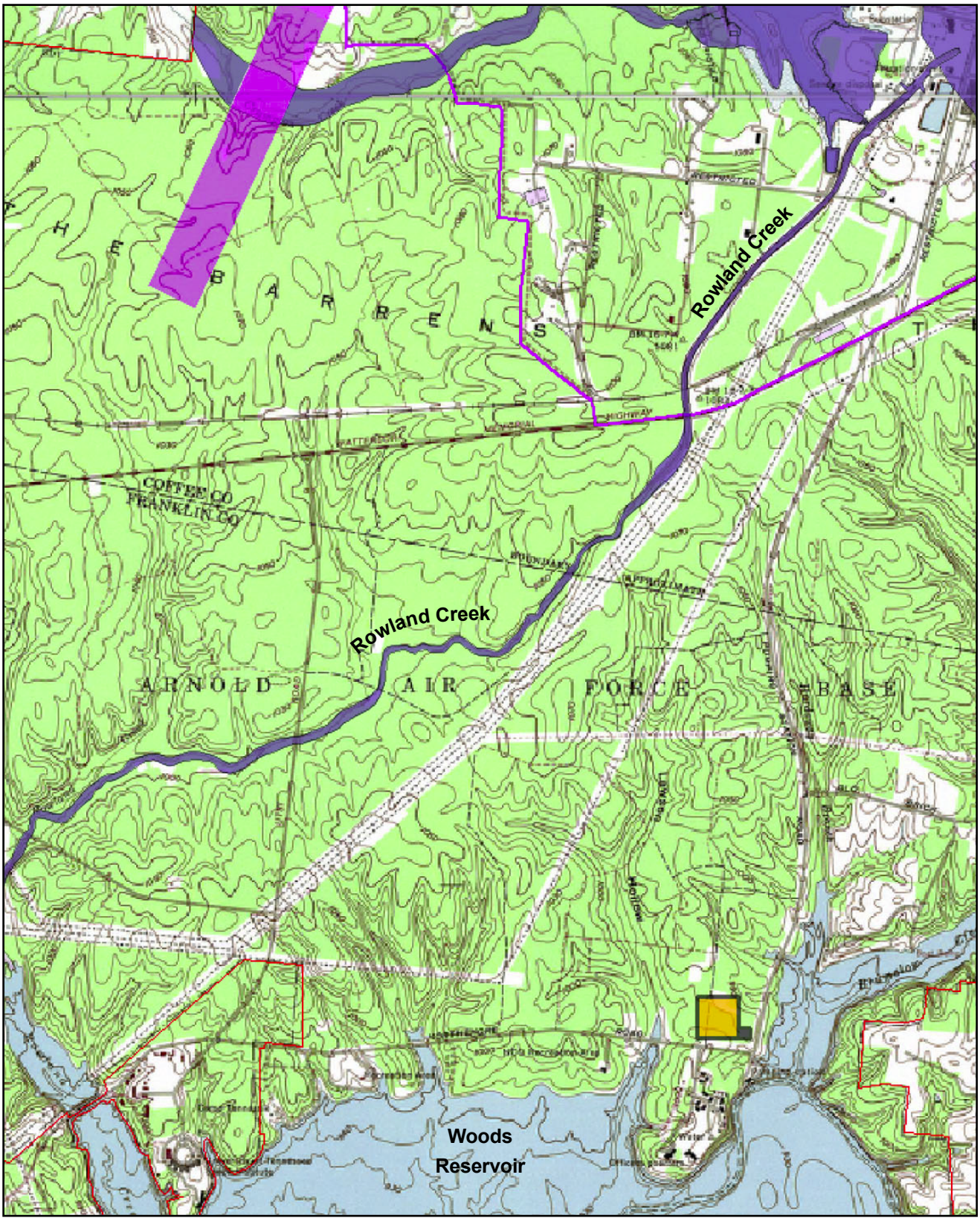
1.8.1.3 Noise

The Proposed Action is located more than 3 miles from the airfield and would not be impacted by noise from aircraft operations. Potential noise impacts would be related to the use of construction equipment. However, construction activities would occur only during regular working hours, construction workers would use proper hearing protection, and the associated noise from construction equipment would be temporary (approximately 6 months during normal working hours of the day).

Noise resulting from operation of the new AVSTP would be comparable to that from the existing plant. As the proposed location is across the road from the existing plant location, there would be no change in potential receptors and no impacts resulting from noise generated by operation of the plant. Consequently, noise was eliminated from further analysis.

1.8.1.4 Socioeconomic Factors

Socioeconomic factors are associated with the human environment, including demographics, community infrastructure and services, employment and wages, recreation, and environmental justice. Construction of a new sewage treatment plant with the equivalent treatment capacity as the current plant would have no significant effect on socioeconomic factors. There would be temporary employment from construction and associated use of construction materials, but these effects would be short-term and minor within the regional economy. There would be no increase or loss in permanent staffing positions to operate the facility, nor would there be any gain or loss of permanent



LEGEND

- Accident Potential Zones
- IRP Sites
- Proposed AVSTP
- Drip Disposal System
- AEDC Boundary
- Arnold AFB Boundary

Figure 1-2

Location of Proposed New AVSTP, Accident Potential Zones, and IRP Sites

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employment in the surrounding region. The facility is on Arnold AFB and serves Arnold AFB staff and dependents and would not impact minority or low income population groups. The Proposed Action would be in compliance with EO 12898 and EO 13045.

There would be no change in demand for recreational facilities/opportunities and no change in recreational facilities/opportunities available to the staff of Arnold AFB or residents of the region. Replacing the existing AVSTP with a new AVSTP of the same capacity would not cause people to move into or out of the area. With no change in population, the Proposed Action would not result in a change in demand for community infrastructure and services (fire, police, medical, housing, schools, etc.).

Construction-related traffic would temporarily increase and traffic flow on North Shore Road could be temporarily disrupted while influent and effluent lines are placed beneath the road. Therefore, socioeconomic factors, with the exception of traffic flow, are eliminated from further analysis.

1.8.1.5 Installation Restoration Program (IRP) and Hazardous Materials

Arnold AFB has an active IRP designed to protect human health and ensure that natural resources are restored for future use (CH2M HILL, 2002). Twenty-six IRP sites have been identified on Arnold AFB and 11 of these have been closed after determinations of no further action required. The proposed site of the new AVSTP is not located near any active IRP sites (Figure 1-2). Therefore, IRP sites have been eliminated from further analysis.

1.8.1.6 The Barrens

The Barrens is a sensitive habitat type that occurs on Arnold AFB. However, the historic and current Barrens area is located approximately 2 miles north of the Proposed Action and would not be impacted by the project (Figure 1-2). Therefore, The Barrens has been eliminated from further analysis.

1.8.2 Issues Studied in Detail

The resource areas below are discussed in detail in this document.

1.8.2.1 Safety and Occupational Health

Potential safety and occupational health impacts would result from implementing alternatives addressed in the EA and would be related to construction activities at the site of the Proposed or Alternative Action and also operational changes from modifying the disinfection process.

1.8.2.2 Land Use

Construction of the new AVSTP would result in conversion of existing forest land to a new use. The magnitude of this conversion is analyzed to determine whether it would be significant.

1.8.2.3 Hazardous Materials

Impacts from hazardous materials would result during construction and operation of the alternatives presented in the EA. Implementation of the Proposed Action or Alternative Action would eliminate the use of chlorine gas for disinfection of effluent at AVSTP.

Eliminating chlorine disinfection also eliminates the need for handling/storing chlorine gas cylinders at AVSTP.

Vehicle operation, refueling, and maintenance during construction would involve fuels and petrochemicals that could be hazardous if released into the environment.

1.8.2.4 Air Quality

Intermittent construction-related effects associated with construction activities under the Proposed and Alternative Actions would result from fugitive dust (particulate matter) and combustive emissions generated by building construction and construction equipment. The analysis will focus on air emissions associated with the construction and operation of the new AVSTP. No change in air emissions from within the AEDC industrial complex is anticipated from operation of the new AVSTP.

1.8.2.5 Geomorphology

Construction and the subsequent presence of new structures may contribute to the erosion potential of surrounding soils due to soil/ground disturbance. Excess storm water runoff resulting from the addition of impervious surfaces may also contribute to soil erosion. Areas likely to be impacted by erosion are identified based on parameters such as soil type and extent and proximity of vegetative cover to the affected area. Potential impacts and measures to eliminate or reduce potential impacts are then described.

1.8.2.6 Water Quality

Modifications in the effluent treatment may result in changes to water quality in Woods Reservoir. Elimination of chlorine as a disinfectant is proposed under the various alternatives. Also, additional impermeable surface would be created during construction of the AVSTP. This could result in an increase in stormwater runoff. Effects would vary depending on the amount of new surface area to be added/constructed. Potential impacts are defined as impacts to the quality and utility of water resources resulting from an increase in stormwater runoff.

1.8.2.7 Non-Sensitive Biological Resources

Biological resources (plants and animals) and related habitats (foraging and nesting areas) may be directly affected by the Proposed Action due to construction and increased use of the area. The impacts analysis focuses on the potential for actions to directly and physically affect plants and animals and the potential for actions to alter/affect the quality and utility of the habitats frequented by those species.

1.8.2.8 Sensitive Species

Construction activities (i.e. vehicular/construction equipment traffic) may occur near sensitive species and their habitat. The analysis focuses on the association between construction footprints and identified sensitive species within these areas, and the potential for adverse impacts to those species

1.8.2.9 Sensitive Habitats

Habitat alteration is defined as the destruction or creation of a habitat that is essential for survival of one or more species. Sensitive habitats (e.g., wetlands and floodplains) may be

disturbed or altered due to construction activities resulting from the Proposed and Alternative Action. Sensitive habitats associated with the Proposed and Alternative Action are identified, and the proximity to construction activities is analyzed. Potential impacts are identified if the construction footprints disturb identified sensitive habitats.

1.8.2.10 Cultural Resources

Cultural resources are defined as archaeological areas and historical architectural properties. Potential impacts are identified if construction footprints associated with the Proposed or Alternative Actions extend into the boundaries of identified cultural resource areas, resulting in the disturbance of such resources through construction activities such as earth removal.

1.9 Document Organization

This EA follows the organization established by the CEQ regulations (40 CFR, Parts 1/500-1508). This document consists of the following sections:

1.0 Purpose and Need for Action
2.0 Description of the Proposed Action and Alternatives
3.0 Affected Environment
4.0 Environmental Consequences
5.0 Plan, Permit, and Management Requirements
6.0 List of Preparers
7.0 List of Contacts and Correspondence
8.0 References
Appendices

2.0 Description of Proposed Action and Alternatives

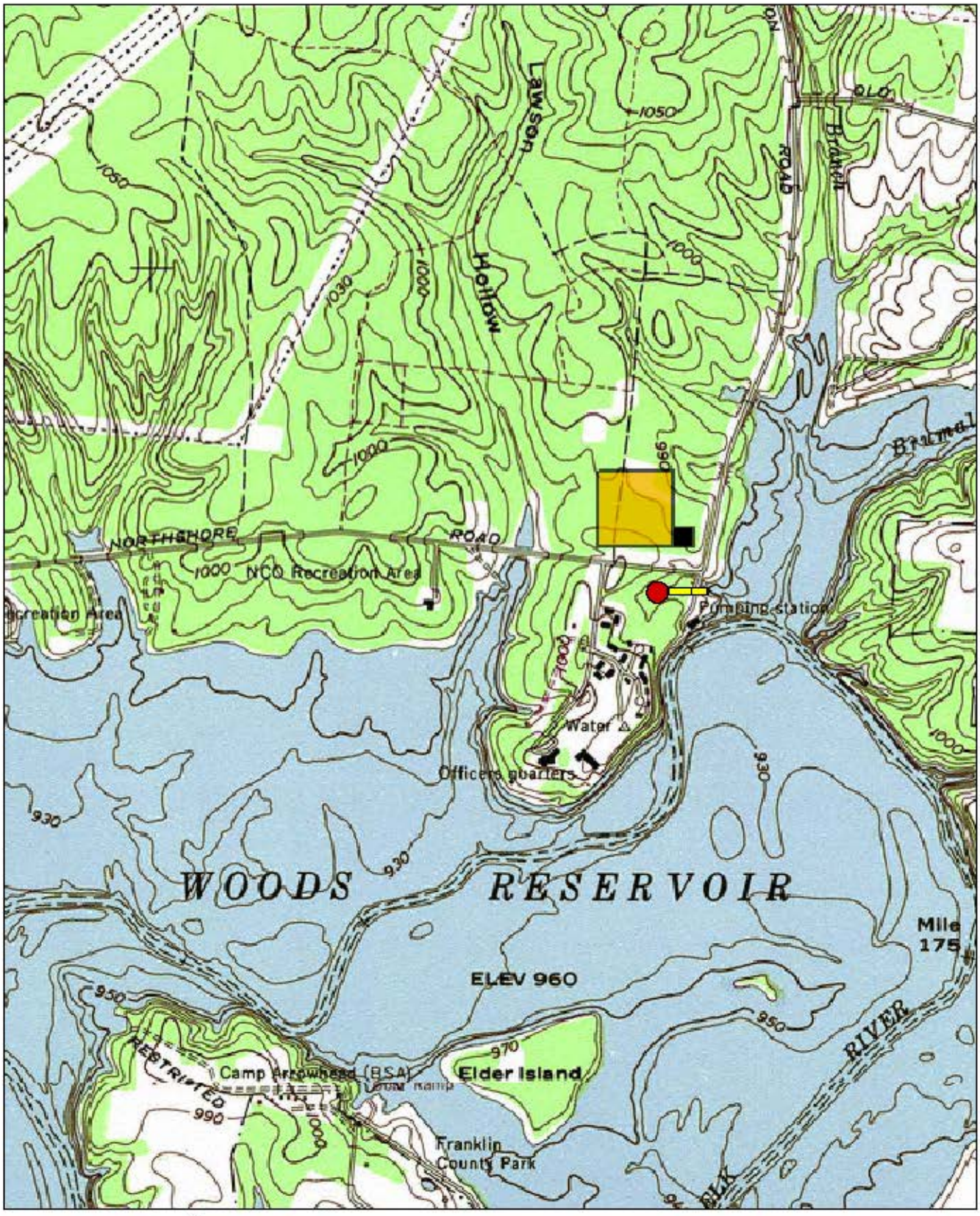
As required by federal regulation, this EA addresses the possible environmental impacts of the Proposed Action and alternative actions including a No-Action Alternative. Section 2.5 provides a summary of the issues and potential impacts associated with the Proposed Action, Alternative Action, and No-Action Alternative.

2.1 Proposed Action (Preferred Alternative)

The preliminary engineering report (Burns & McDonnell, 2003) discusses numerous treatment and disposal options and presents a description of feasible, practical, and economically viable options. The Proposed Action, which is the Arnold AFB Preferred Alternative, is to construct an RSF plant north of North Shore Road. The RSF would require approximately 1 acre of land. The plant would discharge into Woods Reservoir (Figure 2-1) at the location where the existing plant discharges. Some of the main components of the RSF include a septic tank, a recirculating tank, a sand filter, and UV disinfection (Figure 2-2). In the Preferred Alternative, wastewater from the existing Arnold Village collection system would be transferred by gravity into a new package lift station that would include two 90-gallon-per-minute (gpm) non-clog sewage pumps to transfer the wastewater to the new AVSTP plant site. The pumps would be powered from existing electrical service at the existing AVSTP and would be backed up by a new emergency generator located at the new AVSTP. This package lift station would pump wastewater to a preliminary treatment system consisting of a fully automated and manual bar screen and a 3-inch parshall flume to monitor and record the influent flow rate.

Following preliminary treatment, wastewater would discharge by gravity into a 53,000-gallon, two-compartment septic tank which serves as primary treatment, removing settleable solids, floatables, oil and grease, and a portion of the influent organic matter. As recommended by MIL-HDBK-1005.16, the first compartment has a 12-hour retention time at the annual average daily flow rate of 30,000 gpd, plus an additional 25 percent capacity for solids storage. The liquid depth includes 1 foot of sludge storage. The septic tank includes a second compartment to minimize short-circuiting and improve solids removal. Both septic tank compartments provide for venting of influent. Typical septic tank systems provide between 30 percent and 50 percent biochemical oxygen demand (BOD_5) removal as indicated in EPA/625/R-00/008, February 2002.

The effluent from the septic tank is sent to an RSF for BOD_5 and total suspended solids (TSS) removal prior to discharge. The RSF functions as an aerobic, fixed-film bioreactor and provides secondary treatment for the septic tank effluent. Wastewater is pumped over the sand filter media where it contacts a microbial growth (called bioslime) that develops as microorganisms grow and attach themselves to the filter media. As the wastewater percolates through this active layer, BOD_5 and ammonia (NH_3-N) are removed from the



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LEGEND

- Existing WWTP
- Proposed AVSTP
- Drip Disposal System
- Existing Discharge Line

Figure 2-1

Location of Proposed Action and Alternative Action

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

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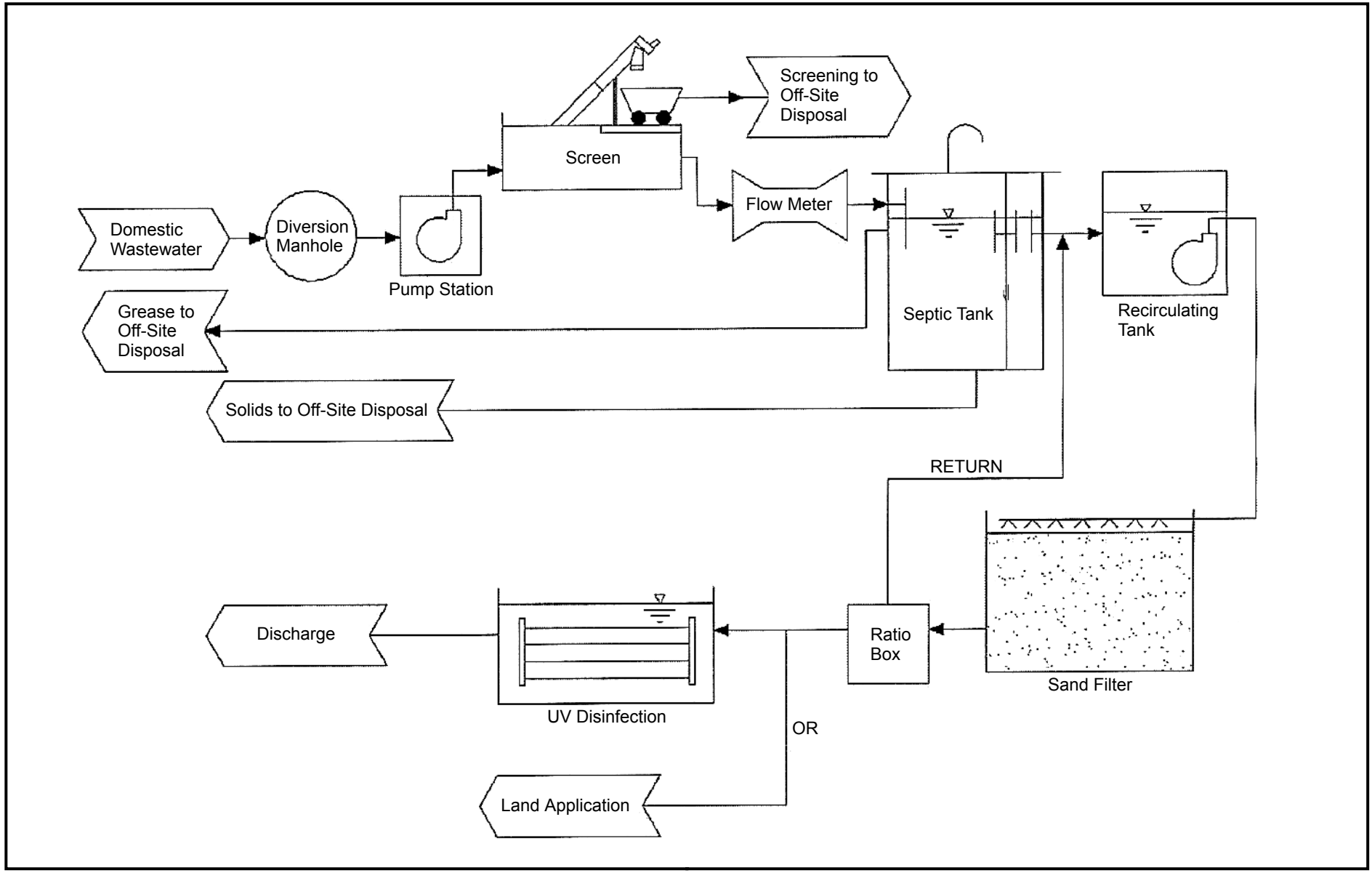

Source: Preliminary Engineering Report on Arnold Village Wastewater Treatment Plant Replacement for Arnold Engineering Development Center, Arnold AFB, Burns & McDonnell, December 2003

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Figure 2-2

Recirculating Sand Filter Flow Diagram

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

wastewater by the microorganisms. Most of the biochemical treatment typically occurs within 6 inches of the filter surface and TSS removal typically occurs at the filter surface.

Typically, wastewater is applied to the sand filter intermittently and at a sufficiently high rate to allow the wastewater to be recirculated through the sand filter multiple times before being discharged. The intermittent dosing of the filter allows the filter media to be re-aerated between wastewater doses, thus supplying the oxygen that the microorganisms require to consume wastewater constituents. The multiple recirculation increases the retention time in the filter media to provide sufficient time for the microorganisms to adsorb and consume waste constituents.

The recirculation tank would have a 60,000-gallon capacity and provide 30,000 gallons of effective volume as required by TDEC design criteria. Timers would provide 48 doses of flow to the sand filter in 5-minute duration increments over a 24-hour period. The effluent from the recirculation system is pumped to two 5,000-square-foot sand filters for additional BOD_5 and TSS removal. An underdrain system, consisting of perforated polyvinyl chloride (PVC) piping, is located in the bedding material and collects filtrate that drains out of the bottom of the sand filter. The effluent from the sand filter is either transferred out of the RSF as effluent or returned to the recirculation tank for additional treatment.

Effluent leaving the RSF would be disinfected with UV light before being discharged through the existing NPDES outfall into Woods Reservoir (Figure 2-3). A package open channel UV disinfection system with a stainless steel channel and a low-pressure high-intensity mercury arc lamp would provide this treatment. The package UV system would be installed in a 4-foot-deep vault below grade similar to the current treatment system. The vault would have a removable plate around the system to maintain gravity flow. Rainwater collected in the vault would drain back to the head of the treatment plant through a gravity well. As required, potable water would be supplied for cleaning of UV lamps. After passing through the UV disinfection system, final plant effluent would flow by gravity to the existing outfall. The new plant would tie into the existing outfall line with new 6-inch PVC piping.

2.2 Alternative Action: Recirculating Sand Filter Plant with Drip Disposal

The Alternative Action would use the same RSF treatment system, but would not include the UV disinfectant and would not discharge to Woods Reservoir. Treated effluent would be disposed of through drip disposal into lateral fields located adjacent to the new AVSTP (Figures 2-1 and 2-4).

Drip disposal systems utilize perforated pipes installed in trenches with porous media (gravel or rock) bottoms. Wastewater flows through the pipes and is distributed over the entire width of the trench through the porous media. The soil beneath the porous media is infiltrated by the wastewater. Soil microorganisms and plants utilize the components in the treated effluent for nutrients and as a substrate.

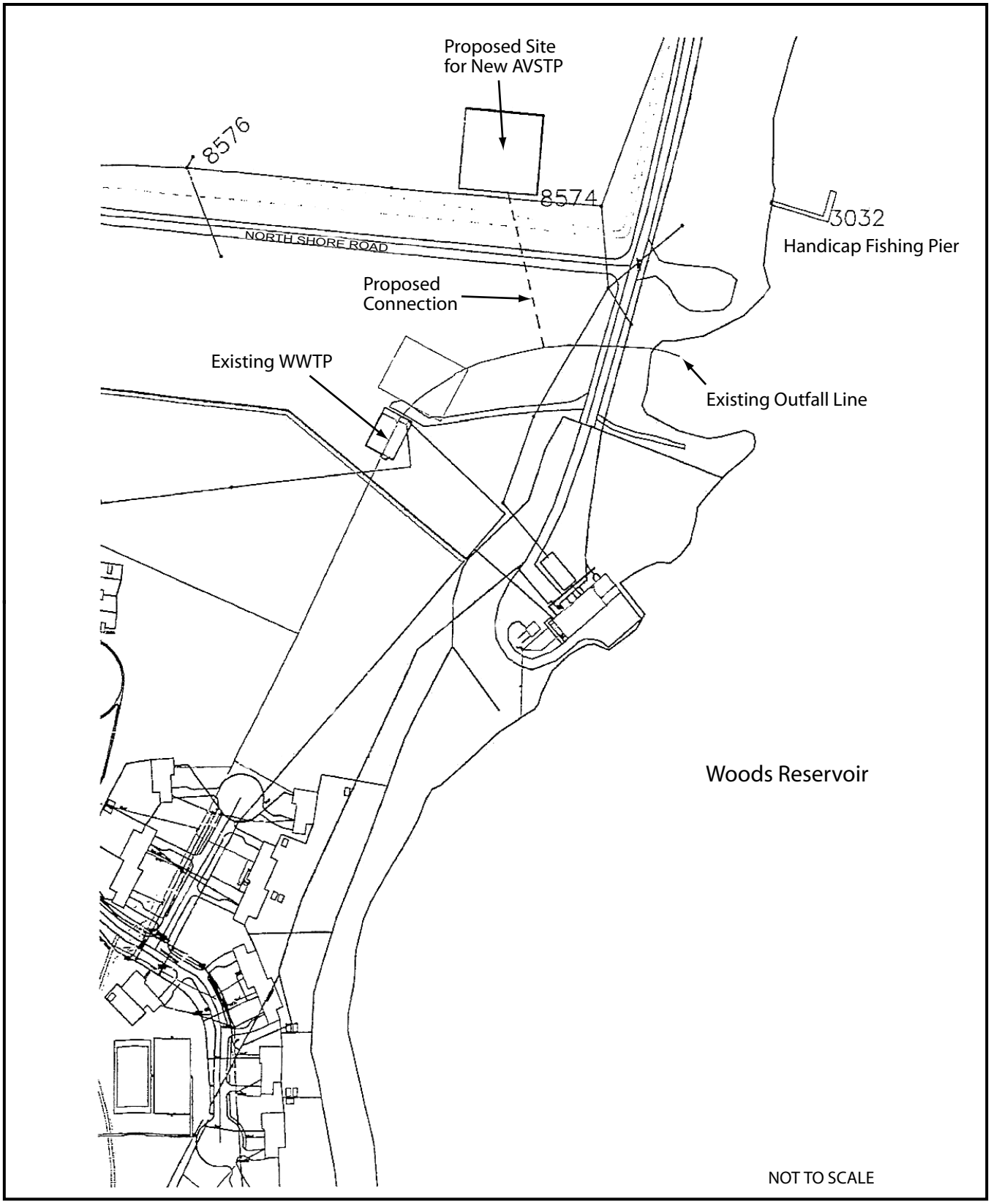
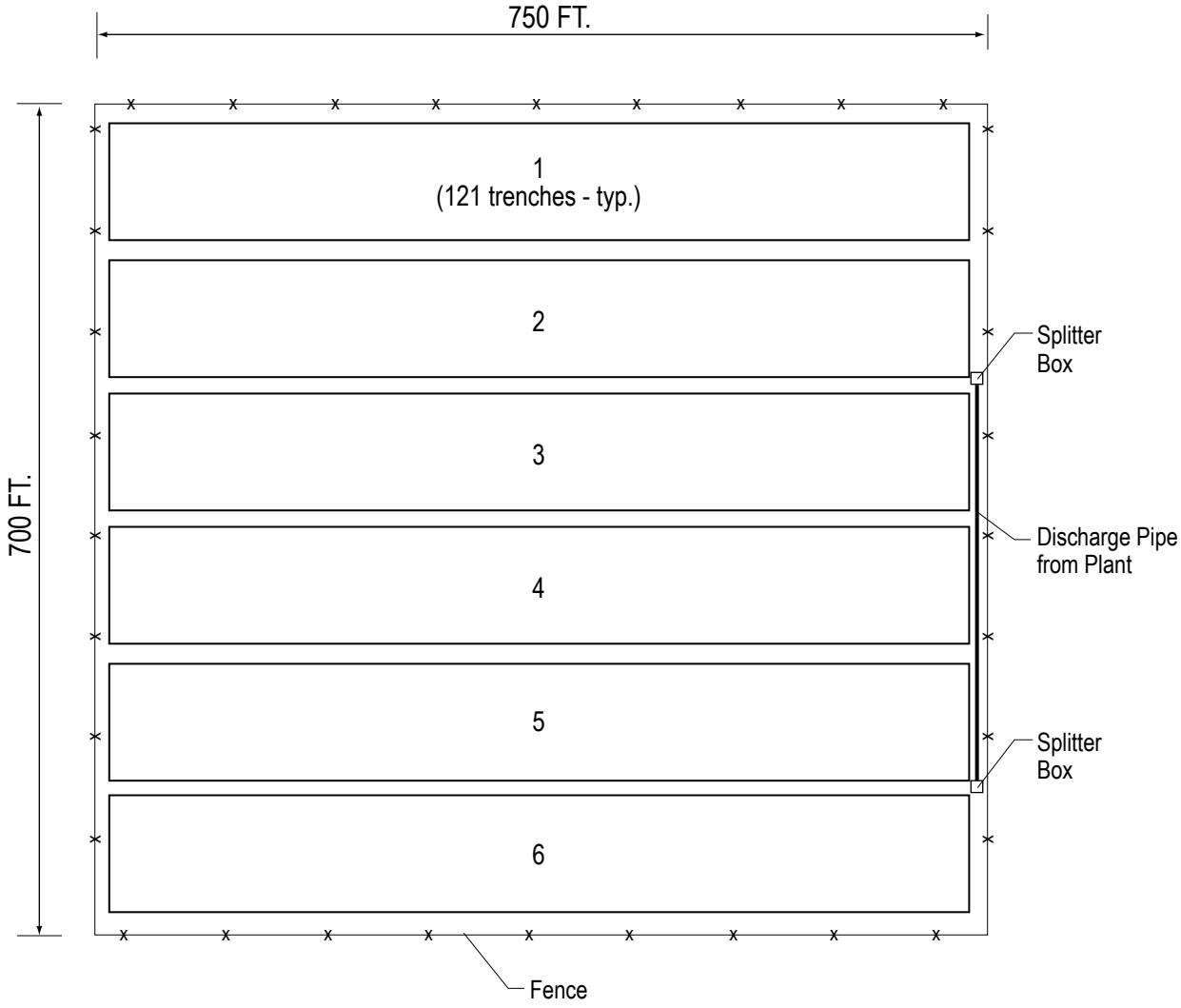


Figure 2-3

Location of Proposed AVSTP and Connection with Existing NPDES Outfall Line

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment



LEGEND

Lateral Field

Fence

Discharge Pipe from Plant

Figure 2-4

Schematic Diagram of Drip Disposal Lateral Field

Construction of New Arnold Village Sewage Treatment Plant

Final Environmental Assessment

The drip disposal system would incorporate a flow splitter to direct flow evenly among separate lateral fields. Treated effluent from the flow splitter box would be transferred by gravity through PVC piping to six separate lateral fields with a total land area of approximately 525,000 square feet or 12.0 acres in addition to 1 acre of land for the other components of the treatment facility. Cumulatively, the six lateral fields would contain approximately 218,000 square feet of infiltration area to provide a hydraulic loading of 0.138 gpd/square foot and a BOD_5 loading of 0.034 pound/day/1,000 square foot. The applied hydraulic loading was determined from the results of a preliminary soil evaluation, which was conducted to determine whether a drip disposal system would be technically feasible.

The six lateral fields would be surrounded by a 6-foot tall chain link fence. Each lateral field would be composed of infiltration trenches and relief lines. There would be approximately 121 trenches with 3 feet of soil separating each trench. A single, 4-inch diameter, perforated PVC pipe in each trench would distribute effluent throughout the infiltration area. The effluent would flow by gravity from the splitter box to the nearest lateral and then through a distribution line and into the next adjacent lateral field. TDEC design criteria for lateral fields require that the PVC pipe be located 7 inches below grade in each infiltration trench and surrounded by approximately 12 inches of rock. A geotextile membrane would be placed on top of the rock and covered with soil to the ground surface. Trenches would be 3 feet wide, 100 feet long (per MIL-HDBK-1006/16 requirements), and provide 300 square feet of infiltration area. Figure 2-4 presents a schematic of the lateral fields. A 15-foot buffer would be placed around each lateral field.

2.3 No-Action Alternative

In the No-Action Alternative, a new sewage treatment plant would not be constructed. Under this alternative, the original AVSTP would continue to be used to treat the wastewater from Arnold Village. Under the No-Action Alternative, AVSTP would continue discharging chlorine-disinfected effluent to Woods Reservoir, with potential environmental impacts associated with degradation byproducts of the chlorination process. UV disinfection would not be used. The current AVSTP has exceeded its original design life and is in need of extensive repair or replacement; however, TDEC will not approve repair to the existing plant and recommends construction of a new plant.

2.4 Alternatives Considered but Not Carried Forward

Burns & McDonald (2003) performed a preliminary engineering analysis that examined the feasibility of multiple options for addressing the wastewater treatment needs of Arnold Village. The options eliminated from further analysis as a result of the engineering analysis are briefly described below.

2.4.1 Activated Sludge Treatment

An activated sludge system would have been similar to the treatment system currently in use at Arnold Village and would have a footprint comparable to the RSF system. Activated sludge is a secondary treatment process that uses suspended microorganisms to remove

BOD_5, TSS and NH_3-N from domestic wastewater. The treatment provided by this system would be comparable to that provided by the considered alternatives, but is not supported by TDEC. A cost comparison of activated sludge treatment with RSF treatment indicated that the present value of the life cycle costs associated with RSF treatment would be $760,000 less than for an activated sludge system. The activated sludge system would cost more to construct and have higher annual operating and maintenance (O&M) costs. As this system would provide no increase in effluent quality, have environmental impacts comparable to those of to the RSF system, and cost substantially more, use of activated sludge treatment was eliminated from further analysis.

2.4.2 Aerobic Fixed Film Treatment

An aerobic fixed-film secondary treatment process uses microorganisms attached to a plastic medium to remove BOD_5, suspended solids, and NH_3-N from domestic wastewater. An aerobic fixed-film system would have a footprint comparable to that of the RSF system. This system would provide treatment comparable to the considered alternatives, but is not supported by TDEC. A cost comparison of aerobic fixed-film treatment with RSF treatment indicated that the present value of the life cycle costs associated with RSF treatment would be $740,000 less than for an aerobic fixed-film system. The aerobic fixed-film system would cost more to construct and have higher annual O&M costs. As this system would provide no increase in effluent quality, have environmental impacts comparable to those of the RSF system, and cost substantially more, use of an aerobic fixed-film system was eliminated from further analysis.

2.4.3 Disposal through Spray Irrigation

Spray irrigation was considered as a final effluent disposal option. Treated effluent would pass into a spray irrigation system adjacent to the new AVSTP, and effluent would be sprayed over the adjacent fields. Wastewater is not disposed of through direct discharge to surface waters but by percolation through the soil, direct evaporation, and transpiration through plant uptake. Spray irrigation systems typically cannot be operated at full capacity during periods of wet weather or frozen soil conditions. To prevent direct discharges into surface water, a separate storage pond would be required to hold effluent during unsuitable weather conditions until it could be applied through spray irrigation. Preliminary analysis indicated that a 2.2-million-gallon earthen storage pond with a plastic liner would be required to provide approximately 75 days of storage.

Spray irrigation would require land for the irrigation field that would not be converted from forest under the Preferred Alternative. In addition, there is a risk of offsite movement of aerosolized droplets containing potential contaminants that could pose a health risk to persons using the handicapped access fishing area located just southeast of the facility site.

A cost comparison of spray irrigation with direct discharge indicated that the present value of the life cycle costs associated with direct discharge treatment would be $460,000 less than for spray irrigation. The spray irrigation system would cost substantially more to construct and would not recoup those costs through slightly lower annual O&M costs. As this system would face operational constraints based on short- and long-term weather patterns, would pose a potential human health risk, have greater land conversion impacts than direct

discharge and cost substantially more, use of an spray irrigation disposal was eliminated from further analysis.

2.4.4 Discharge to an Offsite Treatment System for Treatment and Disposal

Prior to construction of a new wastewater treatment plant or replacement of an existing wastewater treatment plant, TDEC requires that an evaluation be performed to determine if the raw wastewater can be discharged into an existing municipal (offsite) wastewater treatment plant. Two options were identified:

- Discharge to AEDC sewage treatment plant.
- Discharge to Tullahoma municipal collection and treatment system

2.4.4.1 Discharge to AEDC Sewage Treatment Plant

The AEDC sewage treatment plant is located 4 miles from Arnold Village and at a considerably higher elevation. This option would require 4 miles of pipe and one or more lift stations to move the raw sewage to the AEDC facility. The pipe alignment could follow existing transportation rights-of-way, but encroachment into adjoining forests and other natural habitats could not be avoided. Currently, the AEDC sewage treatment plant is operating at design capacity and cannot receive more wastewater. The AEDC facility would have to be enlarged to implement this option. The costs to implement this option would be considerably higher than the Proposed Action and the environmental impacts would be greater. Therefore, discharge to the AEDC sewage treatment plant is not feasible for treatment of domestic wastewater from Arnold Village and this option was eliminated from further analysis.

2.4.4.2 Discharge to the Tullahoma Municipal Collection and Treatment System

Discharge to the Tullahoma municipal collection and treatment system would require construction of approximately 11 miles of new force main corridor and one or more lift stations to transfer Arnold Village flow to Tullahoma. In addition, land would have to be acquired to install the line from Arnold Village to Tullahoma. This option would result in substantial environmental impacts from construction of this new utility corridor. This option also is not economically feasible because of the distance, land acquisition costs, and potential O&M cost. Because of the greater costs, necessity of obtaining easements on land not owned by AEDC, and greater potential for environmental impacts, the discharge of domestic wastewater from Arnold Village to the Tullahoma municipal treatment facility for treatment was eliminated from further analysis.

2.5 Comparison of Alternatives

The Proposed Action, Alternative Action, and No-Action Alternative are compared in Table 2-1.

TABLE 2-1
Comparison of Impacts of Considered Alternatives
Arnold Village Sewage Treatment Plant EA

Resource Area	Proposed Action	Alternative Action	No-Action Alternative
Land Use	Conversion of 1.1 acres to other land use type, from forest management to facility. Demolition of old facility with no planned designation for use of the area.	Conversion of 13 acres to other land use type, from forest management to facility and drip disposal fields. Demolition of old facility with no planned designation for use of the area.	No impact.
Safety and Occupational Health	Positive impact from conversion from chlorine gas disinfectant to UV disinfectant, which eliminates potential for accidental release of chlorine gas.	Positive impact from elimination of chlorine gas disinfection, which eliminates potential for accidental release of chlorine gas. Minor potential negative impact from accidental overload of drip disposal system and release of coliform bacteria into environment and Woods Reservoir.	No change in current conditions. Potential negative impact to workers from accidental release of chlorine gas.
Hazardous Materials	Elimination of use of chlorine gas as disinfectant for effluent. Eliminates the need for storage and handling of chlorine gas cylinders. During construction there is a potential for fuel spills.	Elimination of use of chlorine gas as disinfectant for effluent. Eliminates the need for storage and handling of chlorine gas cylinders. During construction there is the potential for fuel spills.	No change in current conditions. Chlorine gas will be stored and tracked.
Air Quality	Minor potential for fugitive dust emissions from 1.1-acre disturbance during construction. No impacts after construction is complete. Elimination of long term risk of accidental release of chlorine gas.	Greater potential for fugitive dust emissions than Proposed Action as impact areas is 13 times greater. No impacts after construction is complete. Elimination of long term risk of accidental release of chlorine gas.	No change in current conditions. potential for accidental release of chlorine gas would remain.
Geomorphology	Minor disturbance to soils during construction.	Greater soil disturbance and change of soil type on 12 acres from installation of drip disposal fields.	No impact.
Hydrology	Minor change in local hydrology resulting from increase in impervious area. Eliminated or reduced through site design and onsite stormwater controls. No impact from operation.	Minor change in local hydrology resulting from increase in impervious area. Eliminated or reduced through site design and onsite stormwater controls. Reduction of up to 30,000 gpd of input to Woods Reservoir during operation.	No impact.

TABLE 2-1
Comparison of Impacts of Considered Alternatives
Arnold Village Sewage Treatment Plant EA

Resource Area	Proposed Action	Alternative Action	No-Action Alternative
Water Quality	Minor potential for sedimentation during construction. Eliminated or reduced through appropriate BMPs. Minor risk of accidental release of effluent that does not conform to permit limits during operation. Eliminated or reduced through site design. Elimination of potential environmental impacts associated with degradation byproducts of chlorination. Elimination of a chlorine residual discharge permit limit.	Minor potential for sedimentation during construction. Eliminated or reduced through appropriate BMPs. Minor risk of overloading with unauthorized discharge during operation. Eliminated or reduced through use of storage pond and buffers. Minor potential negative impact from accidental overload of drip disposal system and release of coliform bacteria exceeding permit limits into environment and Woods Reservoir. Elimination of potential environmental impacts associated with degradation byproducts of chlorination. Elimination of a chlorine residual discharge permit limit.	Greater potential for accidental releases of effluent that does not conform to permit limits than with a new facility. Potential for environmental impacts from chlorine entering Woods Reservoir and formation of chlorine degradation byproducts.
Non-Sensitive Flora and Fauna	Insignificant impact from conversion of 1.1 acres into a facility area.	Minor impact from loss of 13 acres of early successional forest through conversion to facility and drip disposal fields.	No impact.
Sensitive Species	No impact.	No impact.	No impact.
Sensitive Habitats	No impact.	No impact.	No impact.
Traffic Flow	Minor temporary disruption of traffic flow around project site while pipes are placed beneath or across road. Eliminated or reduced through detour.	Minor temporary disruption of traffic flow around project site while pipes are placed across beneath or across road. Eliminated or reduced through detour.	No impact.
Cultural Resources	No impact.	Additional cultural resource survey needed in western portion (hardwood forest) of area for drip disposal system. No impacts on remainder of site.	No impact.

3.0 Affected Environment

3.1 Land Use

Arnold AFB occupies 39,081 acres including the 3,632-acre Woods Reservoir, which contains approximately 26 billion gallons of water. Woods Reservoir provides cooling water for facilities in the industrial area. Cultivated pine forests total approximately 5,785 acres and hardwood forests total 23,492 acres. There are grasslands and early-successional habitats in utility rights-of-way that occupy roughly 1,479 acres on the installation and provide habitat for numerous rare species. In addition, 4,683 acres of the installation are occupied by wildlife food plots, buildings/structures, mowed/bush hog areas, and other open areas, such as landfills, roads, etc., as shown on Figure 3-1 (Call, 2003).

3.2 Safety and Occupational Health

The Air Force Safety Center develops Air Force Environmental and Occupational Safety (AFOSH) standards. These standards implement Occupational Safety and Health Association (OSHA) rules directed by Department of Defense Instruction (DoDI) 6055.1 and AFI 91-302. The Branch also develops other guidance to supplement the AFOSH standards and ensure their availability at the supervisor and worker level. The goal is to ensure guidance is in compliance with OSHA and other federal standards and incorporates "lessons learned" and appropriate parts of consensus standards to provide the supervisor and worker with the tools to prevent mishaps. Their function is to serve as a focal point for Environmental, Safety, and Occupational Health compliance, produce guidance, evaluate compliance, be technical experts in a wide range of subjects, coordinate with other agencies and private entities in and outside of the federal sector, and perform engineering reviews of procedures and facility design projects (USAF, 2004).

The Environmental Safety Health and Quality (ESHQ) team is responsible for environmental and occupational safety at Arnold AFB. The ESHQ team ensures that workers are informed about potential hazards from chemicals and materials that may be encountered on the Base, assuring that work areas have proper lighting and ventilation for work tasks to be performed. Additional components include ongoing program evaluations for noise, ergonomics, hazard communication, personal protective equipment including respiratory protection, and emergency response. ESHQ team reviews the use and storage of chlorine gas at the AVSTP. Their role is to ensure compliance with appropriate guidance and regulations for maintaining the bottles of gas and the use of the gas by the facility operators.

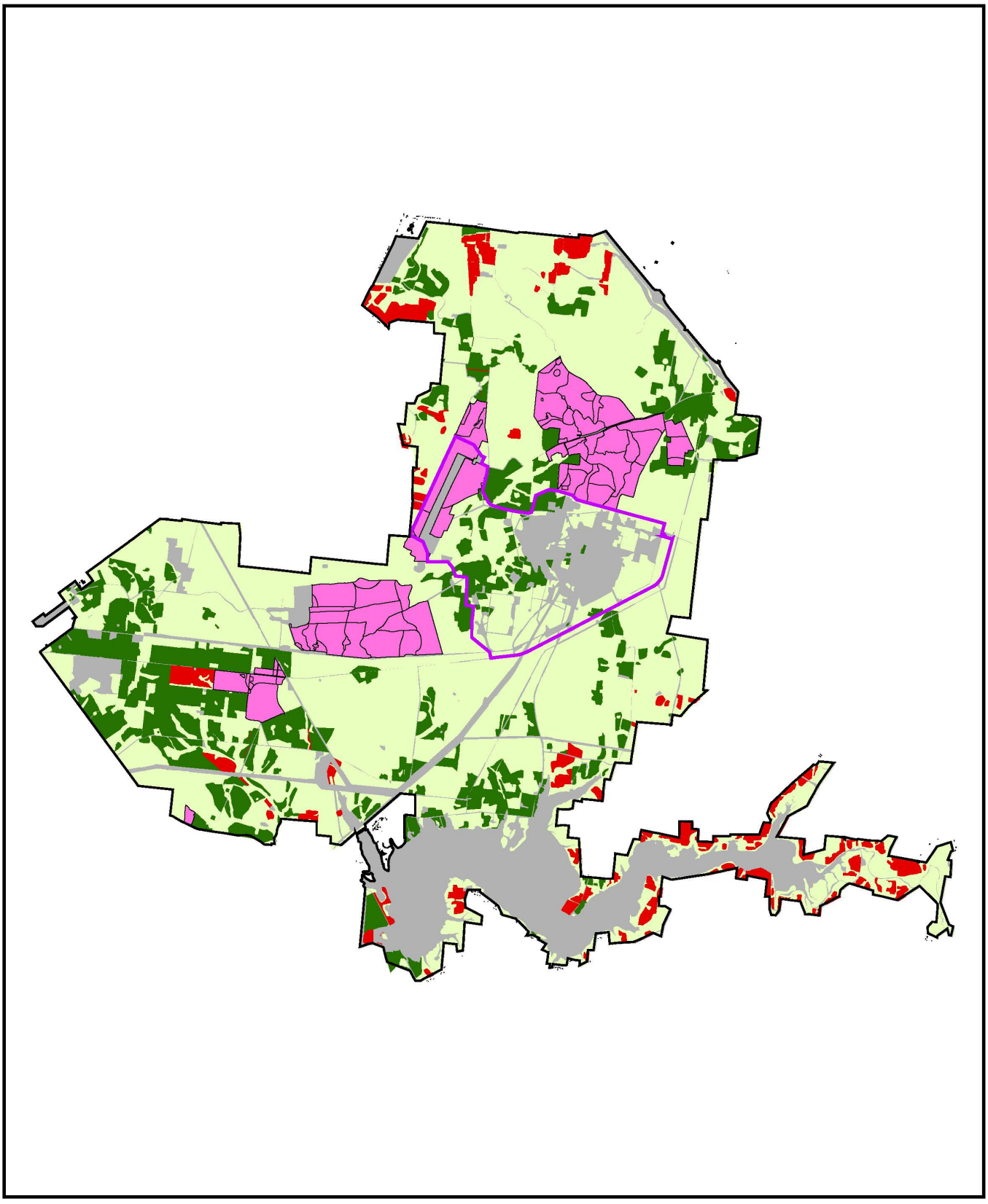


Figure 3-1

Land Use on Arnold Air Force Base

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

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3.3 Hazardous Materials and Hazardous Wastes

The Arnold AFB Hazardous Materials Pharmacy uses a computer database system to manage the purchase, distribution, use, and disposal of hazardous materials. Testing operations at AEDC use chemicals that are classified as hazardous materials. Arnold AFB actively works to reduce the use of hazardous materials on-Base through identification of specific materials targeted for reduction and developing suggestions for appropriate materials for substitution.

At the existing sewage treatment plant, chlorine gas, contained in gas cylinders, is used for disinfection of effluent. Chlorine gas is a hazardous material and is classified as a reportable chemical through the Toxics Release Inventory (TRI). No other hazardous materials are used at AVSTP.

Construction requires operation of vehicles and equipment. Vehicle and equipment operation, refueling, and maintenance during construction would involve fuels and petrochemicals that could be considered hazardous if released into the environment.

3.4 Physical Resources

Physical resources include the atmosphere (air quality, climate, and meteorology), geomorphology (landforms, terrain, topography, and soils), geology (underlying land formations), and hydrology (surface and groundwaters, including water quality). Analyses in this area focus on identifying those resources that would be impacted by the considered actions, and the resulting consequences to the quality and utility of those resources. Impacts to geology have been eliminated from further analysis (see above). However, analysis of potential impacts to geomorphology is included.

3.4.1 Air Quality

Air quality in a given location is described by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or micrograms per cubic centimeter ($\mu g/cm^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the basin, and the prevailing meteorological conditions.

Although activities at Arnold AFB result in various sources and volumes of air emissions, the regional air quality is good. Arnold AFB is located in an attainment zone for all pollutants (CH2M HILL, 2002). Air pollutants are emitted from mobile and stationary sources and general maintenance activities, government and privately owned vehicles, jet engine testing, aircraft operations, prescribed burning, wildfires, and mission test and training operations (U.S. Air Force, 1995). TDEC issued AEDC a Title V Operating Permit in May 2002. There are currently 26 emissions sources covered under this permit and all sources are in compliance. The current AVSTP is not a permitted emissions source.

Since Coffee County is an attainment area for all criteria pollutants, major new or modified stationary sources on and in the area of Arnold AFB are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing

significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds: 100 or 250 tons/year based on the source's industrial category. Because of the size of the proposed facility and its status as replacement-in-kind, the new AVSTP would not be considered a major new source. However, emissions from any new or modified source must be controlled using Best Available Control Technology.

3.4.2 Geomorphology

Geomorphology, as discussed here, refers to landforms, slopes (topography/relief), and soils at the Arnold AFB area. Analysis of this feature helps to establish the relationships between various elements of the environment (geology, hydrology, vegetation, and wildlife). The topography at Arnold AFB ranges from relatively flat with poor surface drainage in the northern portion of the installation to moderately rolling with defined stream channels in the southern section.

Arnold AFB lies within the eastern part of the Highland Rim physiographic region of Tennessee (Miller, 1974). It is bounded to the east by the Cumberland Plateau, which is an escarpment rising to an elevation of 1.000 feet above the Highland Rim and to the west by a well-dissected escarpment dropping off to the Central Basin physiographic region. Between these two escarpments, the Highland Rim region is a bench approximately 25 miles wide. A major surface water drainage divide bisects Arnold AFB in a southwest-to-northeast trending line. Tributaries of the Duck River drain the area to the northwest, and tributaries of the Elk River drain the area to the southeast. Elevations range from about 1,100 feet above sea level at the drainage divide to 890 feet above sea level in the valleys. In the areas north and northeast of Arnold AFB, there are many swamps and internally drained depressions. Stream channels there are poorly defined and stay dry through much of the summer and fall (Haugh and Mahoney, 1994). The southwestern part of Arnold AFB has well-defined drainage channels, particularly Spring Creek, which at its lower reaches is well-incised and supports a sustained base flow (Haugh and Mahoney, 1994).

The stratigraphic column underlying Arnold AFB consists of fractured carbonate rocks covered by regolith (Wilson, 1976). The regolith is derived from the weathering of the Mississippian-age St. Louis and Warsaw Limestones and ranges from 10 to 100 feet thick at Arnold AFB. It is primarily composed of clayey chert rubble with some silt and sand. A typical sequence of regolith at Arnold AFB includes finer-grained clays, sands, and silts at ground surface with increasing amounts of chert rubble occurring with depth (Burchett, 1977). The bedrock underlying the regolith is the Mississippian Fort Payne Formation, which is composed primarily of chert and cherty limestone. At Arnold AFB, this formation ranges in thickness from 20 to 230 feet. The upper portion of the bedrock is highly weathered, with many fractures and solution openings. The lower portion of the bedrock has few fractures (Aycock and Haugh, 1999). Underlying the Fort Payne Formation is the Chattanooga Shale.

The regional geologic dip of these units is approximately 10 to 20 feet per mile to the east and southeast. However, there is a local dome-shaped geologic structure beneath the Arnold AFB area which may have formed in response to regional tectonic stresses (Haugh and Mahoney, 1994). The axis of this dome generally follows the surface water drainage

divide. Vertical and near-vertical fractures exist in the bedrock beneath Arnold AFB, perhaps formed by the same tectonic pressures.

Groundwater beneath the Arnold AFB area occurs within the regolith, and to a more limited extent within the bedrock. The main water-bearing unit in the area occurs within the chert rubble unit at the base of the regolith just above the bedrock and the solution-openings in the upper portion of the bedrock (Aycock and Haugh, 1999). Locally, vertical fractures in the bedrock may influence groundwater flow patterns (Haugh and Mahoney, 1994). The lower portion of the Fort Payne bedrock has few fractures and low yields of water (Haugh and Mahoney, 1994). The Chattanooga shale is considered to be the base of the fresh groundwater system in the area (Haugh and Mahoney, 1994; Haugh, 1996a). A groundwater divide bisects Arnold AFB and generally corresponds to the surface water drainage divide.

A silty mantle of loess underlain by residual clays or cherty clay covers most of the region. Where the mantle has been thinned by erosion the clay is red, which is typical of limestone soils with high iron oxide content. Some areas within Arnold AFB have undergone significant earth moving activities, which may have significantly altered natural surface soil conditions. There is good to moderate drainage in the region.

Soils on Arnold AFB primarily belong to the Dickson-Mountview-Guthrie Association and consist chiefly of ultisols developed on a thin (<4.9 feet) silty mantle overlying cherty limestone residuum (Love et al., 1959; Springer and Elder, 1980; Smalley, 1983; Patterson, 1989). The Dickson silt loam and Mountview silt loam are the most important soils on well-drained slopes and ridges. Both of these soils are strongly to very strongly acidic, moderately permeable in their surface horizons, and low in fertility. They differ primarily in that the Dickson soil has a discontinuous fragipan (relatively impermeable layer) at the base of the silty upper mantle that restricts subsoil drainage (Love et al., 1959). The fragipan layer contributes to the patterns of seasonal flooding observed at Arnold AFB by restricting drainage during the wet winter months and by limiting the upward movement during the dry summer months. Guthrie silt loam is the characteristic soil of headwater wetlands in The Barrens. This soil is developed on parent materials similar to those of the Dickson and Mountview soils and contains a discontinuous fragipan. It is strongly to very strongly acidic and low in fertility. The Guthrie silt loam differs from the Dickson silt loam primarily in its poor drainage and landscape position. The most extensive occurrences of Guthrie silt loam occupy the bottoms of intermittent headwater streams and sinkholes. Small patches of this soil occur as wet inclusions within the Dickson silt loam and other upland soils on ridgetops. Other soils within the association are the moderately well-drained Sango silt loam and the somewhat poorly drained Taft (formerly Lawrence) silt loam (Call, 2003).

The Dickson-Baxter-Greendale soil association also occurs on Arnold AFB. It is an extensive soil association on the Highland Rim and occupies 13.3 percent of Coffee County. Typical relief for this association includes large, almost level or undulating areas with steeper slopes near drainageways. The drainage pattern is dendritic, but streams are neither numerous nor well-entrenched. Imperfectly and moderately drained soils predominate (United States Department of Agriculture [USDA] Soil Conservation Service, 1949).

Dickson, Baxter, and Greendale soils occupy most of the association, with Lawrence, Guthrie, Ennis, and Lobelville soils also present. A small amount of Mountview soil also is

found in the area. Dickson soils occur primarily on undulating or nearly level to depressed areas. The upper layers of these soils are generally free of chert, stones, or gravel, and the subsoils are compact and relatively impervious. Mountview soils are chert-free on the undulating uplands. Baxter soils are located in steeper areas along the larger drainages. The cherty Greendale soils are on young, alluvial-colluvial deposits at the base of slopes occupied by Baxter soils and along intermittent streams. Lobelville and Ennis soils occur in long narrow areas on first bottoms along streams (USDA Soil Conservation Service, 1949).

3.4.3 Hydrology

Hydrological features consist of surface waters (lakes, rivers, streams, and springs) and groundwater. Arnold AFB lies within the Duck River and the Elk River basins. The drainage divide between these two watersheds extends southwest to northeast through the AEDC Industrial Area (Figure 3-2). The Duck River basin lies to the north of the divide and receives drainage from Hunt, Huckleberry, Wiley, Crumpton, and Bobo Creeks and the Hickerson Spring Branch. The Elk River basin is to the south of the divide and collects surface drainage, primarily from Bradley, Brumalow, and Rowland Creeks. Smaller creeks such as Dry Creek, Hardaway Branch, Saltwell Hollow Creek, Spring Creek, and Poorhouse Creek also contribute to the Elk River (Call, 2003).

A groundwater divide approximately coincides with the surface water divide. Groundwater from the Highland Rim aquifer system and surface water flow from the divide to the nearby receiving water bodies. Woods Reservoir defines the southeastern part of the surface water and groundwater flow systems at Arnold AFB.

Surface water and groundwater to the north and west of the divide drain to the Duck River, and water to the south and east of the divide drains to the Elk River and its tributaries, including Bradley, Brumalow, and Rowland Creeks. At the AVSTP site located on the north shore of Woods Reservoir just west of Bradley Creek, groundwater and surface water flow from the north and discharge to Woods Reservoir. Water levels in Woods Reservoir remain fairly constant at an elevation of 960 feet above mean sea level. Surface water and groundwater flow into Woods Reservoir from both the north and the south (Haugh and Mahoney 1994).

Regional groundwater resources include the Mississippi Carbonate (karst) aquifer (recently named Highland Rim aquifer). This aquifer consists of flat-lying carbonate rocks of Mississippian age and underlies the Highland Rim physiographic province. The land in the western part of this area is dissected and hilly to steep, whereas land in the eastern, northern, and southern parts of this province is predominantly undulating. The bedrock formations have a deep (up to 100 feet thick) chert regolith that stores groundwater and releases it to bedrock openings. There are fractures in the bedrock, which permit rapid transmission of water. Well yields commonly range from 5 to 50 gpm (TDEC, 2002).

Karst areas are characterized by sinkholes, springs, disappearing streams and caves, and by rapid, highly directional groundwater flow in discrete channels. Since water can travel rapidly over long distances through conduits that lack natural filtering processes of soil and bacteria, karst systems are easily contaminated. Serious construction concerns may arise in

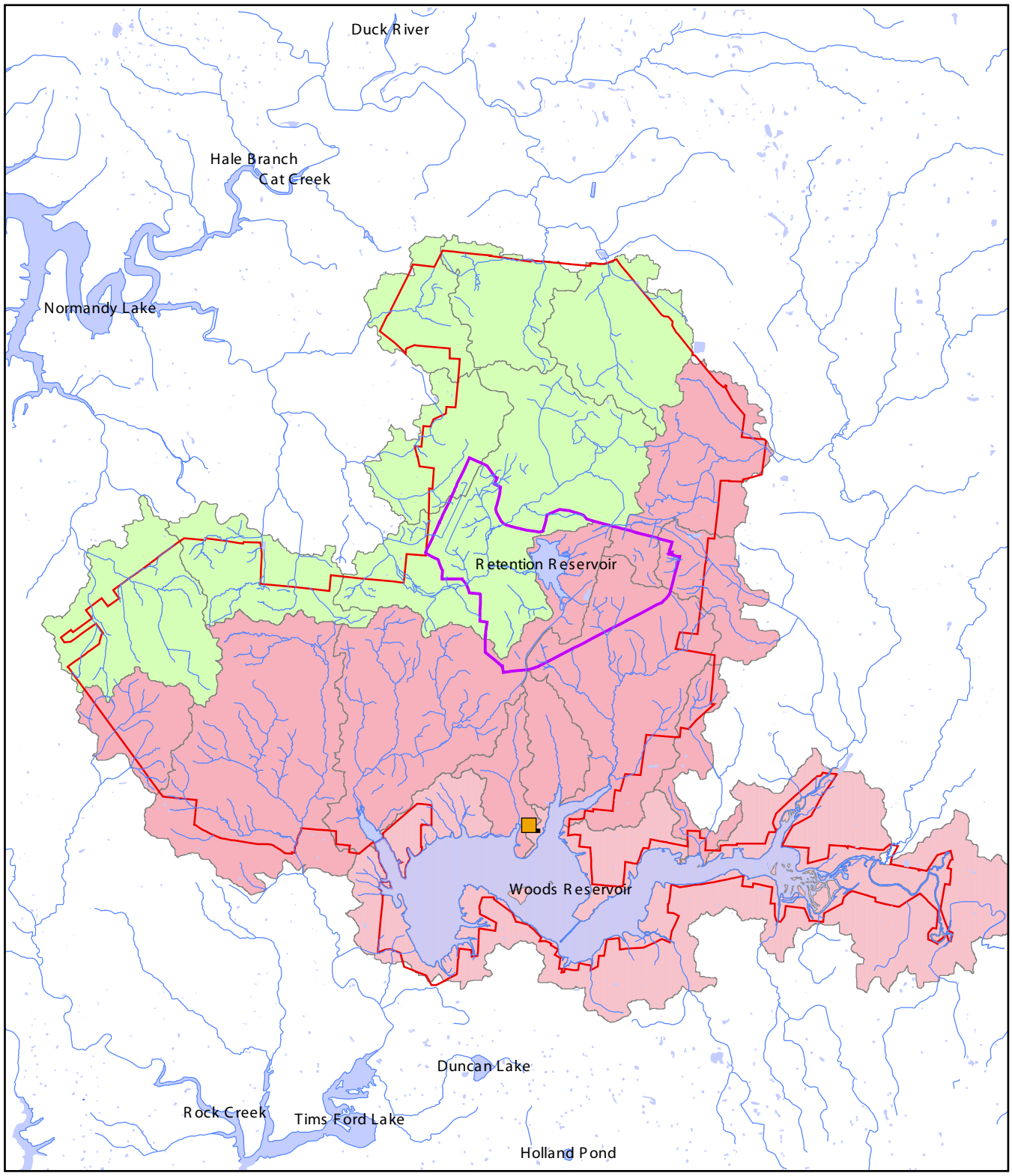

Figure 3-2

Surface Waters and Watersheds on Arnold Air Force Base

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karst areas due to the potential for collapse and flooding, which can also lead to groundwater contamination (TDEC, 2002).

Floodplains have been defined at several locations on Arnold AFB (Figure 3-3). These areas are located near Woods Reservoir and Sinking Pond.

The climate of the eastern Highland Rim varies by season, with generally mild winters and warm summers. Rainfall averages is between 50 and 55 inches per year and is heaviest in late winter and early spring. The average yearly temperature is about 60 degrees Fahrenheit, but is variable from place to place (Smith, 2004). Precipitation is fairly evenly distributed throughout the year, with slightly less in fall and slightly more in winter. August is typically the driest month (3.4 inches of precipitation) and February has the highest average precipitation (6.8 inches) (www.noaa.gov).

Discharge from the existing AVSTP into Woods Reservoir averages 20,000 gpd, based on flows from 2001 and 2002. The high flow from the plant was 86,318 gpd, and the low flow was 618 gpd.

3.4.4 Water Quality

The site of the proposed sewage treatment system is located in the Upper Elk River basin, south of the Duck River basin (Figure 3-2). The Upper Elk basin has 12 water bodies listed on the final version of the 2002 Section 303(d) List, which was issued in January 2004. One of these water bodies (Woods Reservoir) is in the immediate project vicinity. Woods Reservoir is listed as not supporting its designated uses because of historical PCB releases. A No Consumption-General Public (NCGP) fishing advisory has been issued for catfish. Woods Reservoir is southeast of the project area and is the receiving water body for effluent from the AVSTP. Permitted effluent limits on discharges from AVSTP are provided in Table 3-1.

TABLE 3-1
Permitted Effluent Limits for Discharge from Arnold Village Sewage Treatment Plant
Arnold Village Sewage Treatment Plant EA

Parameter	Units	Monthly Average	Daily Maximum
pH	S.U.	6.0 to 9.0	6.0 to 9.0
BOD_5	mg/L	30	45
Nitrogen, Ammonia Total	mg/L	5.0	8.0
Total Suspended Solids	mg/L	30	45
Fecal Coliform Bacteria	CFUs[1]/100 mL	200[2]	400[2]
Escherichia coli	CFUs[1]/100 mL	Not Applicable[2]	126[2]
Minimum Dissolved Oxygen	mg/L	1.0	1.0
Total residual Chlorine	mg/L	Not Applicable	0.5
Settleable Solids	mL/L	Not Applicable	1.0

[1] CFUs = Colony Forming Units
[2] The discharge must be disinfected to the extent that viable coliform bacteria are effectively eliminated. Values are determined as geometric mean of a minimum of 10 samples, with no sample to exceed 1,000 CFUs/100 mL

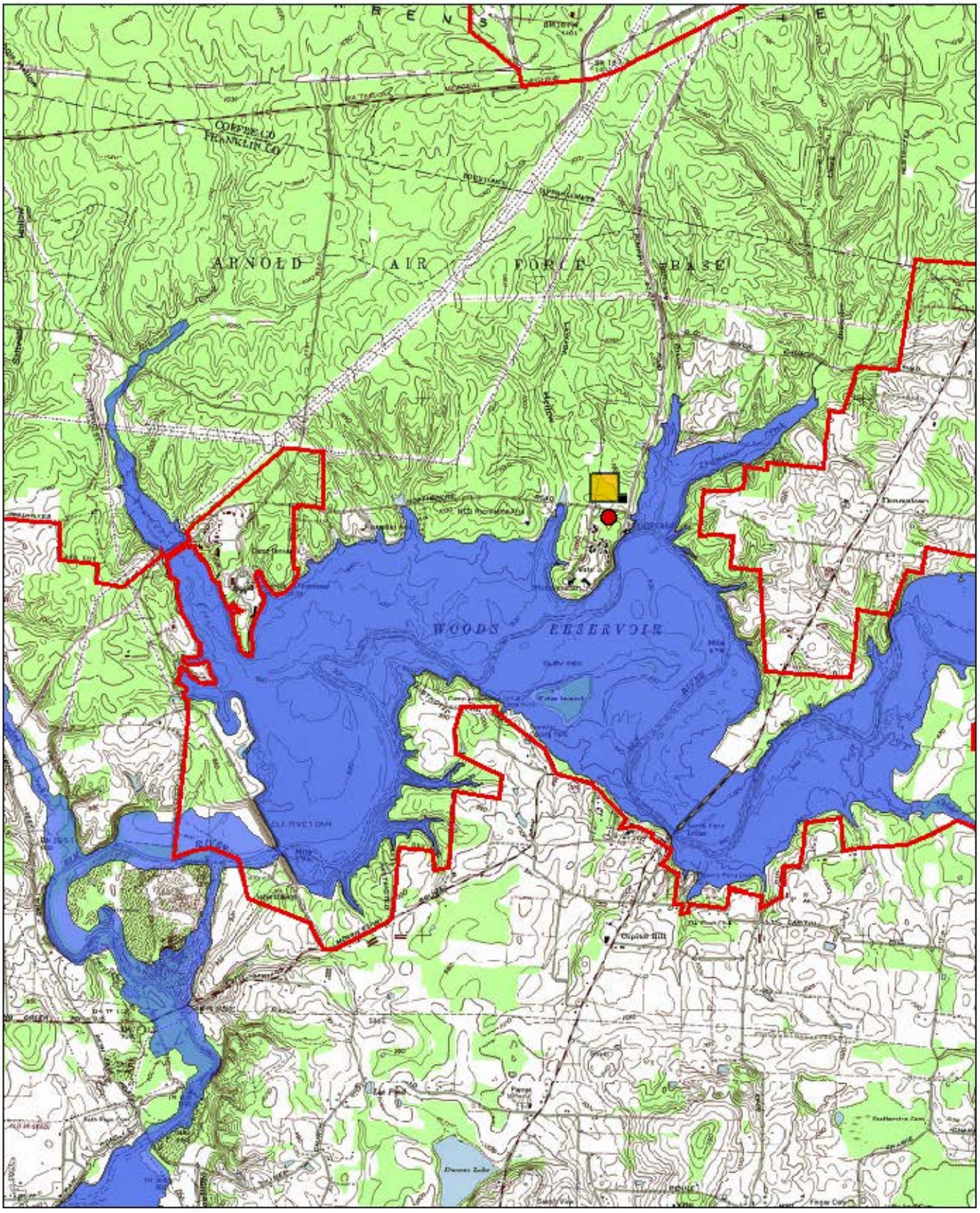

Figure 3-3

Location of Floodplain Area

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3.5 Biological Resources

Biological resources include the native and introduced terrestrial plants and animals around Arnold AFB. The land areas at Arnold are home to unusually diverse biological resources including several sensitive species, habitats, and wetlands. Arnold AFB developed a system of ecological associations based on floral, faunal, and geophysical characteristics. These ecological associations are described in the Arnold AFB IEMP (Call, 2003) and the *Environmental Baseline Study Resource* A*ppendices* (U.S. Air Force, 1995).

3.5.1 Eastern Highland Rim Ecological Association

The eastern Highland Rim region is part of the Mississippian Plateau section of the Western Mesophytic Forest region, supporting a mixed oak-tulip-chestnut forest with accessory stands of beech and hemlock. Relic stands of mixed hardwood-white pine occur on some bluffs above streams. The Barrens is linked to the karst topography and was once an area of tallgrass prairies.

3.5.1.1 Wildlife Species

Wildlife species at Arnold AFB are those common to the central southeastern United States. A literature review was conducted to identify representative common species of mammals, reptiles, amphibians, and birds (Table 3-2).

TABLE 3-2
Common Wildlife Species Occurring in Arnold AFB Vicinity
Arnold Village Sewage Treatment Plant EA

Common Name	Scientific Name
Bats	
Little brown bat	*Myotis lucifugus*
Northern myotis	*Myotis septentrionalis*
Red bat	*Lasiurus borealis*
Eastern pipistrelle	*Pipistrellus subflavus*
Big brown bat	*Eptesicus fuscus*
Rodents	
Eastern chipmunk	*Tamias striatus*
Groundhog	*Marmota monax*
Eastern gray squirrel	*Sciurus carolinensis*
Fox squirrel	*Sciurus niger*
American beaver	*Castor canadensis*
White-footed mouse	*Peromyscus leucopus*
Woodland vole	*Microtus pinetorum*
Raccoon	*Procyon lotor*
Virginia opossum	*Didelphis virginiana*
Smokey shrew	*Sorex fumeus*
Southeastern shrews	*Sorex longirostrus*
Least shrew	*Cryptotis parva*
Eastern mole	*Scalopus aquaticus*
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*

TABLE 3-2
Common Wildlife Species Occurring in Arnold AFB Vicinity
Arnold Village Sewage Treatment Plant EA

Common Name	Scientific Name
Gray fox	*Urocyon cinereoargenteus*
Long-tailed weasel	*Mustela frenata*
Striped skunk	*Mephitis mephitis*
Bobcat	*Lynx rufus*
White-tailed deer	*Odocoileus virginianus*
Eastern cottontail	*Silvilagus floridanus*
Amphibians	
Eastern newt	*Notophthalmus viridescens*
Spotted salamander	*Ambystoma maculatum*
Two-lined salamander	*Eurycea bislineata*
Bull frog	*Rana catesbeiana*
Green frog	*Rana clamitans*
Pickerel frog	*Rana palustris*
Southern leopard frog	*Rana sphenocephela*
Spring peeper	*Hyla crucifer*
Chorus frog	*Pseudacris triseriata*
American toad	*Bufo americanus*
Woodhouse's toad	*Bufo woodhousei*
Reptile Species	
Common snapping turtle	*Chelydra serpentina*
Mud turtle	*Kinosternon subrubrum*
Musk Turtle	*Sternotherus odoratus*
Red-eared slider	*Trachemys scripta*
Eastern box turtle	*Terrapene carolina*
Eastern spiny softshell	*Apalone spinifera*
Eastern fence lizard	*Sceloporus undulatus*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Five-lined skink	*Eumeces fasciatus*
Broad-headed skink	*Eumeces laticeps*
Black racer	*Coluber constrictor*
Corn snake	*Elaphe guttata*
Black rat snake	*Elaphe obsoleta*
Common king snake	*Lampropeltis getulus*
Northern water snake	*Nerodia sipedon*
Rough green snake	*Opheodrys aestivus*
Common garter snake	*Thamnophis sirtalis*
Copperhead	*Agkistrodon contortix*

Mammal species from Lamb, 2004a, Mullen et al. 1995; Bailey et al. 2003; J.W. Lamb personal communication, 2004.

Amphibian species from Mullen et al. 1995; J.W. Lamb personal communication, 2004.

Reptile species from Mullen et al. 1995; Bailey et al. 2003; J.W. Lamb personal communication, 2004.

A study was conducted in 2000 to document bird use of wetland flats and depressions (Roberts et al., 2001). This study identified 59 breeding season birds using wetland areas,

including 34 neotropical migrant species. Forty-six bird species were identified using the wetland flats and depressions in winter. A list of the species identified during this study is provided in the report (Roberts et al., 2001). Eighty-six bird species have been documented breeding at Arnold AFB (Lamb, 1999, 2000, 2001, 2002, 2003, 2004a). Including summer residents, migrants, and wintering species, a total of 226 species have been documented at Arnold AFB (J.W. Lamb, unpublished data).

In the 1950s, a comprehensive game management plan was initiated to increase wildlife populations so that reasonable harvests by the public would be possible. From 1954 to 1964, over 17,000 quail, 6,000 pheasant, 64 deer, and 21 turkeys were stocked. In 1974, the stocking of Canada goose began, with 53 geese stocked on the Retention Pond. An additional 50 geese were stocked in 1975. There are now abundant populations of deer, quail, geese, and turkeys on Arnold AFB. Since deer hunting was initiated in 1965, a total of 21,308 deer have been harvested to date (Call, 2003).

3.5.1.2 Plant Species

The plant species found at Arnold AFB are those common to the eastern Highland Rim Ecological Association. Oak-hickory forest, cedar glades, and a mosaic of bluestem prairie and oak-hickory forest dominate this association. The predominant vegetation form is temperate low land and submontane broad-leaved cold-deciduous forest. Oaks (*Quercus* spp.) are the dominant canopy species. Hickories (*Carya* spp.), including pignut (*C. glabra*), mockernut (*C. tomentosa*), shagbark (*C. ovata*), and bitternut (*C. cordiformis*), form a common but minor component (McNab and Avers, 1994).

AEDC lies in the heart of The Barrens region of the eastern Highland Rim. "Barrens" most often refers to grasslands similar to the Midwestern tallgrass prairie but may also describe openings with scattered trees that may resemble savanna or shrubland. Present vegetation on Arnold AFB is predominantly upland and swamp oak forest. Of the forested areas, 23,492 acres are in native hardwoods and 5,785 acres are in planted, non-native pines. Forested areas are most frequently characterized by closed canopies dominated by various oaks. Dry sites are dominated by post oak (*Q. stellata*), blackjack oak (*Q. marilandica*), scarlet oak (*Q. coccinea*), southern red oak (*Q falcata*), and black oak (*Q. velutina*). Wet sites are dominated by white oak (*Q. alba*), willow oak (*Q. phellos*), water oak (*Q. nigra*), and overcup oak (*Q. lyrata*). Understories include a wide variety of species including dogwoods (*Cornus* spp.), maples (*Acer* spp.), sassafras (*Sassafras albidum*), sourwood (*Oxydendrum arboreum*), and blueberries (*Vaccinium* spp.).

Numerous wetlands occur across the Base, with prevailing vegetation ranging from grassland to closed-canopy forest. Several hundred acres of open, prairie-like Barrens occur primarily near the airfield and along powerline and railroad rights-of-way. The flora of the region has long been noted for its unusual Coastal Plain disjuncts. Coastal Plain disjuncts are species that normally occur only in the Atlantic or Gulf coastal plains. These species are found nowhere else in Tennessee. To date, over 900 vascular plant species have been recorded on the Base (Call, 2003). The Nature Conservancy and the Tennessee Division of Natural Heritage classified and mapped the vegetation of Arnold AFB. The 33 plant associations delineated for Arnold AFB are listed in Appendix B. Seventeen of the 33 vegetation associations found on Arnold AFB are considered "imperiled" community types.

The site proposed for the new AVSTP is within an area managed for production of pine pulpwood/sawtimber. This area was recently clear-cut, primarily as a salvage timber operation to remove loblolly pines that were destroyed by an infestation of southern pine bark beetle. At present, this site is an early successional open field with stumps and root masses of the harvested trees remaining in place.

The footprint of the drip disposal system (under the Alternative Action) would encroach on the adjacent mixed hardwood forest to the west. The hardwood forest is primarily mid-growth oaks.

3.5.2 Sensitive Species

Sensitive species include those with federal endangered or threatened status, species proposed for listing as federal threatened or endangered, and state endangered, threatened, and species of special concern status (U.S. Air Force, 1995). An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species that is likely to become endangered in the future throughout all or a significant portion of its range due to loss of habitat, anthropogenic effects, or other causes.

AF projects that may affect federally protected species and species proposed for federal listing are subject to the ESA. The ESA requires designation of critical habitat for federally listed species. However, no areas on Arnold AFB are designated as critical habitat under the ESA. The species present on Arnold AFB that are protected under the ESA are described below. A list of all sensitive species on Arnold AFB is provided in Appendix C.

3.5.2.1 *Myotis grisescens* (Gray Bat)

In size, the gray bat is the largest eastern representative of the genus *Myotis*. It occupies a limited geographic range in the limestone karst areas of the central and southeastern United States. The gray bat typically uses caves for both winter hibernation and summer roosting/maternity, although different caves are used for these two periods. Gray bats have narrow temperature requirements, which reduces the number of caves that are suitable for use. The species is particularly vulnerable, as 95 percent of the population hibernates in only 9 caves, with over half the population hibernating in a single cave (Rommé and Reaves, 1999). The gray bat is federally listed as endangered due to declining numbers and loss of habitat. Flooding of summer maternity caves and hibernacula as a result of reservoir construction has been a major contributor to decline of the species (Rommé and Reaves, 1999).

Informal Section 7 consultations between representatives from Arnold AFB and USFWS occurred in 1978, 1979, and 1996. As a result, a management action plan was developed to coordinate continued Base operations and protection of the gray bat colony at Woods Reservoir dam and foraging habitat across the Base. The gray bat colony that resides on Arnold AFB at Woods Reservoir dam is listed as a priority 2 maternity colony in the USFWS Gray Bat Recovery Plan (1982) and is one of a very few maternity colonies that have been identified as using manmade structures for a maternity roost (Lamb, 2003b). The bat colony utilizes the gate house at the Woods Reservoir for roosting.

Gray bats forage primarily on aquatic insects along forested riparian corridors and use other forested corridors as travel routes. The canopy provides protective cover from potential predators (Rommé and Reaves, 1999; Lamb, 2003b). Mist net surveys at Arnold AFB have confirmed this life history characteristic, and gray bats have been captured while foraging along Elk River Bottoms, Bradley Creek, Brumalow Creek, and Rowland Creek. Gray bats also have been recorded with AnaBat II™ at Goose Pond, Sinking Pond, Tupelo Swamp, Westall Swamp, and near the Tennessee Valley Authority (TVA) substation.

Juvenile bats typically forage in wooded areas around the maternity cave (Rommé and Reaves, 1999; Lamb, 2003b). Therefore, protection of these areas also is important to recovery and maintenance of the species.

3.5.2.2 *Myotis sodalis* (Indiana Bat)

The Indiana bat is found in the eastern United States from eastern Oklahoma into Vermont and northwestern Florida. Indiana bats hibernate in caves and typically spend summers under the loose bark of trees in upland and bottomland forests and semi-wooded areas (Whitaker and Hamilton, 1998). Typically, Indiana bats make summer roost in hardwood trees with sloughing bark or cavities (Rommé and Reaves, 1999), but males have been documented roosting among the bark furrows of large pine trees on Wright-Patterson Air Force Base (R.A. King, USFWS, personal communication, 2004). As with gray bats, Indiana bats may migrate several hundred miles between winter and summer habitat (Rommé and Reaves, 1999).

Indiana bats forage on insects in a variety of habitats. This species typically forages in and around the tree canopy of riparian, floodplain, and upland forests. They also may forage along fencerows, crops, clearings, and farm ponds (Rommé and Reaves, 1999).

AnaBat II™ surveys in 2003 identified the possible presence of Indiana bats along Bradley and Brumalow Creeks, but the species has never been captured in mist nets on the Base. (Lamb, 2004b). There is some difficulty in positively identifying Indiana bats from calls recorded with an AnaBat II™ detector because of similarity and marginal overlap with other bat species. The USFWS does not currently accept AnaBat II™ identifications in the absence of confirmed captures (Robert Currie, USFWS, communication, 2004 to J.W. Lamb cited in Lamb, 2004b). Additional surveys would be required to confirm the presence of this species on the Base.

3.5.2.3 *Haliaeetus leucocephalus* (Bald Eagle)

The bald eagle is a federally threatened species. The bald eagle is found over most of North America, from Alaska and Canada to northern Mexico. There are an estimated 50,000 bald eagles in the United States, with 80 percent found in Alaska (Murphy et al., 1989).

The bald eagle is the only species of sea eagle that lives in North America. In the Southeast, bald eagles build their nests in early September. They usually build their nests in pine trees or bald cypress trees that are 1,000 feet or less from open water. In Everglades National Park, bald eagles nest in low mangrove trees or use nests that have fallen to the ground. But mostly, bald eagles build nests high in trees where they have a clear view of the water. These nests are large compared to the nests of other birds. The cone-shaped nests may be 6 feet across and from 6 to 8 feet from top to bottom. The nests are made of sticks and twigs

from other trees. The nests may be lined with Spanish moss, corn husks, or grasses (Murphy et al., 1989).

Eagles may start laying eggs as early as late October. Most bald eagles in the Southeast lay eggs in the latter part of December. Bald eagles usually lay one or two eggs, sometimes three. The eggs take about 35 days to hatch. The newly hatched birds stay in the nest from 10 to 12 weeks. Bald eagle parents may care for their young for another 4 to 6 weeks after the eaglets learn to fly (Murphy et al., 1989).

Tennessee's bald eagle population is the highest in winter when birds migrate from the north. Most of the birds winter in western parts of the state, particularly at Reelfoot Lake and Dale Hollow Reservoir, but bald eagles may occur on almost any waterway in the state (Tennessee Wildlife Resources Agency [TWRA], 2004).

Table 3-3 provides the numbers of mature and juvenile bald eagles observed at Woods Reservoir from 1988 through 2004. In most years a single pair of bald eagles winters on Woods Reservoir. Occasional sightings of transient eagles occur, but the species has not been documented nesting on Arnold AFB.

TABLE 3-3
Number of Wintering Bald Eagles at Woods Reservoir (1988-2004)
Arnold Village Sewage Treatment Plant EA

Year	Number of Adults	Number of Immature
1988	0	0
1989	2	0
1990	2	0
1991	2	0
1992	2	1
1993	2	0
1994	2	0
1995	1	0
1996	1	0
1997	2	0
1998	2	0
1999	1	0
2000	2	0
2001	2	0
2002	2	0
2003	2	0
2004	1	1
Total	28	2

Data from J.W. Lamb, unpublished data.

3.5.2.4 *Helianthus eggertii* (Eggert's Sunflower)

Eggert's sunflower is the only federally listed threatened plant species known from Arnold AFB. Management actions for the species are integrated with other aspects of the Arnold AFB ecosystem management program by employing a coarse filter-fine filter approach. The coarse filter approach is to restore and maintain vegetation structure and ecological processes in suitable habitats for Eggert's sunflower. Such process-oriented management supports mission flexibility by working at multiple spatial and temporal scales to conserve biological diversity associated with one of the Base's focal conservation targets–The Barrens mosaic (Fitch, 2003). Fine filter protective measures specific to Eggert's sunflower are also taken to ensure that localized destruction of the species or its habitat does not encroach on mission flexibility by violating provisions of the ESA. Management is coupled with monitoring to help track impacts to the plant. AEDC Conservation implements management and develops projects to further the recovery objectives outlined by the USFWS (Fitch, 2003).

All aspects of Eggert's sunflower management on Arnold AFB are planned in coordination with the Cookeville, TN office of the USFWS. The Service's recommendations are incorporated when developing new management strategies and projects or addressing unforeseen operational impacts (Fitch, 2003).

The document *AEDC Operational Information: Potential Impact to Helianthus eggertii* was developed and implemented through informal Section 7 consultation under the ESA. This document describes AEDC's operations, lists impacts to Eggert's sunflower that may occur from those operations, and outlines measures to reduce or avoid impacts when implementing Base operations. For each Base operation, the document gives the purpose of the operation, the method by which the operation is implemented, the potential impacts to the Eggert's sunflower resulting from each operation, and how to implement the operation to reduce/eliminate these impacts (Fitch, 2003).

It is understood that informal Section 7 consultation is to be reinitiated if (1) new information reveals impacts of the Proposed Action that may affect listed species or critical habitat in a manner not previously considered, (2) the Proposed Action is subsequently modified to include activities that were not considered during this informal consultation, or (3) new species are listed or critical habitat designated that might be affected by the Proposed Action (Call, 2003).

Prescribed burning, mechanical thinning, and invasive plant management are practices used to manage Eggert's sunflower on Arnold AFB. Eggert's sunflower habitat is maintained through Barrens restoration, forest management, and roads and ground operations, in addition to management of approximately 285 acres designed specifically for the specie's conservation (Call, 2003). The management actions are driven by the recovery goals for the species, which are listed in the USFWS Recovery Plan for Eggert's sunflower (White and Ratzlaff, 2000). Through management, Arnold AFB seeks to minimize the threats to Eggert's sunflower, including vegetation succession, habitat destruction, and competition by invasive plants.

3.5.2.5 *Pleurobema gibberum* (Cumberland Pigtoe)

Cumberland pigtoe is a federally threatened aquatic invertebrate bivalve species and is a member of the mollusk phyllum. A single relict shell was found on Arnold AFB in a 1990 faunal survey (Mullen et al. 1995), but live specimens have never been found on the Base (Call, 2003). Additional relict shells have not been located in surveys conducted by USFWS since 1990 (J.W. Lamb, personal communication, 2004). This species is therefore not considered in this assessment.

3.5.3 Sensitive Habitats

Sensitive habitats are described as those supporting threatened or endangered plant and animal species, areas determined to be exemplary natural communities by federal or state agencies, or habitat areas exceptionally fragile and susceptible to damage. Areas meeting these criteria occurring on or within 0.62 mile of Arnold AFB include selected wetlands and The Barrens.

3.5.3.1 Wetlands and Floodplains

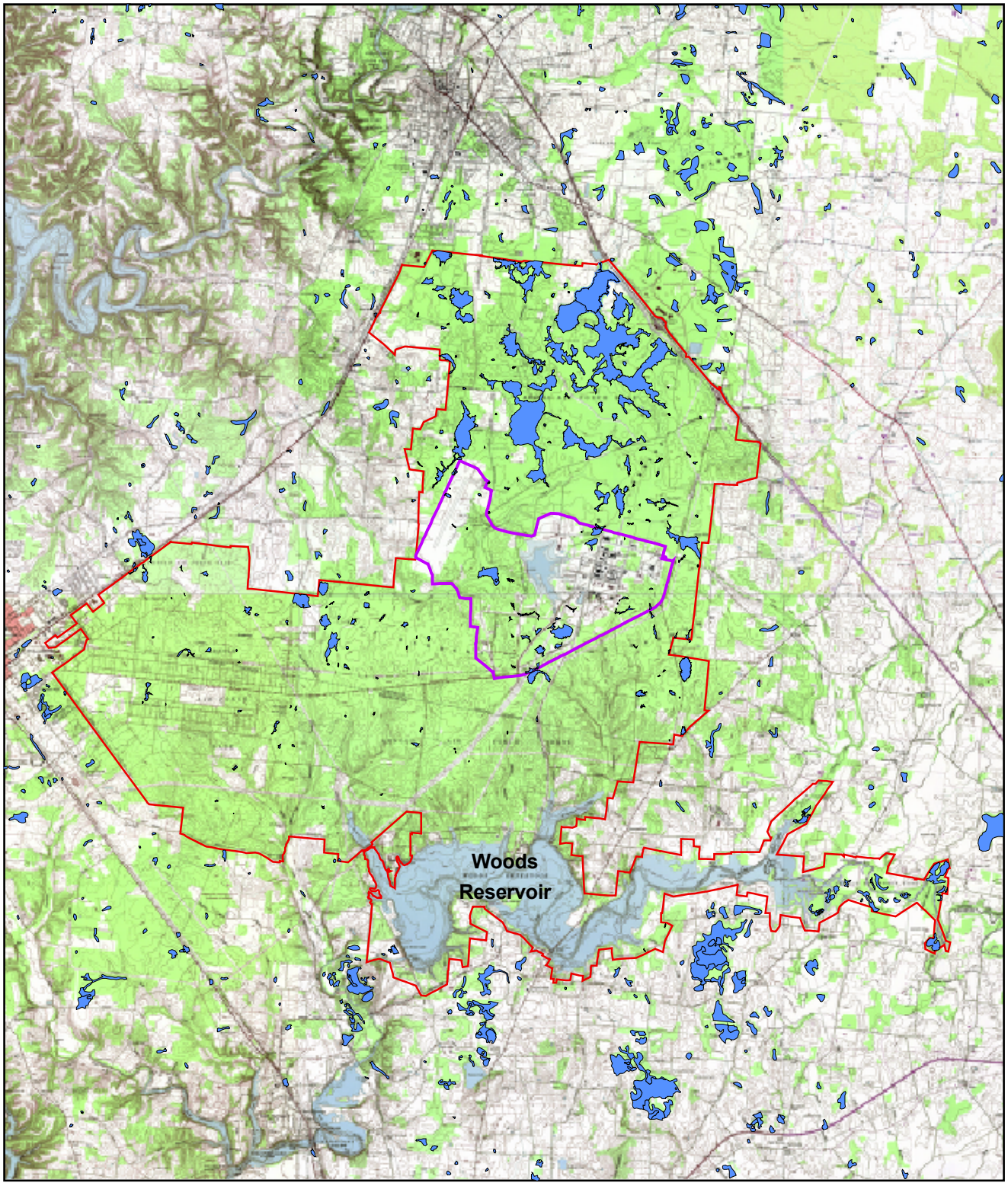
Wetlands are inundated (water-covered) areas, or areas where water is present either at or near the surface of the soil for distinguishable periods of time throughout the year. Local hydrology and prolonged soil saturation largely affect soil formation and development, as well as the plant and animal community composition in wetland areas.

Wetland flats and depressions are the two primary wetland types on Arnold AFB. The USFWS completed a wetlands inventory and mapping project on Arnold AFB in 1998 and documented 1,894 acres of wetlands in 220 sites (Figure 3-4). Two hundred wetlands on Arnold AFB totaling about 1,775 acres are classified as either flats or depressions. At present, an interagency effort is underway to develop models, on the basis of hydrology and geomorphology, for assessing function in wetland flats and depressions. This and other ongoing projects will increase the understanding of how varying land uses in and adjacent to wetlands influence wetland function.

Wetlands at Arnold AFB result from three major geomorphic features: karst pans, compound sinks, and intermittent headwater streams (Call, 2003). Karst pans typically have depths less than 4.9 feet and level bottom topography. Compound sinks generally have depths greater than 8.2 feet and complex bottom topography dominated by internal drainage systems consisting of coalesced sinkholes and connecting channels.

Wetlands associated with headwater streams display a rapid surface water response to localized precipitation events. These areas remain wet for extended periods due to level topography and poorly drained soils. Hydrologic monitoring at Arnold AFB has identified distinct water regimes associated with karst pans and compound sinks.

Two karst pans, Tupelo Swamp and Goose Pond, have water regimes characterized by narrow ranges of flooding depth, gradual seasonal rises and recessions, long hydroperiods, persistent soil saturation, and perched surface water systems. These similarities persist across significantly different hydrologic conditions. Most pans on the Base support wet forests of willow oak, sweet gum, black tupelo, or red maple, but several support unusual natural communities that often include rare or disjunct plants and animals (Call, 2003).



0 1.25 2.5 Miles

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LEGEND

AEDC Boundary

Arnold AFB Boundary

Wetlands

Figure 3-4

Wetlands Located on Arnold Air Force Base

Construction of New Arnold Village Sewage Treatment Plant

Final Environmental Assessment

Goose Pond, which is named as a National Natural Landmark, is remarkable for the diverse forest communities bordering it, and is also the site of a large number of rare plant species.

Three compound sinks, Sinking Pond, Westall Swamp, and Willow Oak Swamp, share the geomorphic characteristics of about 9.8 feet of internal relief and plainly visible sinkhole drains. Their water regimes are characterized by abrupt seasonal rises and recessions, typically 6.6 feet or more during periods as short as 1 to 3 days, and close interactions between surface water and groundwater. These interactions include water table control of sinkhole drainage and very flashy groundwater response under the influence of concentrated recharge through the sinkholes. The annual flooding behavior of compound sinks is more sensitive to rainfall during the fall and early winter than to total annual rainfall (Call, 2003).

Sinking Pond, designated a National Natural Landmark by the U.S. National Park Service, is well known locally for its abrupt seasonal flooding and draining. One of the most pristine areas at Arnold AFB, Sinking Pond also is the site of one of the largest great blue heron rookeries in Tennessee.

According to the Ecosystems Management Plan, 10 plant association target communities are included in the wetland flats and depressions classification. The communities are listed in Appendix B.

Twenty-six target species are associated with wetland flats and depressions. The gopher frog (*Rana capito*) occurs in wetlands on Arnold AFB. However, the subspecific status of the gopher frog on Arnold AFB has not yet been determined. The Arnold AFB population of gopher frog is disjunct, separated from the nearest other population by several hundred miles and may represent a distinct, as yet undescribed, subspecies. The three subspecies of the gopher frog recognized in the scientific literature are considered species of concern by the USFWS. Many of the rare plants associated with the wetland flats and depressions classification also are disjunct populations of species whose central ranges are limited to the Atlantic or Gulf Coastal Plains. Several of the disjunct species associated with wetland flats and depressions are documented in Tennessee only from Arnold AFB. A list of all the conservation target species associated with wetlands on Arnold AFB and the wetland types in which they are typically found is provided in Appendix D.

3.6 Cultural Resources

Section 106 of the NHPA requires that federal agencies analyze the impacts of federal activities on historic properties. Areas potentially impacted by mission activities are surveyed as part of the AF Cultural Resources Management Program.

Surveys conducted on Arnold AFB have identified 107 prehistoric and historic sites dating back to Early Archaic times (Hajic et al., 2002). These include 40 prehistoric sites, 55 historic sites, and 12 mixed prehistoric and historic sites. Of these 107 sites, 6 have been deemed eligible for listing on the NRHP and 40 are considered potentially eligible (R. Alvey, personal communication, 2004). The prehistoric sites include open habitations, isolated projectile points/knives, and a midden mound. The historic sites include the remains of houses, outbuildings, wells, cemeteries, and trash dumps (Call, 2003). Due to the sensitive nature of these sites, their exact locations are undisclosed.

A total of 340 buildings on Arnold AFB were surveyed by Geo-Marine Inc, and 104 of these structures are considered eligible for listing in the NRHP (Peyton, 2004a; 2004b; R. Alvey, personal communication, 2004). In accordance with NRHP eligibility criteria, most notably Criteria Consideration G, 31 facilities at Arnold AFB have exceptional significance and are therefore recommended as eligible for the NRHP under Criteria A and C. The facilities illustrate the Cold War heritage of the United States in the area of materiel development, and they illustrate key Cold War themes, especially in the area of science and technology. The facilities retain integrity and display distinguishing engineering, technological, and scientific characteristics (Peyton, 2004a; 2004b; TRC Garrow Associates et al., 2001).

Pre-dating Arnold AFB, Camp Peay occupied a 1,040-acre tract in the southwest portion of the present Base. It was established in 1926 as a Tennessee National Guard camp. Subsequently, Camp Forrest was founded in 1941, also predating Arnold AFB. Located mostly within present Base boundaries and encompassing 85,000 acres, it was one of the nation's largest training centers just before World War II. Approximately 22,000 prisoners of war were housed here, representing a number of nationalities, including resident aliens, Germans, and Italians (TRC Garrow Associates et al., 2001). After the war ended, Camp Forrest was declared a surplus property and the buildings and support systems were dismantled and sold (TRC Garrow Associates et al., 2001). There are four surviving structures associated with Camp Forrest: two small concrete utility buildings of unknown use, a former brick jail, and a cold storage building. These resources were recommended as ineligible for the NRHP due to loss of integrity and loss of context caused by the removal of Camp Forrest (TRC Garrow Associates et al., 2001).

3.7 Traffic Flow

North Shore Road extends along the north shore of Woods Reservoir, between University of Tennessee Space Institute (UTSI) Road and Pumping Station Road (Figure 3-5). All three roads are rural two-lane asphalt roads. Access into Arnold Village occurs along North Shore Road. Access to the Woods Reservoir Pumping Station and the Handicap Access Fishing Pier follows Pumping Station Road. Additional unpaved, but improved roads are located in the project area.

0 1,250 2,500 Ft

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LEGEND

- AEDC Boundary
- Arnold AFB Boundary
- Existing WWTP
- Proposed AVSTP
- Drip Disposal System

Figure 3-5

Roads in Project Vicinity

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

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4.0 Environmental Consequences

This section discusses the environmental consequences of the Proposed Action, the Alternative Action, and the No-Action Alternative with regard to the resource areas considered in detail.

4.1 Land Use

4.1.1 Proposed Action

Under the Proposed Action, approximately 1.1 acres of recently clear-cut pine forest would be permanently converted into the developed facility. The recent clear-cut harvest was in response to a southern pine beetle infestation. At present, the site is early successional old field with limited areas of logging debris. There are 29,287 acres of forested land within Arnold AFB's boundary, with cultivated pine forests covering 5,785 acres. The amount of land that would be converted from pine forest constitutes 0.003 percent of the total forested area and 0.02 percent of the pine forest. The amount of land use change would be considered very minor.

It is likely that the existing AVSTP would be demolished following construction and initial operation of the new AVSTP. However, at present, there are no formal plans to demolish this structure. Should it be demolished, the site of the existing AVSTP could be converted to another, as yet undetermined, land use. Because of the small size and location within a recreational/residential area, it is likely that this conversion would be considered beneficial and compatible with adjacent land uses.

4.1.2 Alternative Action

The Alternative Action would result in conversion of 1 acre for the facility, as described for the Proposed Action, plus conversion of an additional 12 acres of recently clear-cut pine forest for the drip system lateral fields. This area would be permanently maintained in herbaceous cover to prevent damage to the drip disposal system from deep roots of woody vegetation. Thirteen acres of pine forest would be converted to industrial land use (1 acre for the AVSTP) and herbaceous land use (12-acre drip disposal system).

Under the Alternative Action, 0.04 percent of the total forested land and 0.22 percent of the pine forest would be converted to other land uses. While this amount of conversion is greater than for the Proposed Action, the degree of conversion would still be minor.

The Alternative Action would have the same potential for demolition of the existing AVSTP and conversion of the site to a new land use as the Proposed Action. Impacts would be as described above.

4.1.3 No-Action Alternative

Under the No-Action Alternative a new AVSTP would not be built. No forest would be converted into a new treatment facility or lateral fields. No change in existing land use

conditions would occur and, therefore, no impacts to land use on Arnold AFB or the surrounding region would occur.

4.2 Safety and Occupational Health

4.2.1 Proposed Action

Impacts would result from construction and operation of the AVSTP. Impacts to the construction workers would result from implementation of the Proposed Action. Heavy equipment such as bull dozers, graders, backhoes, excavators, dump trucks, and cement trucks would generate noise that could affect the onsite workers. Workers also would have the potential for accidents as a result of construction activities. Construction workers would use hearing protection and would follow OSHA standards and procedures. The construction contractor would be responsible for ensuring that all contractor employees (and subcontractors) comply with all applicable OSHA standards. Therefore, the safety and occupational health of construction workers or other persons in the area of the Proposed Action or Alternative Action would not be impacted during construction activities. The AVSTP site is located around 3,000 feet from the Arnold Village housing facility and there is a substantial stand of trees that would buffer any sound emanating from the construction site.

Positive impacts would result from the elimination of chlorine gas as a disinfectant. The elimination of chlorination for disinfection of effluent eliminates the potential for AVSTP workers to be exposed to accidental releases of chlorine gas. This would provide a long-term benefit to safety and occupational health at Arnold AFB.

4.2.2 Alternative Action

The Alternative Action would have the same impacts on safety and occupational health as the Proposed Action.

4.2.3 No-Action Alternative

There would be no change from current conditions if the No-Action Alternative were implemented. The potential for AVSTP workers to be exposed to an accidental release of chlorine gas would remain.

4.3 Hazardous Materials and Hazardous Wastes

4.3.1 Proposed Action

The Proposed Action would use UV light for effluent disinfection rather than chlorine gas. This would eliminate the need to purchase, store, and handle chlorine gas at the AVSTP. Thus, AVSTP would no longer be a site where chlorine gas, a HAP and TRI chemical, would be handled and stored. As a result, the Hazardous Materials Pharmacy and the ESHQ team would both experience positive impacts since there would no longer be a need to acquire chlorine gas for the AVSTP nor assess compliance with regulations.

Fuels and lubricants used in O&M of construction equipment may be hazardous. Design features of the project would (1) restrict vehicle refueling and maintenance to specific areas where accidental spills could be contained and (2) require proper storage and handling of these materials. Adherence to the AEDC Spill Prevention and Response Plan also would minimize impacts resulting from a release of fuels or lubricants.

4.3.2 Alternative Action

Chlorine gas would no longer be used to disinfect effluent under the Alternative Action. Because there would be no discharge of effluent, no disinfection would be performed. Therefore, the Alternative Action would have the same impact on hazardous materials as the Proposed Action.

4.3.3 No-Action Alternative

There would be no change from current conditions if the No-Action Alternative were implemented. Chlorine gas would continue to be used for effluent disinfection. As a result, chlorine gas, a HAP and TRI chemical, would continue to be purchased by the Hazardous Materials Pharmacy and stored at the AVSTP; in addition, the ESHQ team would still have to assess compliance with regulations.

4.4 Air Quality

Airborne particles may pose environmental and human health risks. Dust may be carried off-site, thereby increasing soil loss and creating a potential atmospheric deposition source of sedimentation and water pollution. The primary risks from blowing dust particles relate to human health and human nuisance values. Dust can contribute to respiratory health problems and create an inhospitable working environment. Deposition on surfaces can be a nuisance to those living or working downwind.

4.4.1 Proposed Action

Impacts would result from construction and operation of the new AVSTP. The impacts from construction would be negative and temporary, while the impacts from operation would be positive and permanent. The new AVSTP would use UV light for disinfection of effluent. This would replace the existing chlorine gas system and eliminate the potential of chlorine gas emissions from an accidental release, thus providing a long-term benefit to air quality.

Fugitive dust from ground-disturbing activities and combustive emissions from construction/demolition equipment would be generated during construction. Potential sensitive receptors would include residents of Arnold Village (approximately 1,000 feet away) and users of the handicap-access fishing pier (approximately 500 feet away). Potential impacts would be temporary, as the construction period would be of short duration. Measures that would be implemented to reduce or eliminate fugitive dust emissions would include:

- *Sprinkling/Irrigation*. Sprinkling the ground surface with water until it is moist is an effective dust control method for haul roads and other traffic routes (Smolen et al., 1988).

This practice can be applied to almost any site. When suppression methods involving water are used, care would be exercised to minimize overwatering that could cause the transport of mud onto adjoining roadways, ultimately increasing the dust problem.

- *Vegetative Cover*. In areas not expected to handle vehicle traffic, vegetative stabilization of disturbed soil is often desirable. Vegetation provides coverage to surface soils and slows wind velocity at the ground surface, thus reducing the potential for dust to become airborne.
- *Mulch*. Mulching can be a quick and effective means of dust control for recently disturbed areas.

Sewage treatment plants typically emit inorganic compounds (chlorine, carbon dioxide, and hydrogen sulfide) and volatile organic compounds (VOCs) into the air (Environment Australia, 1999). For a typical 30,000-gpd plant, less than 0.06 ton of VOCs would be emitted on a yearly basis (derived from Environment Australia, 1999). Both the existing AVSTP and the proposed replacement facility are aerobic treatment systems and would not produce hydrogen sulfide as a by-product of the treatment process. Potential VOC emissions from the new AVSTP would be comparable to those from the existing AVSTP, and there would be no chlorine emissions as a result of the UV disinfection system. The minor amounts of air emissions would be less than from the current facility and would not constitute an impact to the environment or to human health.

It is likely that the existing AVSTP would be demolished following construction and initial operation of the new AVSTP. However, at present, there are no formal plans to demolish this structure. Should it be demolished, there would be potential for localized, temporary air quality impacts from fugitive dust at the demolition site. BMPs similar to those used for construction would be used to avoid or minimize potential impacts from fugitive dust resulting from demolition of the existing AVSTP. Because of the small size and relative isolation (more than 500 feet from other structures of recreational use sites), it is likely that any air quality impacts from demolition would be temporary and minor.

4.4.2 Alternative Action

The Alternative Action would have the same impacts to air quality as described for the Proposed Action, plus additional potential impacts from fugitive dust and construction vehicle emissions resulting from construction of the 12-acre drip disposal lateral fields. The area for the lateral fields would be graded and trenched to allow for level placement of the drip disposal pipes, which could result in increased potential for fugitive dust. Construction equipment would be operated for an additional 40 hours to prepare and install the drip disposal system.

Suppression measures, as described for the Proposed Action, would be implemented to minimize the health and nuisance risks associated with construction and to stabilize the soil until vegetative cover is re-established. The time for re-establishment of vegetation would vary, depending upon the season of construction completion. During spring to early fall, sufficient vegetation to hold the soil would establish within 4 weeks or less. In late fall and winter, vegetation establishment would be much slower or would not occur until the following spring.

Once construction is complete, potential emissions would be comparable to those described for the Proposed Action and would not constitute an impact to the environment or to human health.

The Alternative Action would have the same potential for demolition of the existing AVSTP and localized short-term demolition-related air impacts as the Proposed Action. Potential impacts and measures to eliminate or reduce potential impacts would be as described above.

4.4.3 No-Action Alternative

Under the No-Action Alternative, a new AVSTP would not be built. Current air emissions on Arnold AFB would not change. Therefore, under the No-Action Alternative, no impacts to air quality on Arnold AFB or the surrounding region would occur.

4.5 Geomorphology

The site of the new AVSTP is located on top of a hill adjacent to the Woods Reservoir at the intersection of Pumping Station Road and North Shore Road. This area was recently clear cut to remove pine trees that were infested with southern pine bark beetles. The site is isolated from direct runoff to the reservoir by these two roads. Construction of new structures would require clearing and grading the site, so controls would be implemented to minimize the potential erosion of surrounding soils due to soil/ground disturbance. Stormwater runoff resulting from increased impervious surface area also may contribute to limited soil erosion. Areas likely to be impacted by erosion are identified based on parameters such as soil type and extent and proximity of vegetative cover to the affected area. Potential impacts are then described as they relate to the contribution to erosion potential. Any changes to topography would be temporary and minor.

4.5.1 Proposed Action

The Proposed Action would have an impact on site soils and topography from construction of a new AVSTP and construction of the new lift station. The construction site of an RSF system would be located 500 feet north of North Shore Road across the street from the existing sewage treatment plant and would require approximately 1 acre for the facility and associated loading/parking areas.

A grading plan would be prepared to identify which areas of the site would be graded, how drainage patterns would be directed, and how runoff velocities would affect receiving waters. The grading plan also would include information regarding when earthwork would start and stop, establish the degree and length of finished slopes, and specify where and how excess material would be disposed or where borrow materials would be obtained if needed. Berms, diversions, and other stormwater practices that require excavation and filling also would be incorporated into the grading plan. The grading plan would be designed with erosion and sediment control and stormwater management goals in mind. Grading crews would be carefully supervised to ensure that the plan is implemented as intended.

Soil disturbance could result in increased erosion potential from loss of ground cover and exposure of bare soils to precipitation and runoff. Potential temporary impacts to water quality from these factors are discussed under "water quality" below. However, potential impacts would be controlled and avoided through the use of appropriate BMPs and soil stabilization/revegetation techniques following construction. Appropriate BMPs, as identified in the AEDC Stormwater Pollution Prevention Plan, would be selected based on site-specific conditions and could include, but would not be limited to, sediment barriers (silt fence or straw bales), temporary detention basins, grade stabilization with seed and mulch, and geotextile slope stabilization. Because rainfall is distributed fairly evenly throughout the year, as discussed above, no particular time of year would be likely to reduce the erosion potential. Therefore, it is unlikely that timing of construction could be used to offset potential erosion impacts.

The Proposed Action would utilize existing discharge piping to reach the current discharge point in Woods Reservoir. However, additional pipelines would have to be constructed to connect with the existing influent and effluent discharge lines. Trenching for placement of the influent and effluent lines would briefly alter surface topography. However, the excavated materials would be returned to the trench following installation of the lines. Application of BMPs, as discussed above, would avoid or minimize impacts that could result from erosion during construction.

Additional impacts to soils and topography could result from the possible decommissioning and demolition of the existing STP. However, similar BMPs would be utilized to minimize or avoid impacts.

4.5.2 Alternative Action

The Alternative Action would have the same impacts as described for the Proposed Action, plus additional impacts to soils and topography in an additional 12 acres from construction of the drip disposal lateral fields. The area for the lateral fields would be graded and trenched to allow for level placement of the drip disposal pipes. Topsoil would be returned to the area following placement of the trenches.

Site preparation and grading to construct 121 3-foot-wide trenches in six lateral fields would require moving 8,700 cubic yards of soils in 12 acres. Additionally, PVC pipe would be placed 7 inches below grade in each trench and surrounded by approximately 12 inches of rock with a geotextile membrane on top of the rock and soil on top of the membrane. The addition of the rock, geotextile membrane, and soil to this site would alter the indigenous soil composition of the area. Site planning could eliminate the need for offsite disposal of excess soil. The pipes and pipe bedding would displace some soils. However, the design and grading plan could account for this displacement; the excavated material would be returned to the site.

A grading plan, as discussed under the Proposed Action, would be developed and implemented. Use of BMPs, as discussed under the Proposed Action, would minimize or avoid impacts from construction activities.

The Alternative Action would have the same potential for localized short-term demolition-related impacts to soils as the Proposed Action. Potential impacts and measures to eliminate or reduce potential impacts would be as described above.

4.5.3 No-Action Alternative

Under the No-Action Alternative, a new AVSTP would not be built. No change from existing conditions would occur. No impacts to soils or topography would result from implementation of the No-Action Alternative.

4.6 Hydrology and Water Quality

The addition of impermeable surfaces would result in an increase in stormwater runoff. Effects would vary depending on the amount of new surface area to be added/constructed. Potential impacts are defined as impacts to the quality and utility of water resources resulting from an increase in stormwater runoff.

Demolition of the existing AVSTP would have no impact on the hydrology or water quality. The area where the demolition would occur is away from surface waters and appropriate BMPs would be used to ensure that any potential impacts from stormwater runoff during demolition would be eliminated or minimized.

4.6.1 Hydrology

4.6.1.1 Proposed Action

The Proposed Action would not change the amount of effluent discharged into Woods Reservoir and operation of the new AVSTP would have no impact on hydrology of the reservoir.

The Proposed Action would result in the addition of approximately 10,000 square feet of impervious surface area. The addition of this impervious surface could increase stormwater runoff into the floodplain and Woods Reservoir. However, the facility would be constructed outside the floodplain and would have no impact on floodplain elevations.

The design of the Proposed Action would include paved surfaces sloped to direct potential runoff away from adjacent waters. This design would be part of the stormwater controls included in the Notice of Intent for an NPDES Stormwater Construction Permit from TDEC. This permit is required for any project disturbing one or more acres. Construction activities would result in soil disturbance and loss of vegetative cover. These activities could result in modified surface water runoff patterns from the site. Increased runoff from an unvegetated site could result in hydrologic impacts, such as channelization and erosion. BMPs and onsite stormwater controls would reduce or eliminate runoff from the site to avoid hydrologic impacts to nearby waters.

4.6.1.2 Alternative Action

The Alternative Action would result in a reduction of up to an average of 30,000 gpd to Woods Reservoir. This reduction would equate to 0.0001 percent of the volume of Woods Reservoir, which would be negligible in terms of impact on reservoir hydrology and operations. The reduction would not result in noticeable reductions in discharge through the dam and downstream flows.

The Alternative Action would have construction impacts similar to those described for the Proposed Action plus any impacts associated with construction of the lateral fields. Since

construction of the lateral fields would occur outside the floodplain, the facility would have no impact on floodplain elevations. Hydrologic impacts due to construction and operation of the drip disposal system in lateral fields would be minimal.

The greatest impact would occur due to construction and land preparation. During this process, BMPs and onsite stormwater controls would reduce or eliminate runoff from the site to avoid hydrologic impacts to nearby waters.

Impacts during operation of the drip disposal system should be minimal due to inherent system design features. During normal operation, no surface runoff would occur as all effluent would be introduced into the soil contained in the lateral fields. However, there is a potential that the soils could become saturated during extreme rainfall events and the drip field would not be 100 percent effective. Under these conditions, a discharge of untreated effluent from the AVSTP could occur. While the chain link fence would minimize exposure to the untreated effluent during normal conditions, it would not prevent exposure during conditions when the soil is saturated and the potential for runoff from the facility exists. One feature of the drip fields, 15-foot buffers surrounding each of the six lateral fields, would be included to minimize runoff from rapid episodic events that could result in limited system discharge under unfavorable conditions.

Perched or shallow groundwater areas may be impacted by the Alternative Action. For example, if the drip disposal fields were located at a point of recharge for a local groundwater system, implementation of the Alternative Action would result in additional hydrologic inputs for that groundwater system. However, the proximity to Woods Reservoir makes this exceedingly unlikely. Should an elevated local groundwater zone lie within the proposed drip disposal fields, the fields would not function properly and the Alternative Action would not be feasible

4.6.1.3 No-Action Alternative

Under the No-Action Alternative, no change from existing conditions would occur. Therefore, no impact on hydrology would result from implementation of the No-Action Alternative.

4.6.2 Water Quality

Impacts to water quality could result from construction and operation of either the Proposed Action or the Alternative Action. Chlorine would be eliminated as a disinfectant for both of the alternatives. Construction impacts to water quality could result from runoff associated with construction activities or with refueling and maintenance of construction equipment. Once the AVSTP is operational, potential impacts to water quality may result from accidental releases of effluent from the facility that do not meet permit requirements, although this would be an extremely rare event.

4.6.2.1 Proposed Action

Potential impacts to water quality from construction would be avoided or minimized through implementation of BMPs as described under "Geomorphology." Additionally, design features of the project would restrict vehicle refueling and maintenance to specific areas where accidental spills would not reach waters. These procedures include keeping all

vehicles and equipment in proper operating condition, conducting no refueling or maintenance activities within 100 feet of an intermittent or perennial stream or a wetland, and storing all fuels and lubricants in proper containers and cabinets more than 100 feet from any stream or wetland. Any spill of fuels or other petroleum hydrocarbons would be addressed as specified in the AEDC Spill Prevention and Response Plan to prevent impacts to waters. Adherence to the AEDC Spill Prevention and Response Plan also would minimize impacts resulting from a release of contaminants from a vehicle or equipment malfunction.

The new AVSTP would operate under the existing NPDES wastewater discharge permit, with no change to any of the permitted concentrations, with the exception that chlorine residual may be removed. TDEC has determined that the permitted discharge concentrations, and the corresponding mass loadings, do not adversely affect the water quality of Woods Reservoir and downstream waters.

An accidental release of water that exceeds permitted discharge limits could occur.

A positive benefit to water quality could result from the change from chlorine disinfection to UV disinfection. The use of chlorine as a wastewater disinfectant can result in several adverse environmental impacts. For example, chlorine residuals have been found acutely toxic to some species of fish at very low levels. Also, when chlorine is used as a wastewater disinfectant, there is the potential to create toxic halogenated organic compounds. The existing AVSTP effluent contains residual chlorine in amounts determined by TDEC not to be detrimental to aquatic life or water quality. However, the change to UV would eliminate the long-term input of chlorine to Woods Reservoir and would also eliminate the potential for an accidental release of potentially toxic levels of chlorine.

4.6.2.2 Alternative Action

The Alternative Action would have the same potential for impacts to water quality from construction activities and accidental release of fuels and lubricants as the Proposed Action.

The Alternative Action would require a Domestic Septage Disposal Site Permit from TDEC. This would be necessary to operate the drip disposal system.

Implementation of the Alternative Action also would have a positive benefit to water quality from the elimination of chlorine as a disinfectant of the effluent. Implementation of the Alternative Action would not require chlorination, as there would be no discharge from the drip disposal system. This would eliminate the long-term input of chlorine to Woods Reservoir and would also eliminate the potential for an accidental release of potentially toxic levels of chlorine.

There is also a potential minor negative impact on water quality should overload of the drip disposal system occur. During high rainfall events, there would be the potential for accidental release of runoff from the drip disposal system that would contain elevated levels of bacteria, which could negatively impact water quality.

4.6.2.3 No-Action Alternative

Under the No-Action Alternative, no change from existing conditions would occur. Therefore, no impacts to water quality would result from implementation of the No-Action Alternative.

4.7 Biological Resources

Biological resources (plants and animals) and related habitats (foraging and nesting areas) may be directly affected by the Proposed Action and Alternative Action due to construction and increased use of the area. Impacts analysis focuses on the potential for actions to directly and physically affect sensitive biological organisms (threatened and endangered species) and the potential for actions to alter/affect the quality and utility of the sensitive habitats (e.g. wetlands and foraging areas) frequented by those species.

4.7.1 Impacts to Non-Sensitive Flora and Fauna

Impacts to common flora and fauna may result from direct physical harm from construction activities or from disturbance-related displacement. Potential impacts for each of the considered alternatives are described below.

4.7.1.1 Proposed Action

Pine trees on the proposed site of the AVSTP were previously harvested as a result of the southern pine bark beetle infestation and vegetation, at the site is in the early stages of succession. Construction of the Proposed Action would require clearing and grading of approximately 1 acre of recently clear-cut pine forest. This area has regrown in early successional pioneer species and currently provides habitat for plant and animal species that utilize early seres. During land clearing and grading, all plants would be removed from the area and there is a possibility of limited animal injury or mortality. Most animals (such as birds, deer, rodents, opossums, and reptiles) would be displaced from the construction area and it is likely that some temporary displacement of animals would occur from habitats that are adjacent to the construction area.

The cleared vegetation would be a permanent impact, as the area would not be allowed to regrow into an early successional sere but remain as a treatment facility and associated infrastructure. However, the habitat type that would be eliminated is a transient habitat that is available in an area for only a few years during regrowth of pine forests, so the impacts to vegetation are expected to be minor. As discussed above, the land use change from pine forest to industrial also is expected to be minor.

Most animals would be able to detect the construction activity and would leave the area prior to experiencing direct physical harm. Animal mortality would be limited and would not threaten populations of species that utilize early successional habitat. Therefore, direct injury and mortality of animals is expected to be minor.

Animals displaced from the construction area would relocate to other similar habitats nearby. Animals displaced from the adjacent habitats would be expected to return following the disturbance. Therefore, displacement of animals would be temporary and minor. The proposed site is a recently clear-cut pine area. In the short term, habitat at the

site would be early successional open field. The immediate loss would represent 0.07 percent of this habitat type on-Base. As discussed under "land use," the conversion would represent a loss of 0.02 percent of total pine forest and 0.003 percent of all forest land on Arnold AFB. This would be a negligible impact on habitat for animals on Arnold AFB.

Demolition of the existing AVSTP would have no impact on non-sensitive flora and fauna. The area where the demolition would occur is already developed and only localized peripheral displacement may result. Any impacts would be temporary and minor.

4.7.1.2 Alternative Action

The Alternative Action would have impacts to non-sensitive flora and fauna similar to those described for the Proposed Action. However, the Alternative Action would involve construction on 13 acres rather than 1 acre, and would have correspondingly higher impacts (0.6 percent of open field habitat, 0.2 percent of pine forest, and 0.03 percent of total forested land). A portion of the land that would be necessary for the drip disposal system would require clearing the mixed hardwood forest. However, even with the greater amount of disturbed land, impacts to flora would be expected to be minor and those to fauna would be expected to be temporary and minor.

The Alternative Action would have the same potential for demolition of the existing AVSTP as the Proposed Action. Impacts would be as described above.

4.7.1.3 No-Action Alternative

Under the No-Action Alternative, no construction would occur and there would be no impacts to flora and fauna.

4.7.2 Impacts to Sensitive Species

Construction activities (i.e., vehicular/construction equipment traffic) may occur near sensitive species and their habitat. Analysis focuses on the association between construction footprints and identified sensitive species within these areas, and the potential for adverse impacts to those species

4.7.2.1 Proposed Action

No sensitive species are known to occur or use the immediate project area (Figure 4-1). The area has recently been cleared of trees in response to a southern pine beetle infestation and is part of the planned pine harvest rotation.

Wintering bald eagles have been observed on Woods Reservoir near the project site and may occur anywhere along Woods Reservoir in a given winter (J. Lamb, personal communication, 2004). Should bald eagles utilize that portion of Woods Reservoir near the proposed project site or perch in trees along that portion of the shore, construction activity could result in the alteration of bald eagle behavior. Bald eagle behavior appears normal in the presence of ground vehicle activity. However, humans on foot and boat traffic are considered disruptive activities (Green, 1985; Stalmaster and Kaiser, 1998). Construction activity would be screened from eagles by intervening vegetation, which would minimize the potential for bald eagles to be disturbed by foot traffic of construction personnel. Mature pines are planted along the slope up from Woods Reservoir between the proposed site and

the reservoir. These trees would serve as a buffer from construction activities. Eagles foraging over the reservoir would not be affected by activity at the construction site. The Proposed Action would not alter winter boat use of Woods Reservoir, and the potential for boat traffic to disturb bald eagles would be unchanged from current levels.

There is the potential that the gray bat could move through the area when departing the gate house at the Woods Reservoir dam. However, construction activities would occur during daylight hours and there would be no impact on the bat. Therefore, no impacts to sensitive species are expected to result from implementation of the Proposed Action.

Demolition of the existing AVSTP would have no impact on sensitive species. The area where the demolition would occur is already developed and is not used by sensitive species.

4.7.2.2 Alternative Action

While the Alternative Action would impact a larger area than the Proposed Action, the additional area that would be impacted by the Alternative Action also has no known occurrences of or use by sensitive species (Figure 4-1). The potential to alter bald eagle foraging or perching behavior would be the same as for the Proposed Action. As with the Proposed Action, the presence of screening vegetation would minimize the potential for impacts. Gray bats would have the same potential to pass through the project area, but the timing of work would avoid the potential to impact this species. Therefore, no impacts to sensitive species are expected to result from implementation of the Proposed Action.

The Alternative Action would have the same potential for demolition of the existing AVSTP as the Proposed Action. Impacts would be as described above.

4.7.2.3 No-Action Alternative

Under the No-Action Alternative, no construction would occur. Therefore, no impacts to sensitive species would result from implementation of the No-Action Alternative.

4.7.3 Alteration of Sensitive Habitats

Wetlands were identified as the only sensitive habitats occurring in the project vicinity. This section discusses the potential impacts to these sensitive habitats.

4.7.3.1 Proposed Action

There are no wetlands within the area where the new AVSTP would be constructed (Figure 3-4). Therefore, implementation of the Proposed Action would not impact wetlands.

Demolition of the existing AVSTP would have no impact on sensitive habitats. The area where the demolition would occur has no wetlands or other sensitive habitats. Therefore, no impacts to sensitive habitats would result.

4.7.3.2 Alternative Action

There are no wetlands within the area where the new AVSTP and drip disposal fields would be constructed (Figure 3-4). Therefore, implementation of the Alternative Action would not impact wetlands.

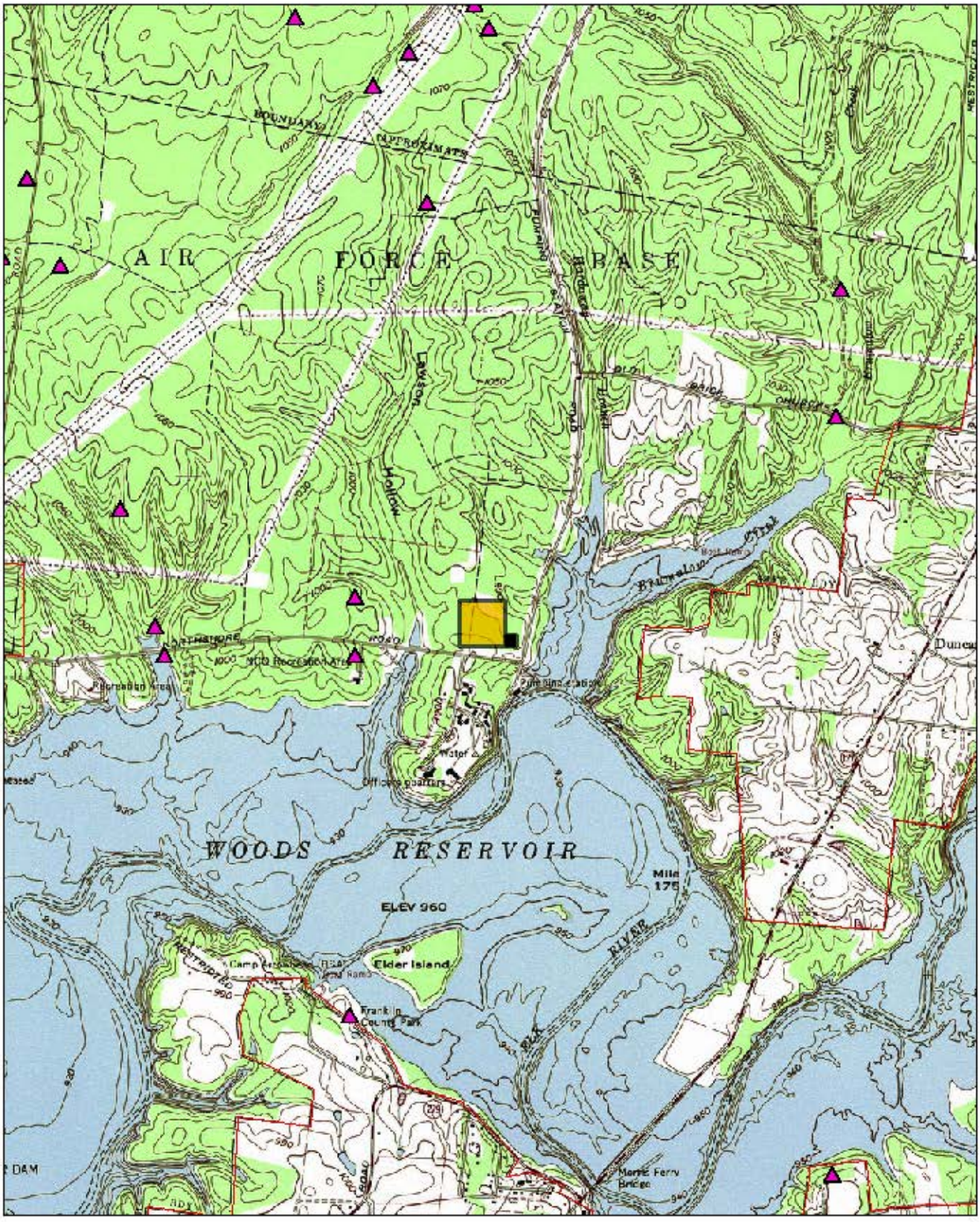

Figure 4-1

Sensitive Species Occurences Near Proposed Project Area

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

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The Alternative Action would have the same potential for demolition of the existing AVSTP as the Proposed Action. Impacts would be as described above.

4.7.3.3 No-Action Alternative

No change in existing conditions would occur under the No-Action Alternative. Therefore, no impacts to wetlands would result from implementation of the No-Action Alternative.

4.8 Cultural Resources

Cultural resources are defined as archaeological areas and historical architectural properties. Potential impacts are identified if construction footprints associated with the Proposed or Alternative Actions extend into the boundaries of identified cultural resource areas, resulting in the disturbance of such resources.

4.8.1.1 Proposed Action

Consultation with the SHPO in 2003 identified all cultural resource sites in pine plantation areas on Arnold AFB, and this effort was documented in Archeological Assessment Report No. 300 (R. Alvey, personal communication, 2004). The site of the proposed AVSTP was formerly a pine stand and was included in the SHPO evaluation. The proposed project area has been investigated and no sites that are eligible or potentially eligible for listing on the NRHP occur on or near the project site and no family cemeteries occur within the proposed project site. Therefore, the Proposed Action would not impact cultural resources.

Demolition of the existing AVSTP would have no impact on cultural resources. The area where the demolition would occur is already developed and all structures are of recent origin. Therefore, no impacts to cultural resources would result.

While no impacts to cultural resources are expected to result from the Proposed Action, there is always a possibility that previously undiscovered archeological artifacts could be discovered during earthmoving activities. If unknown archeological artifacts are discovered during construction, all activities would halt in the immediate area and the Base would be notified of the finding. At this point, pertinent consultations and follow-on actions would be conducted.

4.8.1.2 Alternative Action

The lateral fields would be located partially within the same clear-cut pine area as discussed above for the Preferred Alternative. This area has been investigated for cultural resources and found to have no sites eligible or potentially eligible for listing on the NRHP (R. Alvey, personal communication, 2004). Two historic sites from the late nineteenth-early twentieth century that have been heavily disturbed from previous actions are located within the proposed drip field disposal area, but these sites are not eligible for listing. Therefore, the Alternative Action would have negligible impact on cultural resources within the clear-cut pine portion of the drip disposal system and would not impact cultural resources at the proposed AVSTP site.

However, a portion of the drip disposal system would extend into an adjacent mixed hardwood forest. This area would require a survey for cultural resources prior to constructing the drip disposal system.

The Alternative Action would have the same potential for demolition of the existing AVSTP as the Proposed Action. Impacts would be as described above.

4.8.1.3 No-Action Alternative

Under the No-Action Alternative, no change in existing conditions would occur. Therefore, no impacts to cultural resources would result from implementation of the No-Action Alternative.

4.9 Traffic Flow

4.9.1 Proposed Action

Implementation of the Proposed Action would require placement of influent and effluent lines across or beneath North Shore Road. Construction of these lines would likely result in temporary disruption of traffic on North Shore Road. The lines may be installed by boring underneath the road, which would not impact traffic, or by trenching across the road, which would result in closing the road for 2 days. If the road is closed while the lines are installed, both North Shore Road and Pumping Station Road would function as dead-end roads during construction. It would not be possible to access the pumping station and the handicap-access fishing pier from the west or to access Arnold Village from the east while the road is closed. However, an effective detour can be established using UTSI Road and Wattendorf Highway (Figure 4-2) to route traffic around the construction zone.

It may be possible to keep one lane of North Shore Road open during construction and utilize traffic control to allow two-way traffic on North Shore Road. Whether a detour or flagman-controlled two-way traffic is used, the impact on traffic flow would be temporary and minor.

Demolition of the existing AVSTP would not impact traffic. The site is not on any roadways and the action would not result in temporary closure of any roads.

4.9.2 Alternative Action

The Alternative Action would have impacts similar to the Proposed Action. An influent line would have to be placed across North Shore Road. The time to install a single pipeline beneath the roadway would not be substantially shorter than that required to install two pipelines, as lightweight, small-diameter plastic pipe would be used.

As with the Proposed Action, it may be possible to keep one lane of North Shore Road open during construction and utilize traffic control to allow two-way traffic on North Shore Road. Whether a detour or flagman-controlled two-way traffic is used, the impact on traffic flow would be temporary and minor.

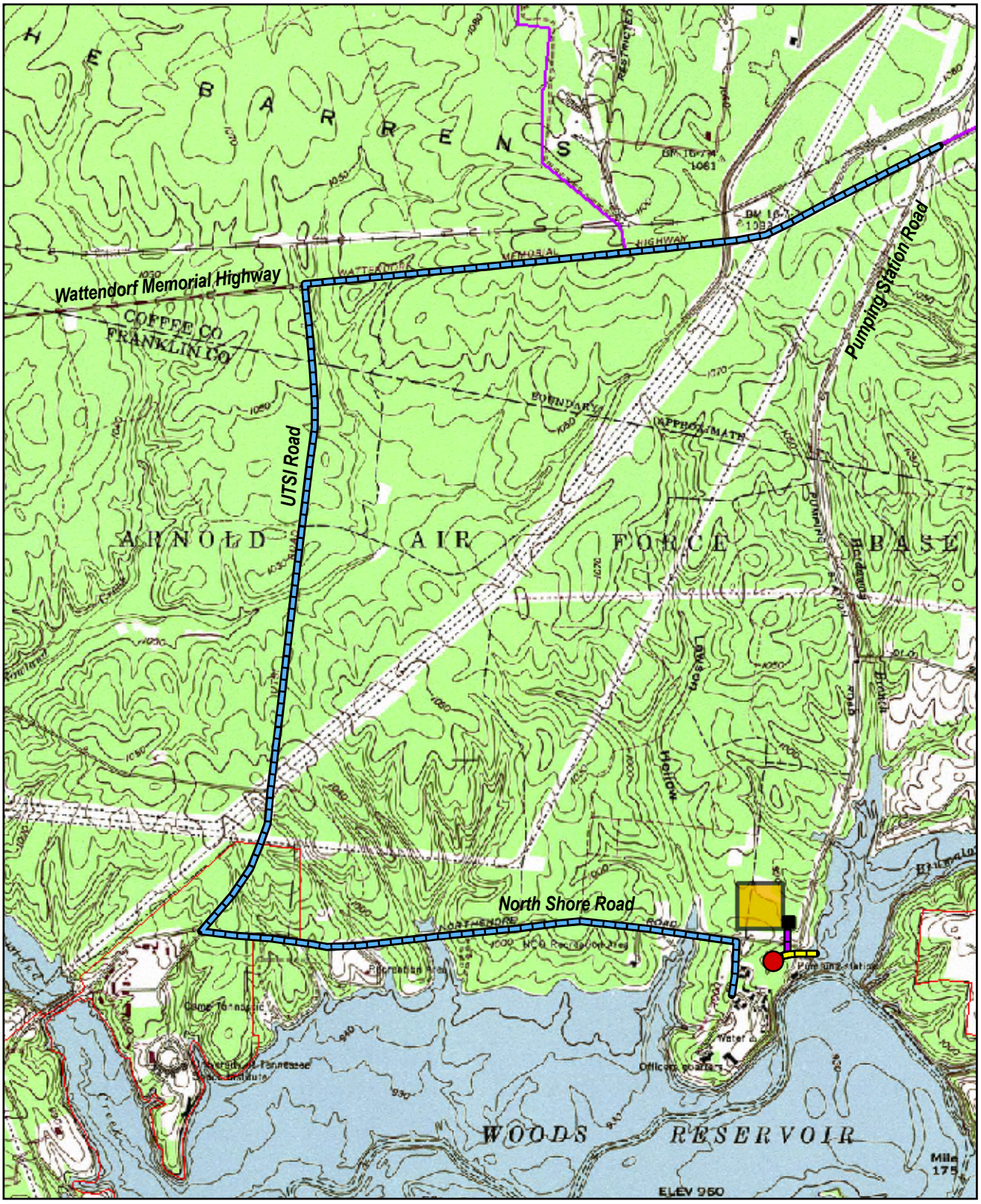

Figure 4-2

North Shore Road and Proposed Construction Detour

Construction of New Arnold Village Sewage Treatment Plant
Final Environmental Assessment

E032004022ATL\Fig4-2.pdf

Installation of the drip field system would result in closure of an improved but unpaved road in the project area (Figure 4-2). The northern portion of this road would become a dead-end and the southern connection to North Shore Road would be closed. This would be a negligible impact on traffic flow in the area.

The Alternative Action would have the same potential for demolition of the existing AVSTP as the Proposed Action. Impacts would be as described above.

4.9.3 No-Action Alternative

Under the No-Action Alternative, no change in existing conditions would occur. Therefore, no impacts to traffic flow would result from implementation of the No-Action Alternative.

5.0 Applicable Regulatory Requirements, Permits, and Coordination

Either the Proposed Action or the Alternative Action would require an NPDES Stormwater Construction Permit from TDEC. These permits are required for construction sites involving clearing, grading, or excavation that result in an area of disturbance of one or more acres, and activities that result in the disturbance of less than one acre if it is part of a larger common plan of development. Permitted activities typically include housing subdivisions, commercial and industrial buildings, golf courses, utility lines, sewage treatment plants, and roads. Land clearing activities, such as borrow pits for fill material, also are covered under this general permit. An NPDES Stormwater Construction Permit is obtained by filing a complete Notice of Intent with the TDEC Division of Water Pollution Control.

The Alternative Action would require a Domestic Septage Disposal Site Permit. This permit must be obtained from the TDEC Division of Groundwater Protection for any land disposal of domestic septage from septic tanks or other sewage treatment or disposal facilities.

6.0 List of Preparers

Russell Short/Senior Project Manager/28 years of experience/Master of Arts

Rich Reaves/Environmental Scientist/9 years of experience/Ph.D.

Dawn Abercrombie/GIS Analyst/6 years of experience/Master of Science

Rakesh Patel/GIS Analyst/3 years of experience/Bachelor of Business Administration

David Dunagan/Technical Editor/24 years of experience/Master of Arts

7.0 List of Contacts and Correspondence

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Steve Farrington, ATA, Natural Resources

Kevin Fitch, ATA, Natural Resources

Mark Moran, ATA, Natural Resources

Ed Roworth, ATA, Natural Resources

JonPaul Wallace, ATA

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Appendix A

Air Force Form 813
Request for Environmental Impact Analysis

FORM 813

REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol
RCS: AAFB-04-005

INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*

SECTION I - PROPONENT INFORMATION

1. TO *(Environmental Planning Function)*	2. FROM *(Proponent organization and functional address symbol)*	2a. TELEPHONE NO.
Phil Sherrill/SS41	JonPaul Wallace	4904

3. TITLE OF PROPOSED ACTION
Replace Sewage Treatment Plant (STP) at Arnold Village

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*
Current STP is in need of extensive repair or replacement. TDEC will not approve repair to the existing plant and recommends the construction of a new plant.

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*
The preferred alternative is to construct a recirrculating sand-filter (RSF) plant north of Northshore Drive with a drip-tube field resulting in zero discharge. (See continuation sheet)

6. PROPONENT APPROVAL *(Name and Grade)*	6a. SIGNATURE	6b. DATE
JonPaul Wallace		11/3/03

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects including cumulative effects.) (+ = positive effect; 0 = no effect; - = adverse effect; U= unknown effect)*	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*		✓		
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)*			✓	
9. WATER RESOURCES *(Quality, quantity, source, etc.)*			✓	
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*		✓		
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*				✓
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*			✓	
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*			✓	
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*			✓	
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*		✓		
16. OTHER *(Potential impacts not addressed above.)*		✓		

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. ☐ PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # _____ ; OR
☒ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS

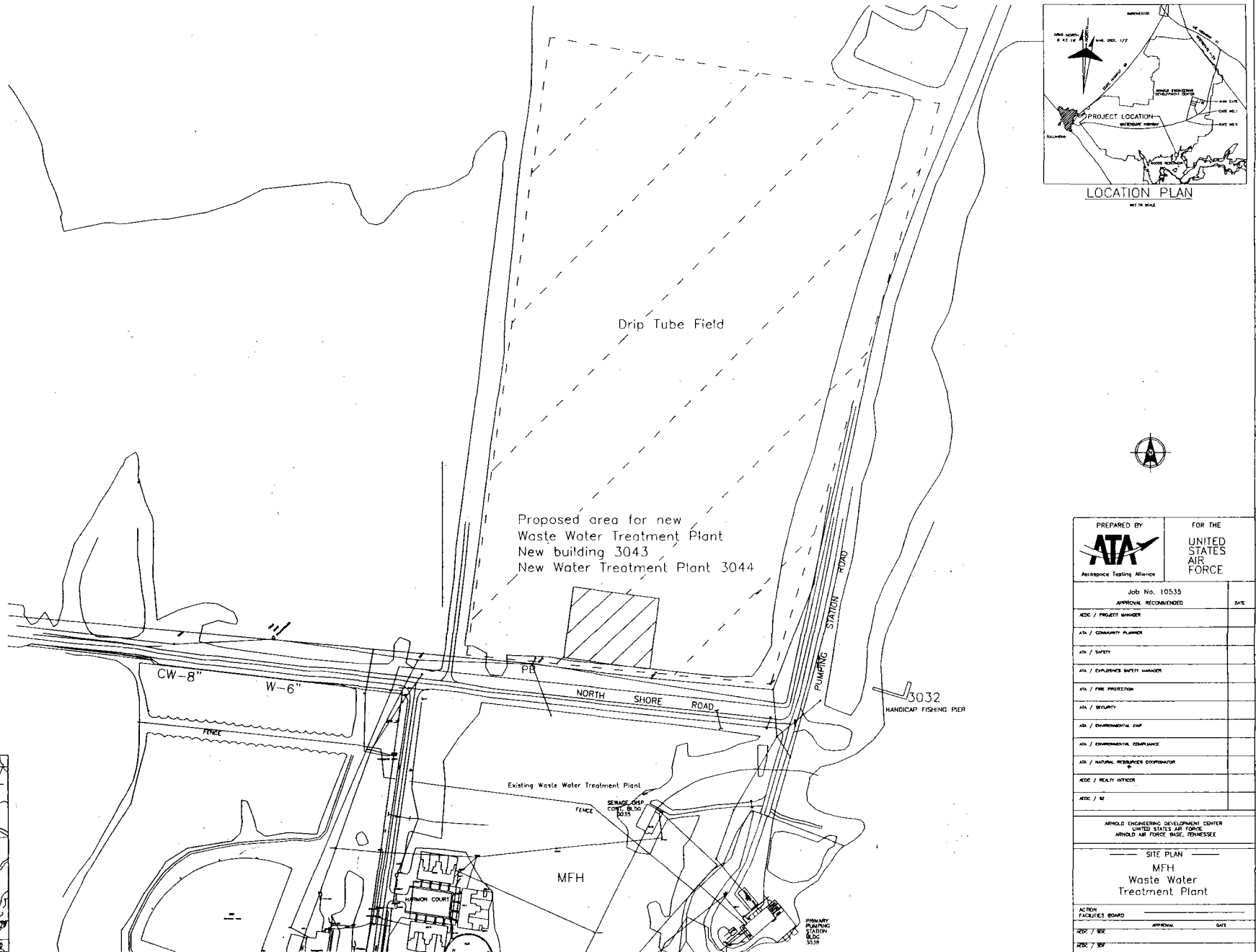
19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)*	19a. SIGNATURE	19b. DATE
FRANK A. DUNCAN, GS-13		14 Nov 03

5. The drip tube field will require approximately 4 acres (30,000 linear feet of pipe on 5' centers at approximately 6" depth). The land does not have to be cleared for installation of the piping. See site plan for approximate location.

Alternative 1 is to install the RSF plant without the drip tube field and route the discharge to the existing NPDES point. The plant will still need to be located as depicted in the site plant for aesthetic reasons.

Alternative 2 is to construct an activiated sludge plant similar to the current STP. This is discouraged by TDEC.

Other Alternative: No Action.



LOCATION PLAN

VICINITY MAP

PREPARED BY: ATA Aerospace Testing Alliance

FOR THE: UNITED STATES AIR FORCE

Job No. 10535

APPROVAL RECOMMENDED	DATE
AEDC / PROJECT MANAGER	
ATA / COMMUNITY PLANNER	
ATA / SAFETY	
ATA / EXPLOSIVES SAFETY MANAGER	
ATA / FIRE PROTECTION	
ATA / SECURITY	
ATA / ENVIRONMENTAL ENP	
ATA / ENVIRONMENTAL COMPLIANCE	
ATA / NATURAL RESOURCES COORDINATOR	
AEDC / REALTY OFFICER	
AEDC / SE	

ARNOLD ENGINEERING DEVELOPMENT CENTER
UNITED STATES AIR FORCE
ARNOLD AIR FORCE BASE, TENNESSEE

SITE PLAN

MFH Waste Water Treatment Plant

ACTION FACILITIES BOARD	APPROVAL	DATE
AEDC / BDC		
AEDC / BSF		

DRAWN BY: RW HUMLEY
PHONE: 7188

SCALE : 1" = 100'
DATE: 29 October 2003

DWG NUMBER 03-24.1
SHEET 1 of 1

Appendix B

Plant Associations Occurring on Arnold Air Force Base

FOREST

Planted/Cultivated

Pinus taeda Planted Forest

Natural

Upland Forest

Quercus falcata - Quercus coccinea - Quercus (stellata, velutina) / Vaccinium pallidum Forest

Quercus falcata - Quercus alba - (Quercus coccinea) / Oxydendrum arboreum / Vaccinium pallidum Forest

Quercus alba - Quercus (falcata, stellata) / Chasmanthium laxum Forest

Juniperus virginiana var. virginiana - Quercus spp. Forest

Juniperus virginiana var. virginiana / Rhus copallinum / Schizachyrium scoparium Forest

Wetland Forest

Quercus lyrata / Betula nigra / Pleopeltis polypodioides Forest

Quercus phellos - Quercus alba / Vaccinium fuscatum - (Viburnum nudum) / Carex (barrattii, intumescens) Forest

Liquidambar styraciflua Forest

Quercus phellos - Quercus nigra - (Nyssa biflora) Forest

Nyssa aquatica / Cephalanthus occidentalis Forest

Floodplain - Floodplain Terrace / Bottomland Forest

Quercus alba - Carya (alba, ovata) - Liriodendron tulipifera -(Quercus phellos) / Cornus florida Forest

Quercus nigra - Quercus (alba, phellos) Forest

Liquidambar styraciflua - Quercus michauxii - Carya laciniosa / Fagus grandifolia -(Aesculus flava) Forest

Quercus velutina - Carya (alba, glabra) / Vaccinium arboreum Forest

Platanus occidentalis - (Liquidambar styraciflua, Acer rubrum) / (Carpinus caroliniana) / Onoclea sensibilis Forest

Salix nigra - Acer (rubrum, saccharinum) / Alnus serrulata - Cephalanthus occidentalis Forest

WOODLAND

Quercus (falcata, stellata) / Quercus marilandica / Gaylussacia (baccata, dumosa) Woodland

Quercus stellata - (Quercus coccinea) / Quercus marilandica / Vaccinium pallidum - (Vaccinium stamineum) Woodland

SHRUBLAND

Upland shrubland

Rubus (argutus, trivialis) - Smilax (glauca, rotundifolia) Shrubland

Wetland shrubland

Cephalanthus occidentalis - Hibiscus moscheutos ssp. moscheutos Shrubland

HERBACEOUS VEGETATION

Upland Grassland

Andropogon gerardii - (Andropogon glomeratus, Panicum virgatum, Sorghastrum nutans) Herbaceous Vegetation

Andropogon gerardii - Schizachyrium scoparium - (Calamagrostis coarctata, Panicum virgatum) Herbaceous Vegetation

Schizachyrium scoparium - Andropogon (gyrans, ternarius, virginicus) Herbaceous Vegetation

Schizachyrium scoparium - Calamagrostis coarctata Herbaceous Vegetation

Andropogon virginicus var. virginicus Herbaceous Vegetation

Wetland Grassland

Juncus effusus Herbaceous Vegetation

Eleocharis microcarpa - Juncus repens - Rhynchospora corniculata - (Mecardonia acuminata - Proserpinaca spp.) Herbaceous Vegetation

Panicum hemitomon - Dulichium arundinaceum Herbaceous Vegetation

Saccharum baldwinii - Calamagrostis coarctata - Panicum rigidulum - Rhynchospora capitellata Herbaceous Vegetation

Scirpus cyperinus - Panicum rigidulum var. elongatum - Rhynchospora corniculata Herbaceous Vegetation

Typha latifolia Herbaceous Vegetation

Wetland Perennial Forb

Pontederia cordata - Sagittaria graminea - Sagittaria latifolia Herbaceous Vegetation

Source: Call, 2003

Appendix C

Sensitive Species Known to Occur on Arnold Air Force Base

Plants		Designated Status		Rank	
Scientific Name	**Common Name**	**Federal**	**Tennessee**	**Global**	**Tennessee**
Agalinis pseudophylla	Shinner's false-foxglove	C2	E	G1G2Q	S1
Carex barrattii	Barratt's sedge		E	G4	S2
Carex buxbaumii	Brown bog sedge		S	G5	S1
Clethra alnifolia	Coastal sweet pepper-bush		T	G5	S1
Cypripedium acaule	Pink lady's-slipper		E-CE	G5	S4
Cypripedium kentuckiense	Kentucky lady's-slipper	C2	E	G3	S1
Panicum aciculare	Needleleaf witchgrass		E	G4G5	S1
Panicum ensifolium	Small-leaved panic grass		S	G4	S1S2
Panicum acuminatum leucothrix	Roughish witchgrass		S	G4?Q	S1
Drosera brevifolia	Dwarf sundew		T	G5	S2
Echinacea pallida	Pale-purple coneflower		T	G4	S1
Eleocharis intermedia	Matted spike-rush		S	G5	S1
Eupatorium leucolepis	White-bracted thoroughwort		E	G5	S1
Festuca paradoxa	Cluster fescue		S	G5	S1
Gaylussacia dumosa	Dwarf huckleberry		T	G5	S3
Gentiana puberulenta	Prairie gentian		E	G4G5	S1
Gymnopogon brevifolius	Broad-leaved beardgrass		S	G5	S1S2
Helianthemum propinquum	Low frostweed		S	G4	S1
Helianthus eggertii	Eggert's sunflower	T	T	G3	S3
Hypericum adpressum	Creeping St. John's-wort	C2	T-PE	G2G3	S1
Iris prismatica	Slender blue flag		T	G4G5	S2S3
Isoetes melanopoda	Blackfoot quillwort		E	G5	
Juglans cinerea	White walnut, butternut		T	G3G4	
Lachnanthes caroliniana	Carolina redroot		E	G4	

Plants		Designated Status		Rank	
Scientific Name	**Common Name**	**Federal**	**Tennessee**	**Global**	**Tennessee**
Lechea pulchella	Legget's pinweed		E	G5	
Lespedeza angustifolia	Narrowleaf bushclover		T	G5	
Lilium michiganense	Michigan lily		T	G5	
Liparis loeselii	Fen orchis		E-PT	G5	S1
Listera australis	Southern twayblade		E	G4	S1S2
Lobelia canbyi	Canby's lobelia		T	G4	S2S3
Ludwigia sphaerocarpa	Globe fruited falseloosestrife		T	G5	S2
Lycopodiella alopecuroides	Foxtail clubmoss		T	G5	S1
Marshallia trinervia	Broad-leaved Barbara's buttons		T	G3	S2
Muhlenbergia glabrifloris	Hair grass		E	G4?	S1
Muhlenbergia torreyana	Torrey's dropseed		S	G3	S1
Myriophyllum pinnatum	Cutleaf water-milfoil		T	G5	S1
Panicum acuminatum var. *densiflorum*	Eaton's witchgrass		E	G5	S1
Panicum hemitomon	Maidencane		S	G5?	S2
Platanthera integra	Yellow fringeless orchid		E	G3G4	S2S
Pogonia ophiglossoides	Rose pogonia		E	G5	S2
Polygala mariana	Maryland milkwort		S	G5	S1
Polygala nuttallii	Nuttall's milkwort		E	G5	S1
Prenanthes aspera	Harsh rattlesnake-root		E	G4?	S1
Prunus pumila	Sand cherry		T	G5	S1
Ranunculus flabellaris	Yellow water crowfoot		T	G5	S2
Rhyncospora perplexa	Obscure beak-rush		T	G5	S2
Sagittaria graminea	Grass-leaved arrow head		T	G5	S1
Trillium pusillum var. *pusillum*	Least trillium	C2	E	G3T2	S1S2
Utricularia subulata	Zigzag bladderwort		T	G5	S1

Plants		Designated Status		Rank	
Scientific Name	**Common Name**	**Federal**	**Tennessee**	**Global**	**Tennessee**
Vaccinium elliottii	Mayberry		E	G5Q	S1
Vaccinium macrocarpon	Large cranberry		T	G4	S2
Woodwardia virginica	Virginia chainfern		S	G5	S2
Xyris fimbriata	Fringed Yellow-eyed-grass		E	G5	S1
Xyris laxifolia var. *iridifolia*	Wide-leaved yellow-eyed-grass		S	G4G5T4T5	S2
Zigadenus leimanthoides	Death Camass		T	G4Q	S2

Status refers to the legal protection afforded the species.
C2 indicates a species formerly classified as a federal candidate species.
T = Threatened, E = Endangered, S = Special Concern, PT = Proposed Threatened, PE = Proposed Endangered, CE = commercially exploited
Rank is an indication of global and state rarity ranging from 1 (most rare) to 5 (most common)
? = inexact numeric rank
Q = taxonomic status is questionable, numeric rank may change with taxonomy
T =taxonomic subdivision (trinomial)

Source: Call, 2003 and TDEC Natural Heritage Website, 2004a.

Animals		Designated Status		Rank	
Scientific Name	**Common Name**	**Federal**	**Tennessee**	**Global**	**Tennessee**
Accipiter striatus	Sharp-shinned Hawk		D	G5	S2
Aimophila aestivalis	Bachman's Sparrow		E	G3	S2
Ambystoma talpoideum	Mole Salamander		D	G5	S4
Ammodramus henslowii	Henslow's Sparrow	C		G4	SPB
Ammodramus savannarum	Grasshopper Sparrow		D	G5	S4
Circus cyaneus	Northern Harrier		D	G5T?	S1N
Haliaeetus leucocephalus	Bald Eagle	T	T	G4	S1
Hemidactylium scutatum	Four-toed salamander		D	G5	S3
Hemitremia flammea	Flame Chub		D	G4	S4
Hyla gratiosa	Barking Tree Frog		D	G5	S3
Myotis grisescens	Gray Bat	E	E	G2G3	S2
*Myotis sodalis**	Indiana Bat	E	E	G1	S1
Napaeozapus insignis	Woodland Jumping Mouse		D	G5	S4
Ophisaurus attenuatus	Eastern Slender Glass Lizard		D	G5T5	S3
Pituophis melanoleucus melanoleucus	Northern Pine Snake		T	G5T4	S3
Pleurobema gibberum	Cumberland Pigtoe	E	E	G1	S1
Rana capito	Gopher Frog	C1NL	?	G4T3	S1
Sorex cinereus	Masked Shrew		D	G5	S4
Sorex fumeus	Smoky Shrew		D	G5	S4
Sorex longirostris	Southeastern Shrew		D	G5	S4
Zapus hudsonius	Meadow Jumping Mouse		D	G5	S4

C2 and C1NL indicate species formerly classified as a federal candidate species.
T = Threatened, E = Endangered, D =Deemed in Need of Management
Rank is an indication of global and state rarity ranging from 1 (most rare) to 5 (most common)
* = possible occurrence

Source: Call, 2003; TDEC Natural Heritage Website, 2004b; TDEC Natural Heritage Website, 2004c.

Appendix D

Conservation Target Species Occurring in Wetlands on Arnold Air Force Base

Conservation Target Species Occurring in Wetland Flats

Carex barrattii (Barratt's sedge)
Iris prismatica (Slender blue flag)
Listera australis (Southern twayblade)
Lycopodiella alopecuroides (Foxtail clubmoss)
Muhlenbergia torreyana (Torrey's dropseed)
Platanthera flava var. flava (Southern rein-orchid)
Trillium pusillum var. pusillum (Least trillium)
Vaccinium macrocarpon (Cranberry)
Zigadenus leimanthoides (Death camas)

Conservation Target Species Occurring in Wetland Depressions

Ambystoma talpoideum (Mole salamander)
Hemidactylium scutatum (Four-toed salamander)
Rana capito (Gopher frog)
Clethra alnifolia (Coastal sweet pepperbush)
Hypericum adpressum (Creeping St. John's-wort)
Lachnanthes caroliniana (Carolina redroot)
Ludwigia sphaerocarpa (Globe-fruited false loosestrife)
Panicum aciculare (Needleleaf witchgrass)
P. acuminatum var. densiflorum (Eaton's witchgrass)
P. acuminatum var. leucothrix (Roughish witchgrass)
P. ensifolium (Small-leaved panicgrass)
P. hemitomon (Maidencane)
Rhynchospora perplexa (Obscure beakrush)
Sagittaria graminea (Grass-leaved arrowhead)
Vaccinium elliottii (Mayberry)
Woodwardia virginica (Virginia chainfern)
Xyris fimbriata (Fringed yellow-eyed-grass)
X. laxifolia var. *iridifolia* (Wide-leaved yellow-eyed-grass)

Source: Call, 2003