
# EVALUATION OF J-85-5 ENGINE TEST BURN

PREPARED FOR

DEPARTMENT OF THE AIR FORCE
ARNOLD AIR FORCE BASE, TENNESSEE

CH2MHILL

JANUARY 2005

E012005004ATL

# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **JAN 2005** | | **00-00-2005 to 00-00-2005** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **Evaluation of J-85-5 Engine Test Burn Final Environmnetal Assessment** | 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 **unclassified** | b. ABSTRACT **unclassified** | c. THIS PAGE **unclassified** | **Same as Report (SAR)** | **84** | |

# Finding of No Significant Impact:
## Arnold Air Force Base
## Proposed J-85-5 Engine Test Burn

Arnold Air Force Base (Arnold AFB) has prepared an Environmental Assessment (EA) that evaluates the potential environmental impacts associated with conducting tests using a General Electric Model J-85-5 turbojet engine with afterburner. Arnold Engineering Development Center (AEDC) and the University of Tennessee Space Institute (USTI) are collaborating on a project at the J-85-5 test facility at UTSI for testing diagnostic equipment to be used for characterizing hot gas plumes. This type of testing is better suited for the UTSI facility than for the large test cells at AEDC, which normally are reserved well in advance for large-scale, long-term testing.

## Description of the Proposed Action (Preferred Alternative)

The Proposed Action covers a joint testing program to be conducted by AEDC and UTSI. Diagnostic test equipment, including cameras, flow field probes, and optical paths for sensors, would be exposed to a hot gas plume generated by a J-85-5 turbojet engine with afterburner (J-85-5 engine). The test platform is housed at the UTSI J-85-5 test facility. The plan is for tests to occur roughly every 2 months initially and ultimately every 2 weeks. Individual tests would take place over approximately 4 hours with the J-85-5 engine operating as a gas plume generator for approximately 1 hour during the test period. During the hour of engine burn, 20 minutes would be at 50 percent power, 20 minutes at 75 percent power, 10 minutes at 100 percent power without afterburner, and 10 minutes at maximum with afterburner. The 100 percent power and afterburner events would last a maximum of 1.5 minutes, with as many as 7 events recorded at each power level during the test. Testing is planned for 40 hours per year and would not exceed 50 hours per year, as regulated by the facility's air emissions permit.

## Alternatives Considered and Dismissed from Analysis

Other test facilities on Arnold AFB were discussed as options but have ongoing tests and are considered less suitable for this type of testing, given the requirements to set up an individualized test platform to house the J-85-5 engine and the instrumentation from AEDC and UTSI. The J-85-5 test facility has been idle and, given the physical plant requirements for conducting tests, no additional alternative actions were considered practicable and none were carried forward for consideration.

## No-Action Alternative

The No-Action Alternative would be not to test diagnostic equipment using the J-85-5 engine. The No-Action Alternative would not be consistent with the military mission of Arnold AFB. Failure to test the diagnostic equipment could result in an uninformed decision being made regarding the performance of the equipment.

## Environmental Consequences

There are no wetlands within the immediate proposed project area and no sensitive species would be negatively affected by the Proposed Action. Impacts from the testing would be minimal, with minor noticeable noise generated during testing. This noise may cause minor temporary displacement of nearby wildlife species, but would not negatively affect wildlife populations, including sensitive and protected species. No impacts to water quality would result from the tests. The fuel delivery system has secondary and tertiary containment and would be monitored throughout testing. The Tennessee Air Pollution Control Board issued an air permit with limits which assure that no deterioration of air quality would result from the tests. There are no cultural resources in the area where the tests would be conducted. Therefore, no impacts to cultural resources would result from implementation of the Proposed Action.

## Restrictions

The Tennessee Air Pollution Control Board issued UTSI Air Permit Number 956920P to authorize the testing at the J-85 test facility. This air permit limited operation of the J-85-5 engine to no more than 50 hours per year. This permit expired on February 1, 2005. A new air permit was issued on November 4, 2004 and is valid until April 1, 2013. The new permit (Number 057684P) has the same operating restrictions as the initial permit.

## 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 was reviewed and found to have no significant impact on the human or natural environment. Notification was provided in local newspapers from 24-Jan-2005 through 25-Feb-2005 with no response from the public. Therefore, a Finding of No Significant Impact (FONSI) is issued for the Proposed Action and no Environmental Impact Statement (EIS) is required.

# 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, and no Environmental Impact Statement (EIS) is required. The Proposed Action is selected as the preferred action for implementation.

Date: 24 Mar 05

Charles King
Chief, Environmental Management Division
Arnold AFB, TN

# Finding of No Significant Impact:
## Arnold Air Force Base
## Proposed J-85-5 Engine Test Burn

Arnold Air Force Base (Arnold AFB) has prepared an Environmental Assessment (EA) that evaluates the potential environmental impacts associated with conducting tests using a General Electric Model J-85-5 turbojet engine with afterburner. Arnold Engineering Development Center (AEDC) and the University of Tennessee Space Institute (USTI) are collaborating on a project at the J-85-5 test facility at UTSI for testing diagnostic equipment to be used for characterizing hot gas plumes. This type of testing is better suited for the UTSI facility than for the large test cells at AEDC, which normally are reserved well in advance for large-scale, long-term testing.

## Description of the Proposed Action (Preferred Alternative)

The Proposed Action covers a joint testing program to be conducted by AEDC and UTSI. Diagnostic test equipment, including cameras, flow field probes, and optical paths for sensors, would be exposed to a hot gas plume generated by a J-85-5 turbojet engine with afterburner (J-85-5 engine). The test platform is housed at the UTSI J-85-5 test facility. The plan is for tests to occur roughly every 2 months initially and ultimately every 2 weeks. Individual tests would take place over approximately 4 hours with the J-85-5 engine operating as a gas plume generator for approximately 1 hour during the test period. During the hour of engine burn, 20 minutes would be at 50 percent power, 20 minutes at 75 percent power, 10 minutes at 100 percent power without afterburner, and 10 minutes at maximum with afterburner. The 100 percent power and afterburner events would last a maximum of 1.5 minutes, with as many as 7 events recorded at each power level during the test. Testing is planned for 40 hours per year and would not exceed 50 hours per year, as regulated by the facility's air emissions permit.

## Alternatives Considered and Dismissed from Analysis

Other test facilities on Arnold AFB were discussed as options but have ongoing tests and are considered less suitable for this type of testing, given the requirements to set up an individualized test platform to house the J-85-5 engine and the instrumentation from AEDC and UTSI. The J-85-5 test facility has been idle and, given the physical plant requirements for conducting tests, no additional alternative actions were considered practicable and none were carried forward for consideration.

## No-Action Alternative

The No-Action Alternative would be not to test diagnostic equipment using the J-85-5 engine. The No-Action Alternative would not be consistent with the military mission of Arnold AFB. Failure to test the diagnostic equipment could result in an uninformed decision being made regarding the performance of the equipment.

## Environmental Consequences

There are no wetlands within the immediate proposed project area and no sensitive species would be negatively affected by the Proposed Action. Impacts from the testing would be minimal, with minor noticeable noise generated during testing. This noise may cause minor temporary displacement of nearby wildlife species, but would not negatively affect wildlife populations, including sensitive and protected species. No impacts to water quality would result from the tests. The fuel delivery system has secondary and tertiary containment and would be monitored throughout testing. The Tennessee Air Pollution Control Board issued an air permit with limits which assure that no deterioration of air quality would result from the tests. There are no cultural resources in the area where the tests would be conducted. Therefore, no impacts to cultural resources would result from implementation of the Proposed Action.

## Restrictions

The Tennessee Air Pollution Control Board issued UTSI Air Permit Number 956920P to authorize the testing at the J-85 test facility. This air permit limited operation of the J-85-5 engine to no more than 50 hours per year. This permit expired on February 1, 2005. A new air permit was issued on November 4, 2004 and is valid until April 1, 2013. The new permit (Number 057684P) has the same operating restrictions as the initial permit.

## 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 was reviewed and found to have no significant impact on the human or natural environment. Notification was provided in local newspapers from 24-Jan-2005 through 25-Feb-2005 with no response from the public. Therefore, a Finding of No Significant Impact (FONSI) is issued for the Proposed Action and no Environmental Impact Statement (EIS) is required.

# 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, and no Environmental Impact Statement (EIS) is required. The Proposed Action is selected as the preferred action for implementation.

Date: 24 Mar 05

Charles King
Chief, Environmental Management Division
Arnold AFB, TN

# Contents

## Figures



## Tables



## Appendices

# Acronyms and Abbreviations

| | |
|---|---|
| µg/cm3 | Micrograms per cubic centimeter |
| AEDC | Arnold Engineering Development Center |
| AF | Air Force |
| AFB | Air Force Base |
| AFI | Air Force Instruction |
| AICUZ | Air Installation Compatible Use Zone |
| CAA | Clean Air Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CWA | Clean Water Act |
| DoD | Department of Defense |
| EA | Environmental Assessment |
| EIAP | Environmental Impact Analysis Process |
| EO | Executive Order |
| ESA | Endangered Species Act |
| FONPA | Finding of No Practicable Alternative |
| FONSI | Finding of No Significant Impact |
| GE | General Electric |
| GWTU | Groundwater Treatment Unit |
| HQ CEV | Headquarters Civil Engineering, Compliance |
| IEMP | Integrated Ecosystem Management Plan |
| IRP | Installation Restoration Program |
| MAJCOM | Major Command |
| NASA | National Aeronautics and Space Administration |
| NCGP | No Consumption-General Public |
| NEPA | National Environmental Policy Act |

| | |
|---|---|
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| OSHA | Occupational Safety and Health Administration |
| PCBs | polychlorinated biphenyls |
| PSD | Prevention of Significant Deterioration |
| RCRA | Resource Conservation and Recovery Act |
| ROD | Record of Decision |
| ROW | right-of-way |
| SAF | Secretary of the Air Force/Environmental Security |
| SARA | Superfund Amendments and Reauthorization Act |
| TDEC | Tennessee Department of Environment and Conservation |
| TSCA | Toxic Substance Control Act |
| TVA | Tennessee Valley Authority |
| TWRA | Tennessee Wildlife Resources Agency |
| USACE | U.S. Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USC | U.S. Code |
| USGS | U.S. Geological Survey |
| USFWS | U.S. Fish and Wildlife Service |
| UTSI | University of Tennessee Space Institute |
| WQA | Water Quality Act |

# 1.0 Purpose and Need for Action

## 1.1 Background

Arnold Air Force Base (AFB) is located in Coffee and Franklin Counties in Middle Tennessee. Arnold AFB is approximately 70 miles southeast of Nashville, the state capitol. Positioned near the towns of Manchester, Tullahoma, and Winchester, Arnold AFB 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 is the source of drinking water for the Base and provides cooling 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 (ROWs) occupy 1,479 acres on the installation and provide habitat for numerous rare species (Call, 2003).

### 1.1.1 Operations

Arnold Engineering Development Center (AEDC), which is located on Arnold AFB, 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 AEDC'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 (NASA), the Federal Aviation Administration, private industry, allied foreign governments, and U.S. government and educational institutions.

The Arnold AFB commander is responsible for accomplishing the Base'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 History

Arnold AFB 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 AF. Dr. von Karman sent a task force from his newly formed group to Germany 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.

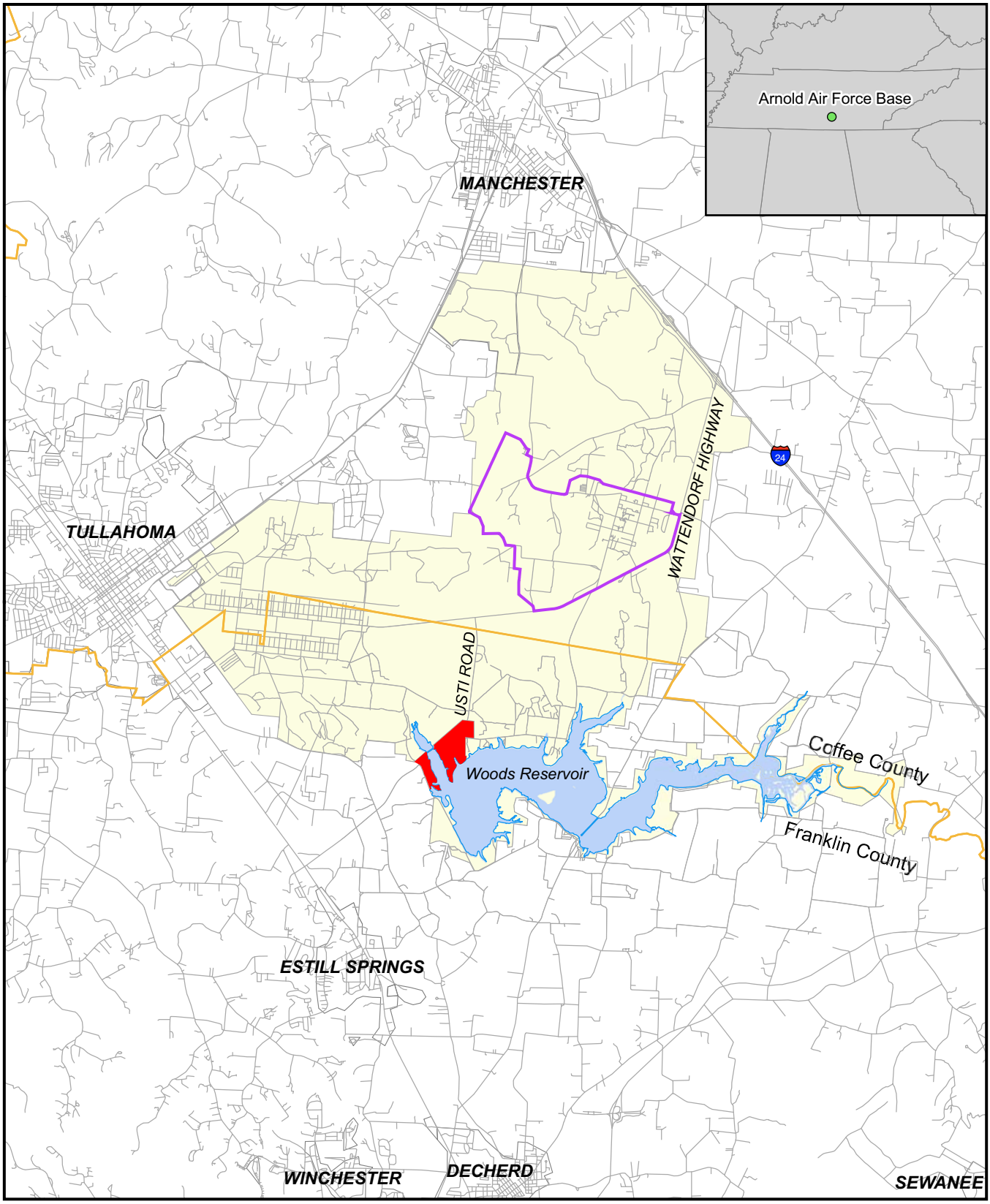



Figure 1-1

**Arnold Air Force Base and General Vicinity**

*J-85-5 Engine Test Burn*

*Final Environmental Assessment*

E012005004ATL\Fig1-1.ai

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 25 June 1951, 1 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 Military Mission

The military mission is to support the development of aerospace systems by testing hardware in facilities that simulate flight conditions. AEDC 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 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 Arnold AFB 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 addressed by this Environmental Assessment (EA) covers a joint testing program to be conducted by AEDC Technology and the University of Tennessee Space Institute (UTSI). During the test program, diagnostic test equipment, including cameras, flow field probes, and optical paths for sensors will be exposed to a hot gas plume generated by a General Electric Model J-85-5 turbojet engine with afterburner (J-85-5 engine). The test platform is housed at the UTSI test facility. The planned schedule is for tests to occur roughly every 2 months during the initial stages. Ultimately there are plans for the testing to occur every 2 weeks when fully operational. Individual tests would take place over approximately 4 hours with the J-85-5 engine operating as a gas plume generator for approximately 1 hour during the test period. During the hour of engine burn, 20 minutes would be at 50 percent power, 20 minutes at 75 percent power, 10 minutes at 100 percent power without afterburner, and 10 minutes at maximum afterburner (Table 1-1). The duration of 100 percent power and afterburner events would be a maximum of 1.5 minutes, with multiple events recorded during the test. The intent is to develop a program that would conduct tests twice monthly. Total testing time utilizing the engine would be within the limits of the TDEC air permits.

TABLE 1-1
Test Sequence and Power Settings
*J-85-5 Engine Test Burn Final Environmental Assessment*

| Sequence | Setting | Power (%) | Duration (minutes) |
|---|---|---|---|
| Warm-Up | Idle | 50 | 10 |
| Test Cycle | Intermediate | 75 | 20 |
| | Military[a] | 100 | 10 |
| | Maximum[b] | 100 + | 10 |
| Cool-Down | Idle | 50 | 10 |

[a] without afterburner
[b] with afterburner

## 1.3 Need for Proposed Action

Engine testing is necessary to collect preliminary performance data on diagnostic equipment that will be used during flow field monitoring of hot gas plumes. Hardware testing is a primary component of the Arnold AFB military mission, as discussed in Section 1.1. UTSI includes ancillary facilities that provide a means of conducting preliminary hardware tests using diagnostic equipment prior to committing major resources for testing at the AEDC test cells. This step allows the Air Force to avoid costly modifications to full-scale systems when the hardware is under development. Testing diagnostic equipment at UTSI allows existing operations on AEDC to continue without interruptions or schedule delays and at the same time, new equipment can be developed for tests that are in the planning stage.

The UTSI facility would be used because of the test platform availability and schedule flexibility. AEDC test facilities typically are used for long-duration projects and are difficult to schedule for short-duration tests, such as the 1- or 2-day tests required for evaluation of the diagnostic equipment. Conducting tests at the UTSI facility is more cost-effective for such short-duration testing. The smaller J-85-5 engine at the UTSI facility is also less expensive to maintain, repair and replace.

## 1.4 Objective of Proposed Action

The objective of the Proposed Action is to evaluate diagnostic and monitoring equipment in a hot gas plume emanating from a jet engine. This information could be used to modify and improve the test equipment used to evaluate engine performance.

## 1.5 Related Environmental Documents

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

- Integrated Ecosystem Management Plan 2003, Arnold Engineering Development Center, Arnold Air Force Base, Tennessee, for Arnold Air Force Base, prepared by Geoff Call, Conservation Biologist, ACS Environmental Services, Conservation
- Tennessee National Pollutant Discharge Elimination System (NPDES) Permit Number TN0056430
- Tennessee Air Pollution Control Board Permit Number 057684P (Issued November 4, 2004)

## 1.6 Decision to Be Made

A decision is required regarding whether to evaluate diagnostic equipment performance in the hot gas plume generated by a J-85-5 turbojet engine at the UTSI facility.

## 1.7 Authority, Applicable Regulatory Requirements, Permits, and Coordination

The Air Force Environmental Impact Analysis Process is governed by 32 Code of Federal Regulations (CFR), Part 989. This process specifies the requirements for performing an Environmental Assessment on Air Force bases including descriptions of proposed action, reasonable alternatives, affected environment, and the environmental impacts of the proposed action. A Finding of No Significant Impact is prepared to describe why an action would not have a significant effect on the environment.

Other applicable regulatory requirements, permits, and coordination are addressed in the following:

- 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).

- DoD Directive 6050.1 (32 CFR 214), which provides DoD policies and procedures to supplement 40 CFR 1500-1508.
- Air Force Instruction (AFI) 32-7061.
- Executive Order (EO) 11514, Protection and Enhancement of Environmental Quality (amended by EO 11991).
- The Endangered Species Act (ESA) of 1973 (16 U.S. Code [USC] 1531-1543).
- The Fish and Wildlife Coordination Act (16 USC 661, et seq.).
- The Migratory Bird Treaty Act (16 USC 701, et seq.).
- The CWA of 1977 and the Water Quality Act (WQA) of 1987.
- EO 11988, Floodplain Management.
- The Clean Air Act (CAA) (42 USC 7401 et seq., as amended).
- The Noise Control Act of 1972.

## 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 a Request for Environmental Impact Analysis - AF Form 813 (Appendix A).

### 1.8.1 Issues Eliminated from Detailed Analysis

The Proposed Action would not have the potential for significant impacts on all resource areas on Arnold AFB. Consequently, the resource areas discussed below have been eliminated from further analysis in this document.

#### 1.8.1.1 Air Installation Compatible Use Zone

The Proposed Action would be conducted in a test facility located on the UTSI campus, which is more than 8 miles from the Arnold AFB airfield. The test facility is not along the flight line. The activities involved in conducting the Proposed Action would not impact airfield operations and would not violate any Air Installation Compatible Use Zone (AICUZ) restrictions. Therefore, AICUZ was eliminated as an issue warranting further analysis.

#### 1.8.1.2 Land Use

The Proposed Action would be contained within an existing test facility structure and would not result in any change in land use on Arnold AFB. Therefore, land use was eliminated as an issue warranting further analysis.

### 1.8.1.3 Safety and Occupational Health

Potential safety and occupational health impacts would be related to engine testing and fuel handling. All workers, including any contractors and subcontractors, would be required to comply with all applicable Occupational Safety and Health Administration (OSHA) standards.

In addition to OSHA standards, specific protocols have been developed to address potential safety risks and minimize the threat to workers. The protocols address the following test processes:

- J85 Pre-Test Inspection/Cleanup of Area (W07-0002-0100)
- J-85 Pre-Op Engine/Hardware Inspection (W07-0002-0101)
- J-85 Exhaust Rake Installation (W07-0002-0102)
- J85 Pre-Op Fuel System (W07-0002-0103)
- J85 Pre-Test Engine Inlet Inspection (W07-0002-0104)
- Pre-Test SecuringJ85 Test Area (W07-0002-0105)
- Final Preparation for J-85 Test (W07-0002-0106)
- Post-Test Removal of J85 Exhaust Rake (W07-0002-0107)
- Post-Test Removal of J85 Test Boundary Ropes (W07-0002-0108)
- Post-Test J-85 Engine/Hardware Inspection (W07-0002-0109)
- Post-Op J85 Fuel System (W07-0002-0110)
- Securing Area Following J-85 Test (W07-0002-0111)
- Accident/Injury/Sudden Illness (W07-0004-0001)
- Fire/Explosion (W07-0004-0002)
- Mishap/Near Miss (W07-0004-0003)
- Spills (W07-0004-0004)
- USTI Test Article and Test Area Emergency Instructions (W07-0004-0100)

As a result of OSHA standards and test-specific protocols, there would be no impacts on the safety and occupational health of workers or other persons in the area of the Proposed Action. Therefore, safety and occupational health were eliminated as issues warranting further analysis.

### 1.8.1.4 Installation Restoration Program (IRP)

Arnold AFB has an active IRP designed to protect human health and the environment and to restore areas for future use. Arnold AFB executes the IRP in consultation with the Tennessee Department of Environment and Conservation (TDEC) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). Twenty-six IRP sites have been identified on Arnold AFB, 11 of which have been closed after determinations of no further action required.

The Proposed Action would occur in an existing test facility on the UTSI campus and not on Arnold AFB. Because the test would be located off Arnold AFB and away from any of the Base's IRP sites, there is no potential for interaction with the IRP. Therefore, the IRP was eliminated as an issue warranting further analysis.

#### 1.8.1.5 Hazardous Materials

Engine testing would include use of jet fuel and kerosene as fuel for the J-85-5 engine. Temporary storage and handling of these fuels would be necessary to conduct the tests. Storage and use of these fuels would be temporary and of short duration. No fuels would be stored on-site between tests. When on-site, the fuel tank would be kept within a secondary containment system. A facility review was conducted and identified measures to reduce the risk of fuel spills. These measures included reducing the length of fuel supply line required to convey fuel from the storage tank to the engine. During testing, the fuel delivery system is monitored by remote cameras to identify any compromises to the system and allow immediate response to correct problems.

Because of the temporary nature of the use and storage of fuels for the engine tests, the use of jet fuel and kerosene in the Proposed Action would be minor. Therefore, hazardous materials was eliminated as an issue warranting further analysis.

#### 1.8.1.6 Geology and Geomorphology

The Proposed Action would be confined to an existing structure on the UTSI campus. No activities conducted under the Proposed Action would affect the geomorphology or underlying geologic features of UTSI, Arnold AFB, or the surrounding area. Therefore, geology and geomorphology were eliminated as issue warranting further analysis.

#### 1.8.1.7 Hydrology

Hydrology refers to the path, quantity, and duration of flow of surface- and groundwater. The Proposed Action would not result in water withdrawal or water discharge, except for permitted stormwater discharge. There would be no changes to local or regional hydrology. Therefore, hydrology was eliminated as an issue warranting further analysis.

#### 1.8.1.8 Socioeconomic Factors and Community Infrastructure

Socioeconomic factors are associated with the human environment, including demographics, community infrastructure and services, employment and wages, recreation, and environmental justice. The Proposed Action would have no significant effect on socioeconomic factors. No additional staff would be required to operate the treatment and monitoring systems. There would be no increase or loss in permanent staffing positions on Arnold AFB or UTSI, nor would there be any gain or loss of permanent employment in the surrounding region. The engine test would not impact minority or low income population groups.

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. The Proposed Action 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 (utilities, fire, police, medical, housing, schools, etc.). Therefore, socioeconomic factors and community infrastructure were eliminated as issues warranting further analysis.

#### 1.8.1.9 Cultural Resources

Cultural resources are defined as archaeological areas and historical architectural properties. Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, and any other physical evidence of human activity considered important to a culture or community for scientific, traditional, religious, or other reasons. The Proposed Action would be confined to an existing structure on the UTSI campus and no ground disturbance would result. No buildings would be altered in appearance or structure to conduct the tests. Therefore, cultural resources were eliminated as an issue warranting further analysis.

#### 1.8.1.10 Traffic Flow

The engine and other test–related equipment would be transported to the test facility. However, none of the equipment to be transported is large and delivery would not require any traffic control measures. The engine tests would not impact traffic flow because the tests would be confined to an existing structure on the UTSI campus. Therefore, traffic flow was eliminated as an issue warranting further analysis.

### 1.8.2 Issues Studied in Detail

The issues discussed in detail in this document are noise, water quality, air quality, and biological resources.

## 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
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 the No-Action Alternative. This section provides a summary of the issues and potential impacts associated with the Proposed Action and No-Action Alternative.

## 2.1 Proposed Action (Preferred Alternative)

The Proposed Action is to conduct diagnostic equipment tests on the hot gas plume generated by the J-85-5 engine at the J-85-5 facility on the UTSI campus (Figure 2-1). The J-85-5 test facility is located in a fenced area adjacent to Rollins Creek Road north of the main UTSI campus (Figure 2-2). The J-85-5 facility has been idle since the early 1990s, but has been reactivated for this series of tests. Other buildings in the fenced compound within the J-85-5 facility would remain idle.

A portable control/monitoring room and an engine test sled would be placed in the western portion of the J-85-5 facility (Figure 2-3). The J-85-5 engine would be fixed to the sled and provided with fuel pumped from a portable tank south of the J-85-5 test facility (Figure 2-3). During engine burns, engine exhaust would exit the west side of the building to open air. The Proposed Action is to conduct multiple tests using the J-85-5 engine. Equipment tests would continue for approximately 8 hours, with the afterburner fired as many as 7 times for up to 1.5 minutes during each 8-hour test.

Fuel would be supplied to the portable tank only when testing would be conducted. No fuel would be stored between testing periods. Tests would be conducted using both jet fuel and kerosene, to determine performance capability using both fuels.

The J-85-5 engine was selected for this series of tests because this engine's performance is well understood and it is readily available, relatively inexpensive to operate, and easily maintained. Other jet engines could have been used to generate the gas plume, but these engines would cost more and be more time-consuming and expensive to maintain.

## 2.2 No-Action Alternative

The No-Action Alternative would be not to test diagnostic equipment using the J-85-5 engine. The No-Action Alternative would not be consistent with the military mission of Arnold AFB. Failure to test the diagnostic equipment could result in an uninformed decision being made regarding the performance of the equipment.

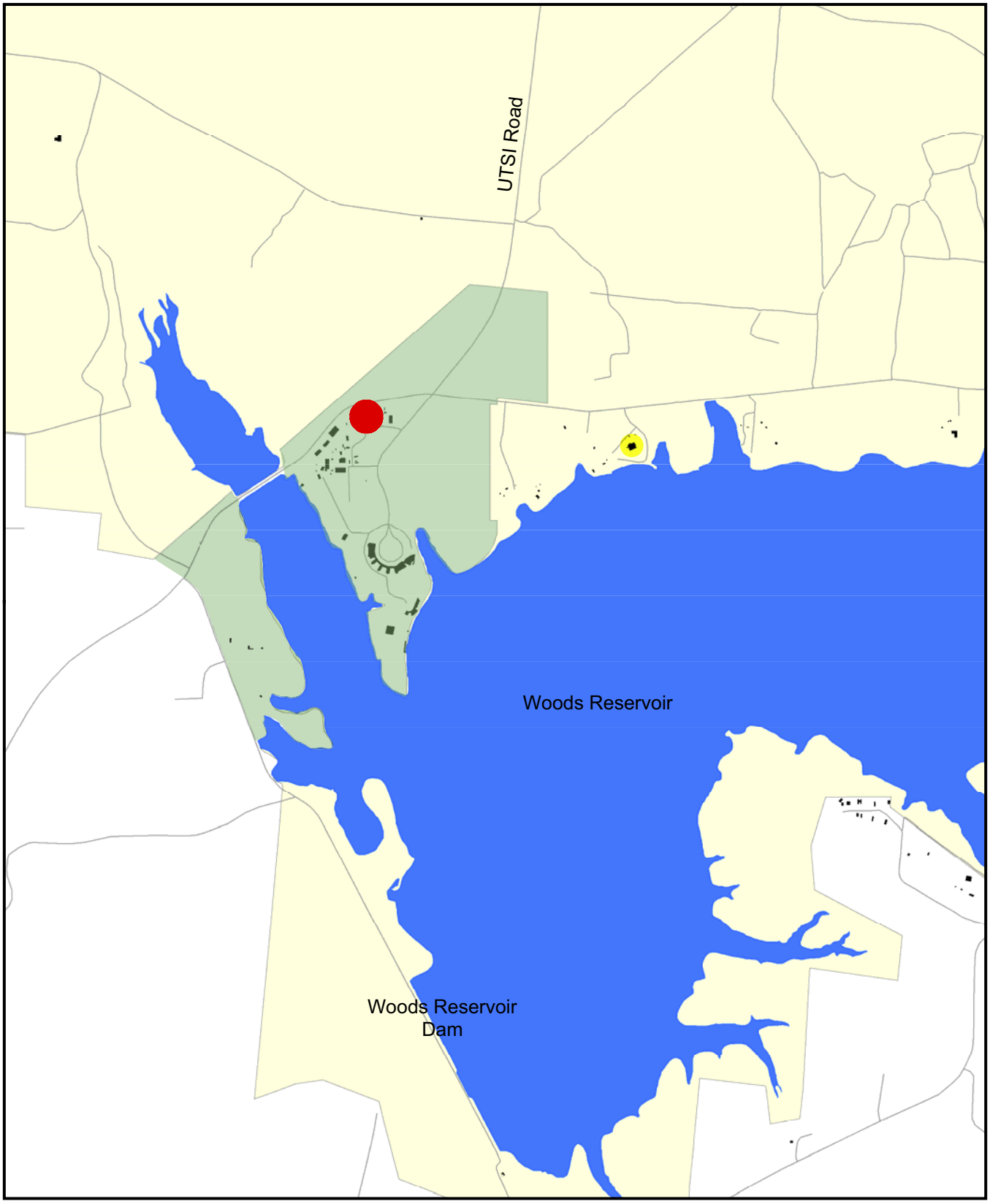
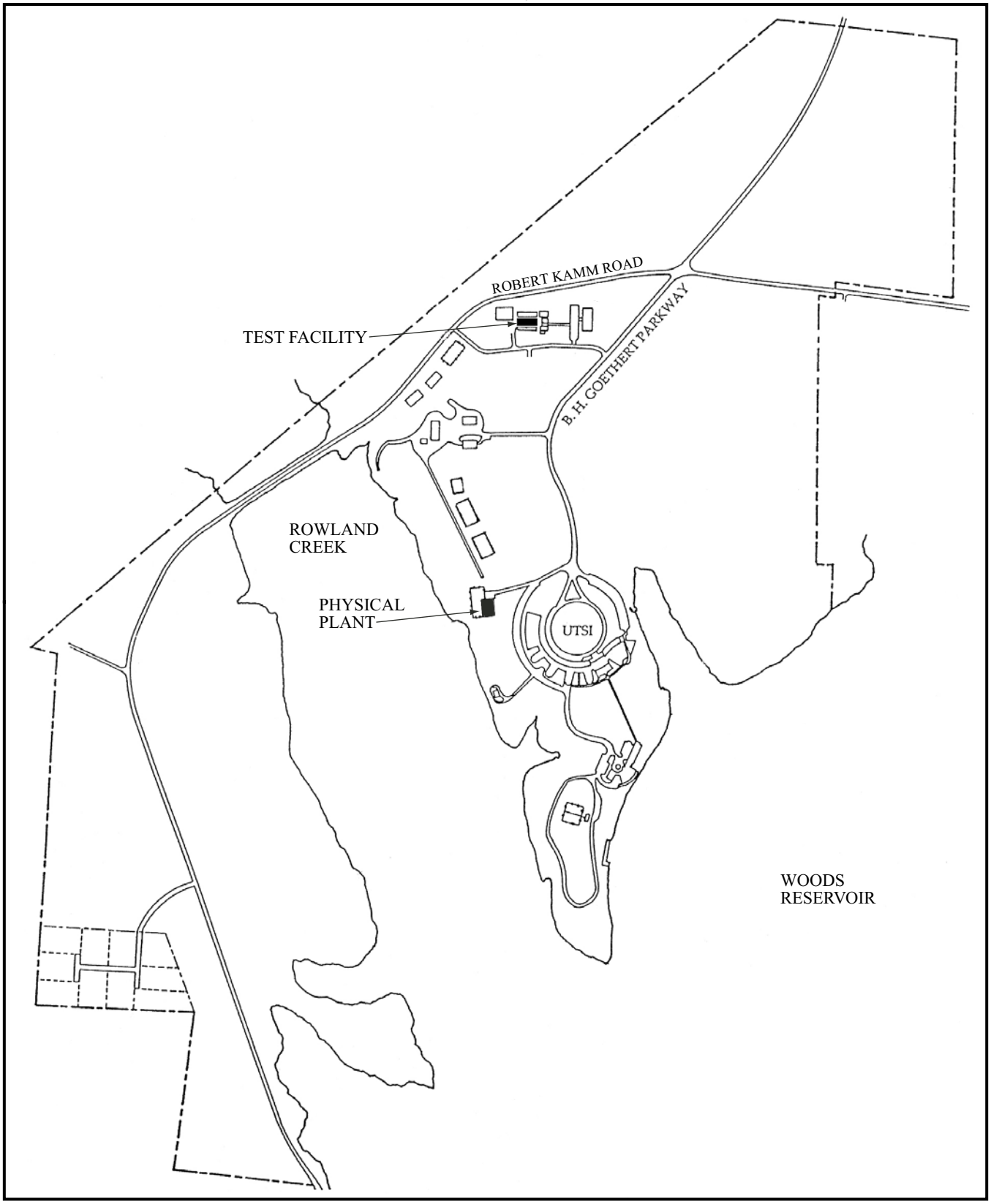



Figure 2-1
**Location of Proposed Action**
*J-85-5 Engine Test Burn*
*Final Environmental Assessment*

E012005004ATL\Fig2-1.ai




NOT TO SCALE

N

Figure 2-2
**Location of J-85 Test Facility and Main UTSI Campus**
*J-85-5 Engine Test Burn*
*Final Environmental Assessment*

E012005004ATL\Fig2-2.ai

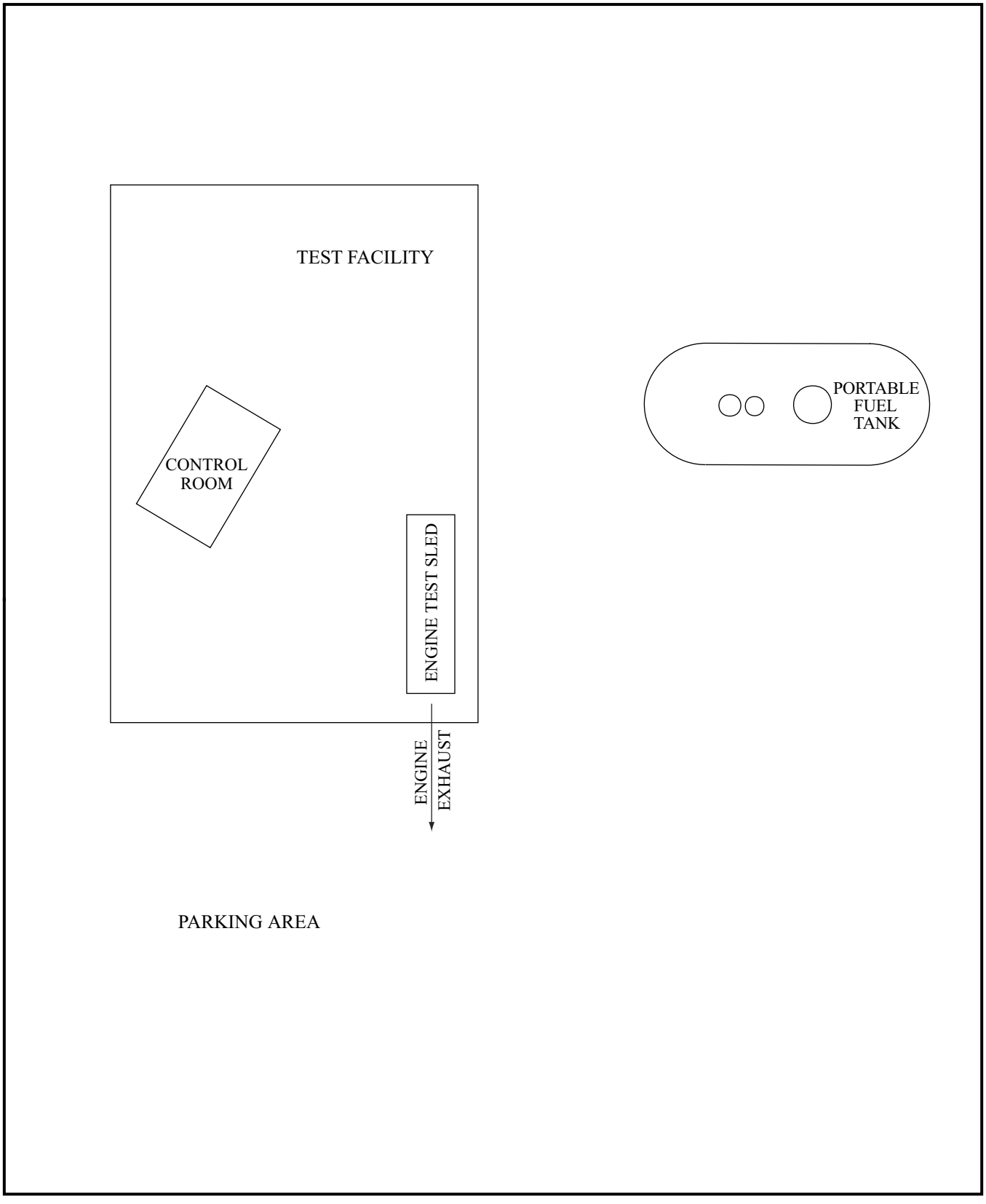



Figure 2-3
**Plan View of J-85 Facility as Configured for the Proposed Engine Tests**
*J-85-5 Engine Test Burn*
*Final Environmental Assessment*

## 2.3 Alternatives Considered but Not Carried Forward

The Proposed Action is the only feasible action alternative for joint tests between AEDC and UTSI. The J-85-5 test facility has been idle and, given the physical plant requirements for conducting tests, it is considered appropriate for conducting widely spaced tests. Other test facilities on Arnold AFB have ongoing tests and are considered less suitable for this type of testing, given the requirements to set up an individualized test platform to house the J-85-5 engine and the instrumentation from AEDC and UTSI. Therefore, no additional action alternatives were considered practicable and none were carried forward for consideration.

## 2.4 Comparison of Alternatives Carried Forward

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

TABLE 2-1
Comparison of Impacts of Considered Alternatives
*J-85-5 Engine Test Burn Final Environmental Assessment*

| Resource Area | Proposed Action | No-Action Alternative |
|---|---|---|
| Noise | Potential excess noise at UTSI campus would be temporary. Personal hearing protection would be used in these areas if noise exceeds nuisance levels. Potential noise disturbance for wildlife and protected species (gray bat, Indiana bat, and bald eagle) would be temporary and minor. Nearby residents would experience intermittent noise levels of up to 65 dBa during testing. Time of testing would minimize impacts. Any impacts would be temporary and minor. | No Impacts |
| Water Quality | Potential impact from accidental release of jet fuel or kerosene during engine fueling operations prior to or during tests. Secondary and tertiary containment of spills would prevent impacts to water quality. | No Impacts |
| Air Quality | Potential release of unburned hydrocarbons during engine testing. Limiting testing to the hours specified in Tennessee Air Pollution Control Board Permit Number 057684P or less would prevent deterioration of air quality and there would be no impacts. The permit expires on April 1, 2013. | No Impacts |
| Biological Resources | Temporary and minor displacement of animals from habitats in the immediate project vicinity. No adverse impacts to protected species. | No Impacts |

# 3.0 Affected Environment

## 3.1 Noise

Noise, in the context of this analysis, refers to sounds generated by activities that may affect employees of the Base, on-Base residents, residents of off-Base areas, or wildlife. Noise levels typically are expressed in terms of decibels (dB), a measure of the sound pressure generated. The decibel scale is logarithmic rather than linear because humans perceive sound as the logarithm of the sound pressure rather than the actual sound pressure (Danish Wind Industry Association, 2003).

For determination of impacts to human receptors, noise measurements are weighted to increase the contribution of noises within the normal range of human hearing and decrease the contribution of noises outside the normal range of human hearing. For humans, this is considered an A-weighted scale (dBA). When sound pressure doubles, the dBA level increases by 3. Psychologically, most humans perceive a doubling of sound as an increase of 10 dBA (Danish Wind Industry Association, 2003). Sound pressure decreases with distance from the source. Typically, the amount of noise is halved as the distance from the source doubles (Danish Wind Industry Association, 2003).

Additionally, people tend to exhibit differing sensitivity to noises generated by time of day, with noise at night being more disturbing than daytime noise. Therefore, a Day-Night Average Noise Level (LDN) is used to determine whether noise would be perceived as an adverse impact. EPA developed an index as a standard descriptor for noise impacts from a variety of sources. Where LDN values exceed 65 dBA, residential development is not recommended.

Noise levels in typical urban residential areas range from 58 dBA to 72 dBA (USACE, 1998). Noise levels in suburban neighborhoods are typically around 50 dBA to 60 dBA (dB Engineering, 2004). A quiet office or rural home typically has a noise level of approximately 40 dBA (League for the Hard of Hearing, 2004). The UTSI campus has noise levels typical of a suburban neighborhood, with the interior of campus buildings being quieter. The area around the proposed test facility is rural.

## 3.2 Water Quality

Hydrological features include 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 3-1). The Duck River basin lies to the north of the divide and receives drainage from Hunt, Huckleberry, Wiley, Crumpton, and Bobo Creeks and 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

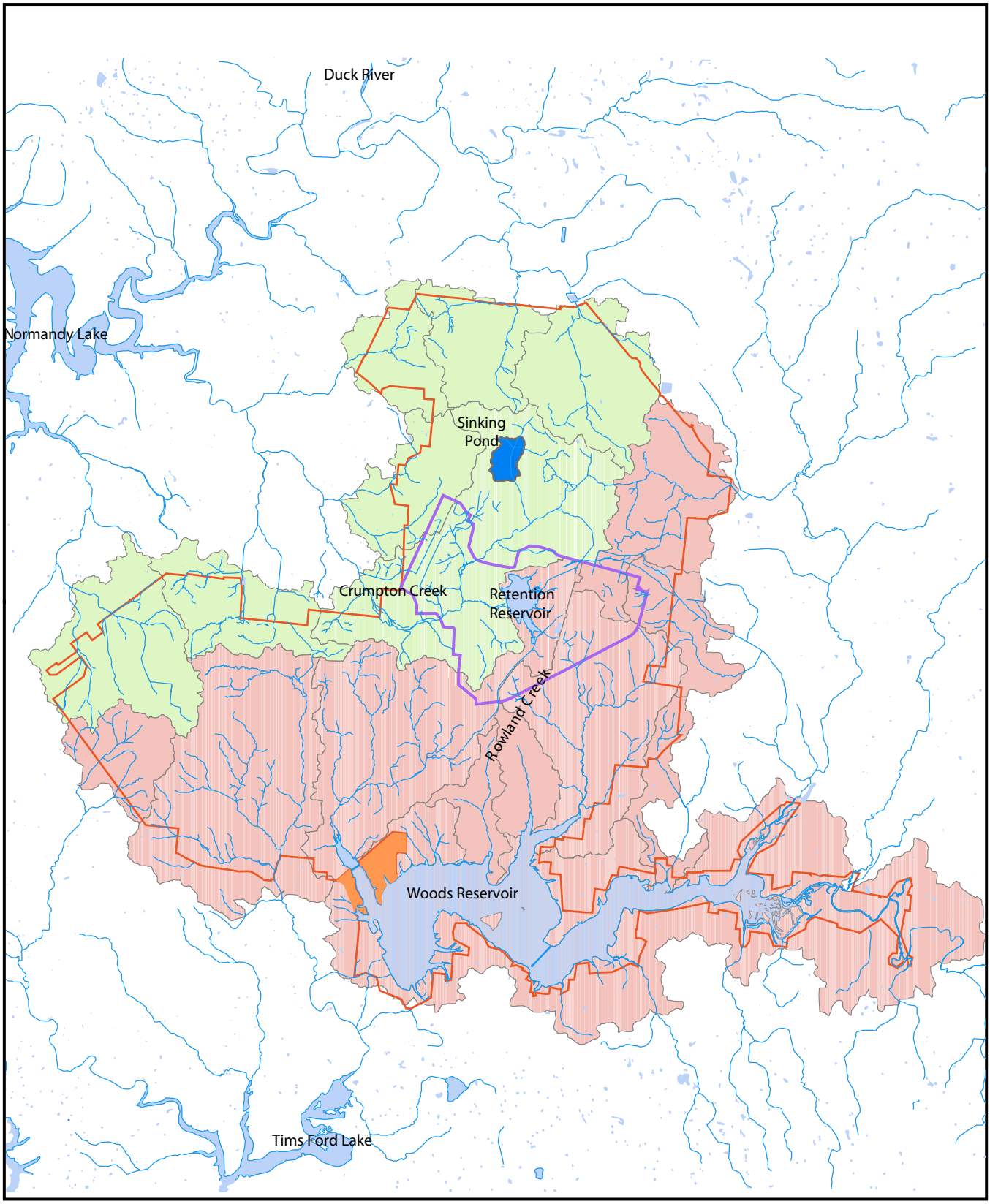



Figure 3-1

**Surface Waters and Watersheds on Arnold Air Force Base**

*J-85-5 Engine Test Burn*
*Final Environmental Assessment*

E012005004ATL\Fig3-1.ai

such as Dry Creek, Hardaway Branch, Saltwell Hollow Creek, Spring Creek, and Poorhouse Creek also contribute to the Elk River (Call, 2003).

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 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-foot 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 gallons per minute (TDEC, 2002a).

Karst areas are characterized by sinkholes, springs, disappearing streams and caves, and 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.

Floodplains have been defined at several locations on Arnold AFB located near Woods Reservoir and Sinking Pond. The proposed test facility is upslope and away from floodplains.

The proposed test facility is near Woods Reservoir in the Upper Elk River basin. This basin has 12 water bodies on the final version of the 2002 Section 303(d) list, which was issued in January 2004 (United States Environmental Protection Agency [USEPA], 2004a). Woods Reservoir, located in the project area, is listed as not supporting its designated uses because of polychlorinated biphenyl (PCB) impairment of sediments resulting from historical PCB releases from AEDC into Woods Reservoir. A No Consumption-General Public (NCGP) fishing advisory has been issued for catfish (TDEC, 2002b).

TDEC has issued an NPDES stormwater permit for the J-85-5 test facility (Appendix B). This permit allows discharge of stormwater runoff from the facility, but does not authorize the discharge of process or cooling water.

Groundwater is monitored in five wells at the UTSI site. Trichloroethylene (TCE) was detected on the site in the mid 1980's. Semi-annual reports are sent to TDEC Division of Solid Waste Management presenting the laboratory results. Monitoring and reporting are the only actions required to date (Wesley McMinn, pers com December 22, 2004).

## 3.3 Air Quality

Arnold AFB is located in the Tennessee Valley - Cumberland Mountains Interstate Air Quality Region, which occupies portions of Alabama and Tennessee. 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, 2000). The Tennessee Air Pollution Control Board of TDEC issued AEDC a Title V Operating Permit in May 2002. There are currently 26 emission sources covered under this

permit, and all are in compliance. The Tennessee Air Pollution Control Board issued an air contaminant source construction permit to UTSI for the initial engine burn tests and for a specific test to determine noise levels (Tennessee Air Pollution Control Board Permit Number 956920P, Appendix C). Permit Number 956920P expires on 1 February 2005. An air contaminant source operating permit was issued for ongoing tests at UTSI. That permit, 057684P, expires on 1 April, 2013 (Tennessee Air Pollution Control Board Permit Number 057684P, Appendix D).

Since Arnold AFB is within 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 deterioration of the 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.

## 3.4 Biological Resources

Biological resources include the native and introduced terrestrial plants and animals on and around Arnold AFB. The land areas at the Base 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 Integrated Ecosystem Management Plan (IEMP) (Call, 2003).

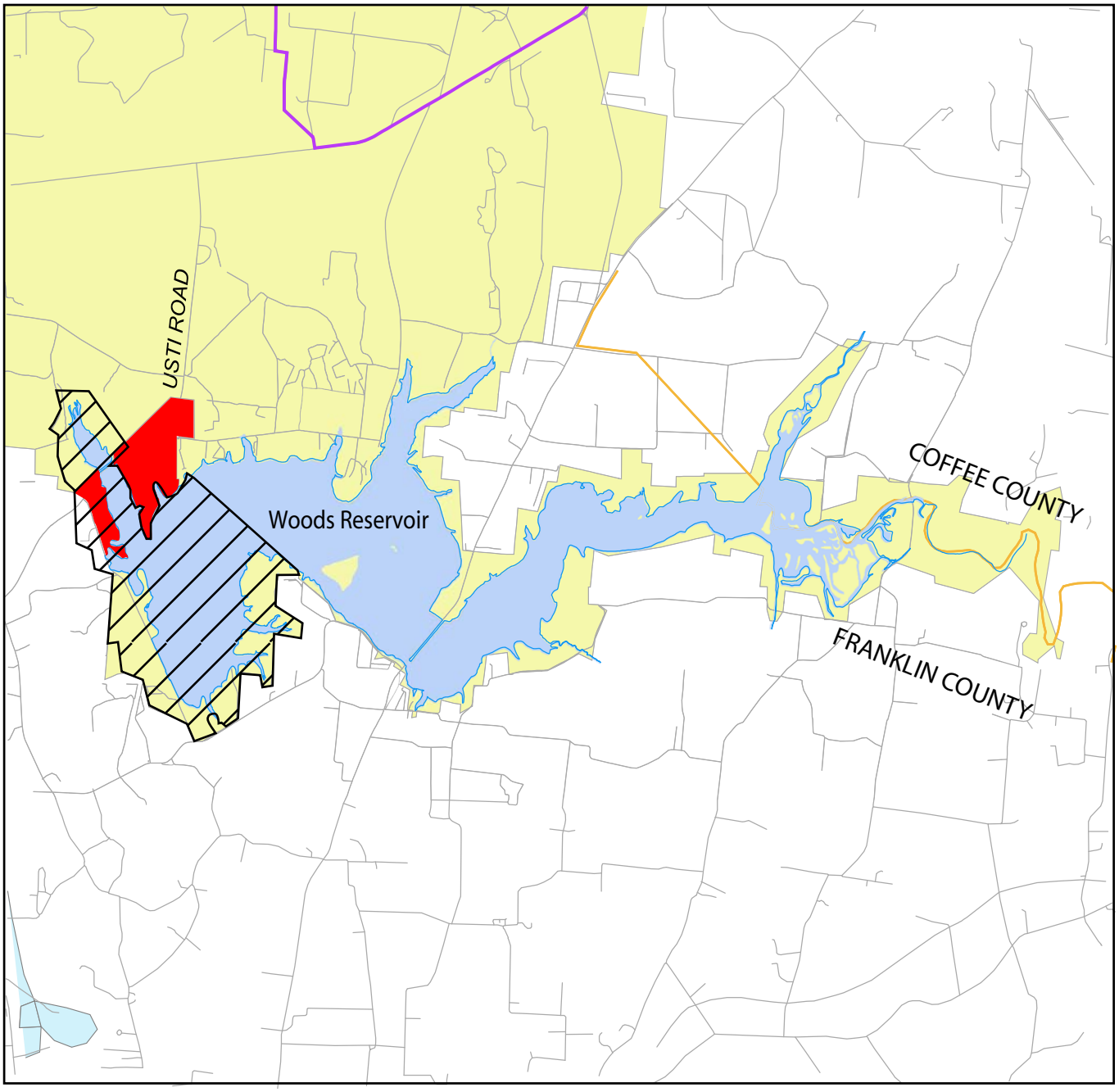
### 3.4.1 Wildlife Species

Wildlife species on the UTSI campus are limited. Eastern gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), and white-tailed deer (*Odocoileus virginianus*) may occur occasionally on the campus. Canada goose (*Branta canadensis*), waterfowl, and passerine birds also may occasionally occur. Other wildlife species would be unlikely to occur on UTSI.

Forested land within the Arnold AFB boundary is located just north of the test facility. This forested area would support a greater diversity of wildlife than the UTSI campus. Wildlife species that would occur in this forest would be typical of hardwood forests of the central southeastern United States.

In the 1950s, a comprehensive game management plan was initiated to increase wildlife populations so that a reasonable level of 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 (Call, 2003). These species are very likely to occur in the forested area north of the test facility or along Woods Reservoir to the south and west of the test facility.

TDEC has established a state waterfowl refuge on the western portion of Woods Reservoir (Figure 3-2). The state refuge encompasses the lake and immediate surrounding shoreline.




0 1 2 Miles

N

LEGEND

- Road Centerline
- County Boundaries
- UTSI Boundary
- AEDC Boundary
- Local Cities
- Arnold AFB Boundary
- State Waterfowl Refuge

Figure 3-2

**Woods Reservoir Refuge**

*J-85-5 Engine Test Burn*

*Final Environmental Assessment*

E012005004ATL\Fig3-2.ai

The refuge was created to serve as a haven for waterfowl. The area is closed to recreational activity from 1 December through 31 January each winter.

### 3.4.2 Plant Species

The UTSI campus consists of landscaped areas with scattered trees, buildings, and parking areas, as well as ruderal areas. Vegetation consists primarily of lawn grasses in landscaped parts of the campus and typical early successional vegetation and colonizing weedy species in the ruderal areas.

Mixed age hardwood forests are located north of the test facility on Arnold AFB property. Vegetation within this forest and the adjacent forest on UTSI property would be classified as upland forest. Plant associations that occur in upland forest communities on Arnold AFB are listed in Appendix E.

### 3.4.3 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.

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 UTSI or Arnold AFB are designated as critical habitat under the ESA. Six species that may be present on Arnold AFB are protected under the ESA: *Myotis grisescens* (gray bat), *Myotis sodalis* (Indiana bat), *Haliaeetus leucocephalus* (bald eagle), *Hemitremia flammea* (flame chub) *Pleurobema gibberum* (cumberland pigtoe), and *Helianthus eggertii* (Eggert's sunflower). Of these, only the two bat species and the bald eagle may be affected by the Proposed Action. These three species are unlikely to occur on the UTSI campus because of the level of development and human use. However, they may occur on or adjacent to Woods Reservoir in the general project area or in the forested area north of the test facility. These species are described below.

#### 3.4.3.1 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 and bats may travel up to 325 miles between winter and summer habitat (Whitaker and Hamilton, 1998). Adult females raise their young in maternity colonies that lack adult males. Adult males typically roost in bachelor colonies during the summer. Gray bats have narrow temperature requirements, reducing 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 the U.S. Fish and Wildlife Service (USFWS) occurred in 1978, 1979, and 1996. As a result, a management action plan was developed to coordinate continued Base operations with 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). Investigation of the maternity colony in 2004 identified 24 non-volant juveniles in the dam (J. Lamb, personal communication). Non-volant juveniles are those that have not yet developed the ability to fly. Maternity colony inspections are conducted while the adults are foraging, so the number of adult females in the maternity colony is unknown, but would be at least 20.

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.

#### 3.4.3.2 Indiana Bat

The Indiana bat is found in the eastern United States from eastern Oklahoma into Vermont and northwestern Florida. The Indiana bat is listed as a federally endangered species throughout its range. 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 AFB (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 may also 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 calls of 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.

### 3.4.3.3 Bald Eagle

The bald eagle is a federally threatened species and is found over most of North America, from Alaska and Canada to northern Mexico. Approximately 50,000 bald eagles are 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 nests in pine trees or bald cypress trees that are 1,000 feet or less from open water.

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 highest in winter when birds migrate from the north. Most of the birds congregate during the winter at Reelfoot Lake and Dale Hollow Reservoir, but bald eagles may be observed on almost any waterway in the state (Tennessee Wildlife Resources Agency [TWRA], 2004). Table 3-1 provides the number 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 3-1
Number of Wintering Bald Eagles at Woods Reservoir (1988-2004)
*J-85-5 Engine Test Burn Final Environmental Assessment*

| 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.

# 4.0 Environmental Consequences

## 4.1 Noise

Noise would be generated during 40 hours of tests using the J-85-5 engine. This engine powers multiple jets in use by the AF and NASA. During operation, this engine typically produces noise levels of 140 to 160 dBA at 10 feet with the afterburner operating.

Potential sensitive receptors for noise (Figure 4-1) include the persons conducting the engine test burns; staff, faculty, and students at UTSI; persons occupying residences in the vicinity of UTSI; and wildlife species, including federally protected species (bald eagle, gray bat, Indiana bat).

### 4.1.1 Proposed Action

Jet engine noise is loudest immediately behind and below an operating engine. The test facility would be arranged such that the engine exhaust would be directed west and not toward any nearby sensitive receptors. Noise levels halve (reduce by 3 dBA) as the distance from the source doubles (Danish Wind Industry Association, 1999).

As indicated in Table 1-1, typical testing would involve 1 hour of engine burn with 10 minutes spent at idle for engine warm-up, followed by 40 minutes of testing and 10 final minutes at idle for engine cool-down. Idle represents operating the engine at 50 percent power without the afterburner. During the 40 minutes of testing, power levels would be varied among intermediate, military, and maximum afterburner for recording instrument readings and taking photographs. In the intermediate power setting, the engine is operated at 75 percent power without the afterburner, military is 100 percent power without the afterburner, and maximum is 100 percent power with the afterburner operating at maximum. Test periods at a given power setting would last approximately 1.5 minutes, with the engine returned to the military setting between tests.

A preliminary engine test burn was conducted on 24 September 2004, and noise levels were recorded for each engine power setting. Noise levels were recorded at eight different locations adjacent to the test facility (Table 4-1, Figure 4-1). The maximum noise reading was observed outside the control cab near the test sled. The noise level at maximum afterburner reached 129 dBA, sufficiently high to cause hearing damage with extended exposure. However, no personnel would be in this area during testing and the control cab is insulated to protect observers during tests. Should emergency action be required, responders would wear hearing protection in addition to other required personal protection equipment.

The regularly occupied buildings nearest to the test facility are located approximately 500 feet from the test facility on the UTSI campus (Figure 2-2). These buildings are south of the test facility and not in a direct line with the engine exhaust. Preliminary tests indicate noise levels ranging from 85 dBA to 99 dBA at 400 feet directly behind the engine, depending on the engine power setting. Lytec and Intersoft are the businesses nearest to the test facility and are located across Woods Reservoir. Lytec is twice the distance from the test

facility in relation to the campus loop buildings. Noise levels were consistently lower at Lytec, reaching a maximum of 72 dBA during the maximum afterburner testing phase.

TABLE 4-1
Noise Levels Recorded During 24 September 2004 Test of J-85-5 Engine
*J-85-5 Engine Test Burn Final Environmental Assessment*

| Location | Distance from Source (feet) | Sound Levels Recorded at Each Power Setting (dBA) | | | |
|---|---|---|---|---|---|
| | | Idle (50%) | Intermediate (75%) | Military (100%) | Maximum Afterburner |
| 1. Outside Control Cab at Test Sled | 25 | 113 | 118 | 123 | 129 |
| 2. Directly behind Exhaust at Edge of Campus | 400 | 85 | 85.2 | 95 | 99 |
| 3. At Campus Entrance to Loop Road | 1,625 | 52 | 54 | 72 | 77 |
| 4. At Lytec in UTSI Industrial Complex | 3,750 | 50 | 50 | 59 | 72 |
| 5. At Nearest Residence | 5,500 | 50 | 50 | 58 | 65 |
| 6. At 4-Way Stop on Robert Kamm Road | 10,100 | 62 | 62 | 62 | 64 |
| 7. On Woods Reservoir Dam | 9,000 | 50 | 50 | 55 | 62 |
| 8. At Girl Scout Camp | 3,750 | Engine noise not detectable above background by observer. | | | |

At the edge of the campus loop, noise levels for full power without afterburner and maximum afterburner were 72 dBA and 77 dBA, respectively. Within buildings on the campus loop, the noise levels would be further reduced. Testing indicated that the noise of traffic passing on the roadway approximately 1.9 miles from the test facility exceeded that of the engine, and that engine noise ranged from 62 dBA to 64 dBA (Site 6).

At Woods Reservoir Dam, recorded noise levels ranged from 50 dBA to 65 dBA on the top of the dam depending on engine power setting. These noise levels would not be expected to adversely impact gray bats living in the dam. While not measured, noise levels in the gate rooms of the dam are noticeably higher that on the top of the dam, due to the noise of water rushing over the gates (personal observation, R.P. Reaves, March 2004).

Residences are present near the proposed test facility to the east and southwest. Southwest of the facility, the nearest residences are approximately 5,500 feet (site 5) from the test facility (Figure 4-1). Noise levels at these homes during afterburner tests would be expected to reach a maximum between 50 dBA and 65 dBA. The timing of the tests would minimize the number of potential receptors. Any impacts would be temporary and minor. Nearest residences to the east are approximately 9,800 feet from the facility across Woods Reservoir. Noise levels at these homes during afterburner tests would be expected to be near or below background levels, based on observations made at the Girl Scout Camp. The Girl Scout Camp is approximately 3,750 feet east of the test facility. During tests, engine noise was not detectable by an observer at the Girl Scout Camp. Most testing would occur during the daytime on weekdays, when fewer people would be at home or using the Girl Scout Camp.

The noise impacts associated with the engine test burn can best be characterized by comparison to the National Institute for Occupational Safety and Health (NIOSH) noise exposure standards (Table 4-2).

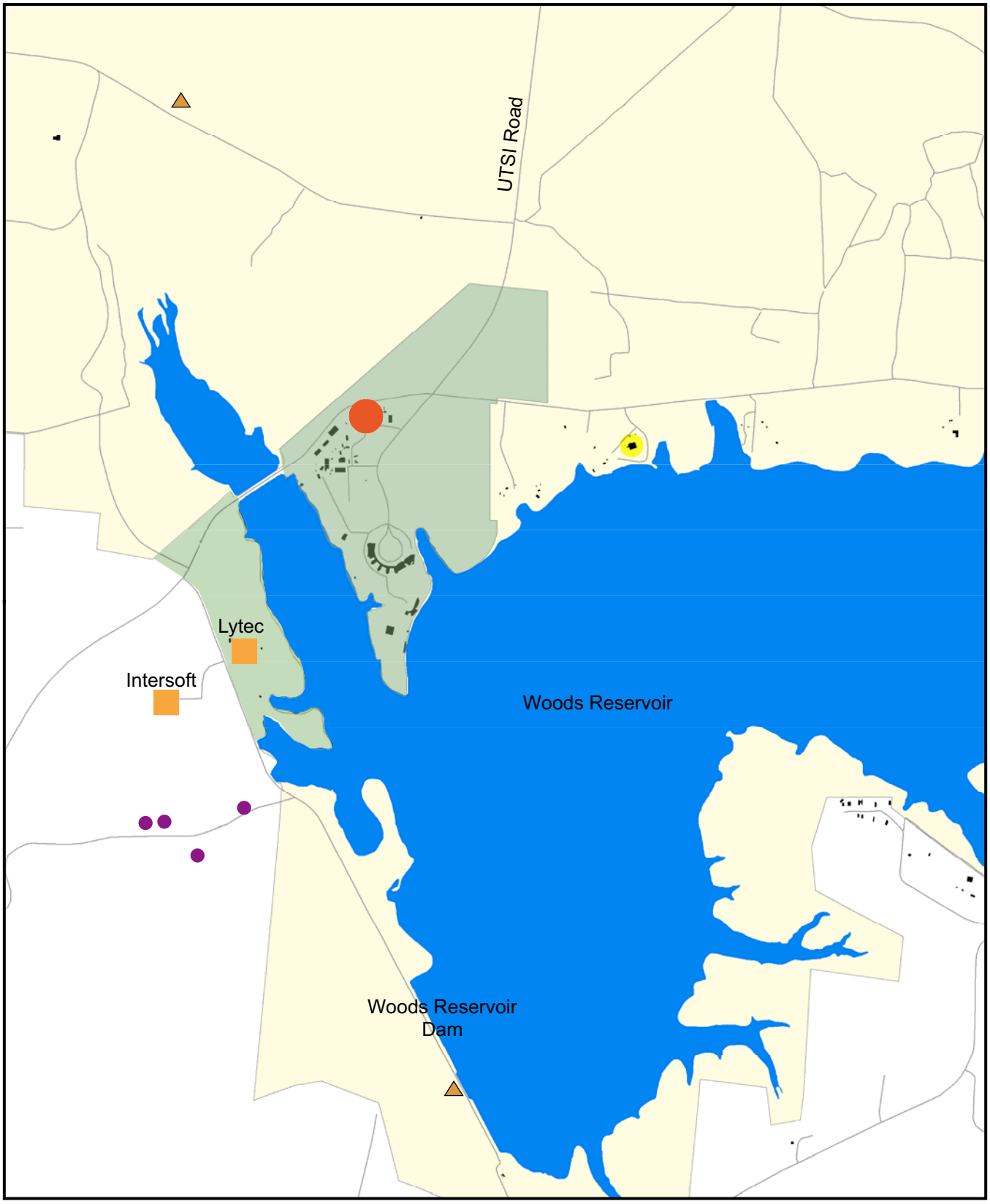



Figure 4-1
**Sensitive Noise Receptors**
*J-85-5 Engine Test Burn*
*Final Environmental Assessment*

E012005004ATL\Fig4-1.ai

TABLE 4-2
NIOSH Noise Exposure Levels and Exposure Duration for Workers
*J-85-5 Engine Test Burn Final Environmental Assessment*

| Noise Exposure Level (dBA) | Duration (hr:min) | Noise Exposure Level (dBA) | Duration (hr:min) |
|---|---|---|---|
| 80 | 25:24 | 93 | 1:16 |
| 81 | 20:10 | 94 | 1:0 |
| 82 | 16:0 | 95 | 0:48 |
| 83 | 12:42 | 96 | 0:38 |
| 84 | 10:5 | 97 | 0:30 |
| 85 | 8:0 | 98 | 0:24 |
| 86 | 6:21 | 99 | 0:19 |
| 87 | 5:2 | 100 | 0:15 |
| 88 | 4:0 | 105 | 0:5 |
| 89 | 3:10 | 110 | 0:1 |
| 90 | 2:31 | 115 | 0:0.47 |
| 91 | 2:0 | 120 | 0:0.15 |
| 92 | 1:35 | 125 | 0:0.05 |

Source: NIOSH, 1998; values indicate levels that are not to be equaled or exceeded.

Comparison of the observed noise readings to the NIOSH standards indicates that, with the exception of two locations (Sites 1 and 2), all of the levels fall within the 8-hour exposure levels established by NIOSH. Site 1 is located 25 feet and immediately behind the test sled. Personnel would be excluded from this location during the engine tests and would not be exposed to the noise levels observed during the preliminary test. Noise levels of 95 dBA and 99 dBA observed at Site 2 are associated with 100 percent power and maximum afterburner settings. NOISH standards indicate a noise level of 99 dBA can be experienced for up to 19 minutes without sustaining hearing loss. The maximum afterburner setting would be tested for a total of 10 minutes during the engine test burns. NIOSH standards indicate that a noise level of 95 dBA can be experienced for up to 48 minutes without sustaining hearing loss. The military power setting would be used for a total of 10 minutes during the test sequence. As a result, no significant noise impacts would result from the planned engine test burns.

### 4.1.2 No-Action Alternative

Under the No-Action Alternative, no tests would be conducted and there would be no impacts from noise to any potentially sensitive receptors.

## 4.2 Water Quality

### 4.2.1 Proposed Action

The Proposed Action has the potential to impact water quality through accidental release of kerosene or jet fuel from the engine during the diagnostic equipment tests and during

fueling activities prior to or during tests. No fuel would be stored at the test facility between test periods, so there is no potential for impacts from a leak in the fuel tank between tests. The test facility has both secondary and tertiary containment mechanisms to prevent an accidental release of jet fuel or kerosene from reaching Woods Reservoir and impacting water quality (Figure 4-2). The storage tank is contained within a dike on a concrete pad. Any spills from the tank would be contained within the dike until clean-up could be implemented. All ground surrounding the test facility is contoured to direct surface flow into a holding pond in the event of a spill that overflows the containment dike or a release from hose couplings at the jet engine outside the tank containment dike. The combination of site grading and the holding pond would prevent any jet fuel or kerosene from reaching Woods Reservoir. Therefore, no impacts to water quality are expected from the Proposed Action.

### 4.2.2 No-Action Alternative

Under the No-Action Alternative, no tests would be conducted and there would be no impacts to water quality.

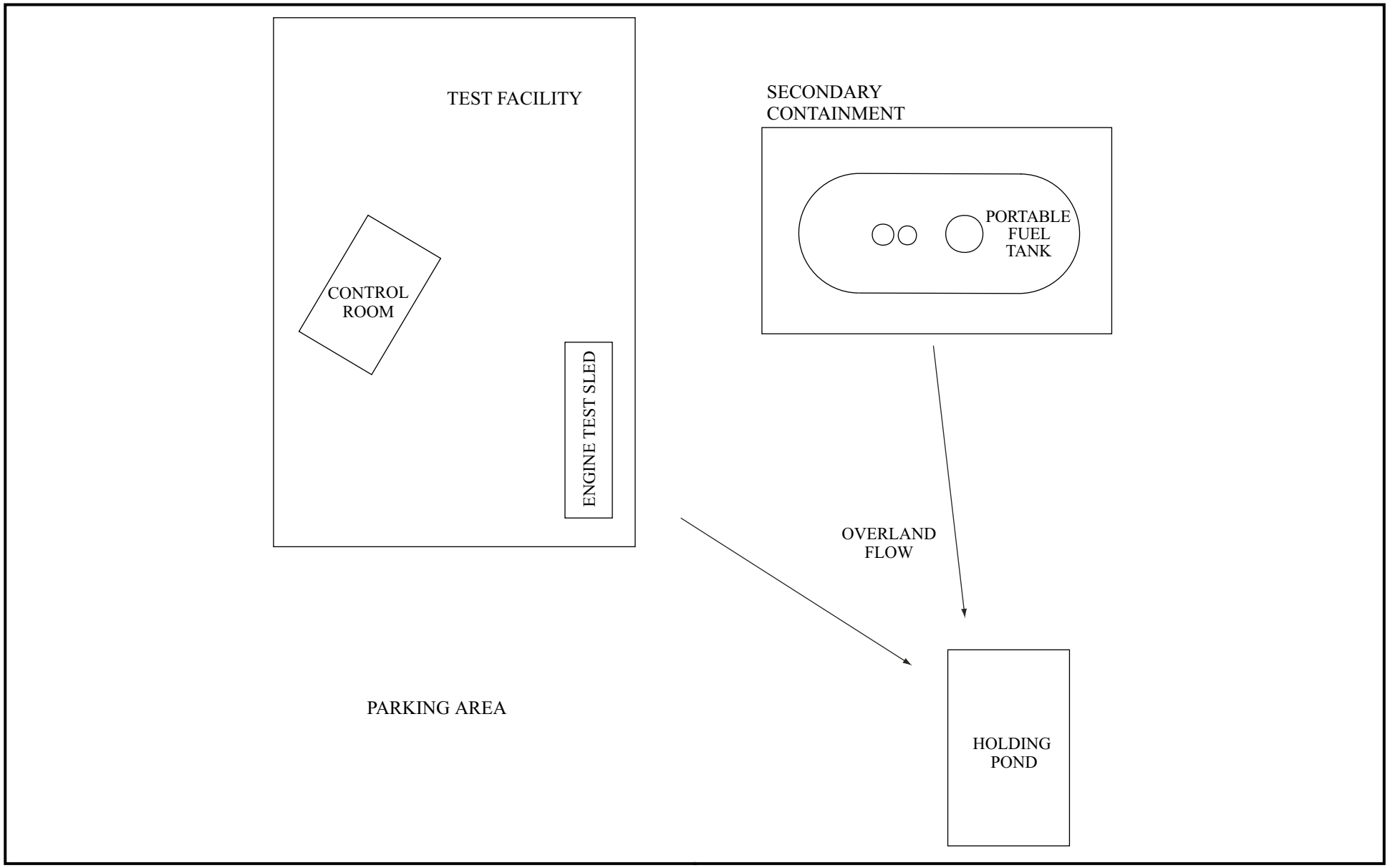
## 4.3 Air Quality

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 air basin, and the prevailing meteorological conditions.

### 4.3.1 Proposed Action

The Tennessee Air Pollution Control Board (of the TDEC) issued UTSI Air Permits 956920P and 057684P to authorize the J-85-5 engine test facility as an emissions source during the period of the tests (Appendices C and D, respectively). The permits limit the rate of fuel use (maximum of 8,200 pounds per hour) and hours of operation (maximum of 50 hours per year) to assure that air quality would not be impaired by the tests. Limits were established based on hourly emissions of the engine while operating at maximum fuel consumption (Table 4-3).

Forty hours of engine use is planned during testing. The remaining 10 hours would provide additional testing time in the event that problems occurred. This is within the 50 hours of engine use permitted annually by the TDEC air permit. As shown in Table 4-3, if all 40 hours of testing were to occur at maximum fuel consumption for the J-85-5 engine, the emissions would be below the permitted limits. It is not expected that all testing would occur at maximum fuel consumption.




NOT TO SCALE

N

Figure 4-2

**Spill Containment System for J-85 Test Facility**

*J-85-5 Engine Test Burn*

*Final Environmental Assessment*

Because the anticipated emissions from the engine during tests are well below the limits in the construction and operating permits, Permit Numbers 956920P and 057684P respectively, no adverse impacts to air quality are expected to result from the Proposed Action.

TABLE 4-3
Air Emissions Permitted for Engine Test Burns
*J-85-5 Engine Test Burn Final Environmental Assessment*

| Permitted Compound | Hourly Emissions at Maximum Permitted Fuel Consumption | Maximum Permitted Quantity of Emissions | Anticipated Total Quantity of Engine Emissions |
|---|---|---|---|
| Particulate Matter | 0.016 pounds per hour | 0.0004 ton per year | 0.0003 ton per year |
| Sulfur Dioxide | 9.00 pounds per hour[a] | 0.22 ton per year | 0.18 ton per year |
| Carbon Monoxide | 81.6 pounds per hour | 2.04 tons per year | 1.63 tons per year |
| Volatile Organic Compounds | 8.04 pounds per hour | 0.2 ton per year | 0.16 ton per year |
| Nitrogen Oxides | 3.12 pounds per hour | 0.08 ton per year | 0.06 ton per year |
| Visible Emissions | ≤ 20 % opacity | N/A | N/A |

[a] Sulfur content of fuel is further limited to no more than 0.3 percent by weight.

### 4.3.2 No-Action Alternative

Under the No-Action Alternative, no tests would be conducted and there would be no impacts to air quality.

## 4.4 Biological Resources

Potential impacts to biological resources could result from noise effects. These impacts are summarized below.

### 4.4.1 Proposed Action

Wildlife may be temporarily displaced from the area around the test facility during testing. This disturbance would be minor and wildlife would be expected to return to the area after each test is completed.

No adverse impacts to the Woods Reservoir Refuge located at Woods Reservoir and along the embayment of Rollins Creek would occur. Testing could occur as many as four times during the 1 December to 31 January period when recreational activity is prohibited. The noise levels produced during the intermittent testing, however, are not expected to exceed 77 dBa within the refuge for short time periods, less than 1.5 minutes on average. The noise of the engine is likely to be less than that of some motor vehicles driven through the refuge on Robert Kamm Road. Any impacts from the engine burns are expected to be temporary and minor.

#### Indiana Bat

Indiana bats have not been detected near the proposed test facility. This species could begin using the area during the testing period, though bat use would occur at night when testing is not being conducted. An Indiana bat maternity colony would have to be established near the test facility for any impacts to the species to occur. This is very unlikely given the lack of

previous use of this area by Indiana bats. Bachelor males would likely avoid the area during testing, but this would not adversely affect the species.

#### Gray Bat

Gray bat foraging would not be affected by the engine tests because the times of day for the tests and for foraging would not coincide.

The gray bat maternity colony and an adjacent bachelor male roost are located in gate rooms of the Woods Reservoir Dam, approximately 9,000 feet from the test facility. The dam is not directly along the exhaust path of the engine, as the test facility is structured, and would not be subjected to the full noise level of the engine. Noise measurements recorded during a test burn of the J-85-5 engine indicated noise levels at the top of the dam would be 62 dBa during testing at maximum afterburner. This noise level would not be expected to negatively affect gray bats in the dam gate rooms.

#### Bald Eagle

As discussed above, bald eagles may be temporarily displaced from Woods Reservoir in the vicinity of the test facility. However, this is only a small part of the reservoir and the disturbance would be confined to a 3-week period. The short duration of the disturbance would result in minor short-term displacement. Bald eagles could return to the area after each test was completed. No impacts on water quality are expected, so impacts (if any) to the prey base for bald eagles would be negligible. As a result, no significant direct, indirect, or cumulative impacts on bald eagles are expected to result from the Proposed Action.

### 4.4.2 No-Action Alternative

Under the No-Action Alternative, no tests would be conducted and there would be no impacts to biological resources.

# 5.0 Plan, Permit, and Management Requirements

Air permits, pursuant to the Tennessee Air Quality Act, have been issued for proposed J-85-5 engine testing. The Tennessee Air Pollution Control Board issued Permit Number 956920P on 17 February 2004 (Appendix C). This air permit covered initial testing of the J-85-5 engine and expires on 1 February 2005. An operating permit has been issued for ongoing testing, Permit Number 057584P (Appendix D). The operating permit expires on 1 April 2013.

UTSI has been issued an NPDES stormwater permit for the J-85-5 facility. NPDES Permit Number TN0056430, issued by TDEC, is valid through 31 March 2007, for the facility (Appendix B). This permit authorizes discharge of coal pile runoff from outfall 001 into Rollins Creek at mile 1.1. This permit covers stormwater runoff from the J-85-5 facility.

UTSI does not have a permit for discharge of cooling or process water from the J-85-5 facility. No process or cooling water could be used in the engine tests without an appropriate permit from TDEC.

# 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

David Dunagan/Technical Editor/26 years of experience/Master of Arts

# 7.0 List of Contacts

Richard McWhite, Civ AEDC/SED

Steve Farrington, Aerospace Testing Alliance Natural Resources

Kevin Fitch, Aerospace Testing Alliance Natural Resources

Mark Moran, Aerospace Testing Alliance Natural Resources

Greg Beitel, Aerospace Testing Alliance/TE53

Wesley McMinn, University of Tennessee Space Institute

# 8.0 References


ACS Conservation. 2003a. Two-Year Forest Management Plan 2004-2005. Environmental Management, Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.

ACS Conservation. 2003b. Two-Year Conservation Management Plan 2004-2005. Environmental Management, Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.

Bailey, M., K. Bailey, J. Holmes, G. Gerald, and CH2MHILL. 2003. Northern pine snake (Pituophis melanoleucus melanoleucus) ecological assessment on Arnold Air Force Base, Tennessee. Technical report prepared for Arnold Engineering Development Center.

Brahana, J. V., and M. W. Bradley. Preliminary Delineation and Description of the Regional Aquifers of Tennessee--The Highland Rim Aquifer System: U.S. Geological Survey, Water-Resources. 1986.

Call, G. 2003. Integrated Ecosystem Management Plan - Protecting, restoring, and managing using the principles of Ecosystem Management. Arnold Engineering Development Center, Arnold Air Force Base, Tennessee. ACS, Environmental Services, Conservation. September 2003.

CH2M HILL. 2002. Land Use Characterization: Final Report. Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.

Danish Wind Industry Association. 2004. WINDPOWER.ORG. http//www.windpower.org/css/ps.htm?10

dB Engineering. 2004. Tutorial: everyday noise list. www.800nonoise.com/tutorial_noiselist .htm

Hajic, E., W.J. Bennett, Jr., W. Isenberger, J. Northrip, and R. Bennett. 2002. Draft Report: Archeological Site Evaluation – Native American. Arnold Engineering Development Center, Arnold Air Force Base, Tennessee.

Lamb, J.W. Gray Bat Management Plan for Arnold Air Force Base. Environmental Management, Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee. 2003b.

Lamb, J.W. 2004a. Annual Report For Partners In Flight Point Counts (A.3018) Arnold Air Force Base/Arnold Engineering Development Center (AEDC). Technical report prepared for Arnold Engineering Development Center.

Lamb, J.W. 2004b. Baseline bat fauna inventory final report. Technical report prepared for Arnold Engineering Development Center.

League for the Hard of Hearing. 2004. Noise levels in our environment fact sheet. www.lhh.org/noise/decibel.htn

Love, T., L. D. Williams, W. H. Proffitt, I. B. Epley, and J. Elder. Soil Survey of Coffee County, Tennessee: U.S. Department of Agriculture, Soil Conservation Service, Series 1956, No. 5, 112 pp. 1959.

Miller, R.A., 1974, The geologic history of Tennessee, Tennessee Division of Geology Bulletin 74, 63 p.

Mullen, D., B. Miller, B. Cushing, J. Williams. 1995. An investigation and assessment of rare, threatened, and endangered fauna and their habitats on Arnold Air Force Base: invertebrates, fish, amphibians, reptiles, mammals, and birds. Technical report prepared for Arnold Engineering Development Center.

Murphy, T.M., F.M. Bagley, W. Dubuc, D. Mager, S.A. Nesbitt, W.B. Robertson, and B. Sanders. 1989. The Southeastern States Bald Eagle Recovery Plan – Revision. Region Four U.S. Fish and Wildlife Service, Atlanta Georgia.

National Institute for Occupational Safety and Health. 1998. Criteria for a Recommended Standard: Occupational Noise Exposure. June 1998. NIOSH Publication No. 98-126. http://www.cdc.gov/niosh/98-126.pdf

Patterson, W. B. Vegetation and Soils of the Sinking Pond Area, Coffee County, Tennessee: Knoxville, University of Tennessee, M.S. Thesis, 105 pp. 1989.

Peyton, P.M. 2004a. Preliminary Draft report: Historic Building and Associated Landscape Inventory and Evaluation, Arnold Air Force Base, Tennessee. Volume I. Prepared for the United States Air Force AEDC/SDE, Arnold AFB, Tennessee.

Peyton, P.M. 2004b. Preliminary Draft report: Historic Building and Associated Landscape Inventory and Evaluation, Arnold Air Force Base, Tennessee. Volume II. Prepared for the United States Air Force AEDC/SDE, Arnold AFB, Tennessee.

Pullin, P. P. 1980. Nest distribution the sinking pond colony. A report to the Tennessee Valley Authority.

Pullin, P. P. 1990. Size and trends of wading bird populations in Tennessee during 1977-1988. The Migrant 61(4): 95-104.

Roberts, T.H., M.S. Peterson, and CH2M HILL. 2001. Wetland fauna and drainage basin studies: spatial aspects of habitat use by birds in and around forested depressional and flats wetlands. Prepared for Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.

Rommé, R.C. and R.P. Reaves. 1999. Fort Leonard Wood Endangered Species Management Plan for the Indiana Bat (Myotis sodalis), Gray Bat (Myotis grisescens), and Bald Eagle (Haliaeetus leucocephalus). Directorate of Public Works, Fort Leonard Wood Energy, Environment and Natural Resources Division.

Semlitsch, R.D. 1998. Biological delineation of terrestrial buffer zones for pond-breeding salamanders. Conservation Biology 12: 1113-1119.

Smalley, G.W. Classification and Evaluation of Forest Sites on the Eastern Highland Rim and Pennyroyal: New Orleans, USDA Forest Service, Southern Forest Experiment Station, General Technical Report SO-43, 123pp. 1983.

Smith, K.E. 2004. Physiography of Tennessee. Tennessee Archaeology Network, Middle Tennessee State University. (http://www.mtsu.edu/~kesmith/TNARCHNET/physio.html).

Springer, M. E. and J. A. Elder. Soils of Tennessee: University of Tennessee Agricultural Experiment Station Bulletin 586. 1980.

Tennessee Department of Agriculture Division of Forestry. 2003. Guide to Forestry Best Management Practices. http://www.state.tn.us/agriculture/forestry/bmpmanual.html.

Tennessee Department of Environment and Conservation, Division of Water Supply. 2002. Tennessee Ground Water Report, 305b Water Quality Report, November 2002.

Tennessee Department of Environment and Conservation (TDEC). 2002a. Tennessee Ground Water Report, 305b Water Quality Report. http://www.state.tn.us/environment/water.php.

Tennessee Department of Environment and Conservation (TDEC). 2002b. 2002 305(b) Report: The Status of Water Quality in Tennessee. http://www.state.tn.us/environment/water.php.

Tennessee Wildlife Resources Agency (TWRA). 2004. Eagle Count Scheduled for January. http://www.state.tn.us/twra/eaglecount.html.

TRC Garrow Associates, Inc., M.T. Cleveland, and J.L. Holland. 2001. Historic Building Survey and Evaluation, Arnold Air Force Base, Coffee and Franklin Counties, Tennessee, Draft Report. Prepared for Arnold Engineering and Development Center, Arnold Air Force Base, Tennessee.

U.S. Air Force. 1995. Air Force Instruction 32-7061, The Environmental Impact Analysis Process. 24 January 1995.

U.S. Air Force. 2000. General Plan: Arnold Engineering Development Center.

U.S. Army Corps of Engineers (USACE). 1998. *Draft Environmental Impact Statement : Water Allocation for the Apalachicola-Chattahoochee-Flint (ACF) River Basin*. Mobile District.

USDA Soil Conservation Service (SCS). 1949. Soil Survey Series of Franklin County, Tennessee. In cooperation with Tennessee Agricultural Experiment Station Tennessee Valley Authority.

USEPA. 2004a. Section 303(d) List Fact Sheet for Watershed Upper Elk. February 2004. http://oaspub.epa.gov/pls/tmdl/huc_rept.control?p_huc=06030003&p_huc_desc=UPPER%20ELK.

USEPA. 2004b. Construction Site Storm Water Runoff Control. February 2004. http://cfpub1.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm.

US Fish and Wildlife Service (USFWS). 1982. Gray Bat Recovery Plan. Denver, Co. 16pp with appendices.

US Fish and Wildlife Service (USFWS). 1999. Agency Draft Indiana Bat (Myotis sodalis) Revised Recovery Plan. Fort Snelling, Minnesota. 53pp.

Whitaker, J.O., Jr. and W.H. Hamilton, Jr. 1998. Mammals of the Eastern United States. Comstock Publishing Associates. Ithaca, New York. 583 pp.

White, D. L. and J. A. Ratzlaff. 2000. Recovery plan for Helianthus eggertii Small (Eggert's sunflower). Region Four U. S. Fish and Wildlife Service, Atlanta, Georgia.

Wilson, C. W., 1976, Geologic map and mineral resources summary of the Manchester quadrangle, Tennessee Division of Geology, MRS 86-NE, scale 1:24,000.

# Appendix A

## Air Force Form 813 —
## Request for Environmental Impact Analysis

# REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS

Report Control Symbol RCS: AAFB-04-043

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. |
|---|---|---|
| Philip Sherrill | Gregg Beitel / TE53 | 931-454-6265 |

3. TITLE OF PROPOSED ACTION

J-85-5 ~~Demo~~ Test @ UTSI-Coal-Fired Flow Facility (CFFF)

4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)*

Need to ensure compliance with NEPA

5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)*

A J-85-5 jet engine will be operated over the next 18 months. Testing will take place approximately 8 hours every other month. Total engine run time will be less than 50 hours.

| 6. PROPONENT APPROVAL *(Name and Grade)* | 6a. SIGNATURE | 6b. DATE |
|---|---|---|
| Gregg Beitel / ATA | V. A. Zaccardi for Gregg Beitel | 20040302 |

| **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) # ~~A2-3.27~~ ; OR

☒ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS

Environmental Assessment (EA) required.
See Continuation Sheet.

| 19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)* | 19a. SIGNATURE | 19b. DATE |
|---|---|---|
| FRANK A. DUNCAN, GS-13<br>Deputy, Environmental Mgt. Div. | | |

18. AAFB-04- 043

**Interdisciplinary Team Review**

Public Affairs: No issues.

Compliance (Air/Water): UTSI has applied for, and been issued, a TDEC air quality operating permit. There may be some slight negative impacts from unburned hydrocarbons in the engine exhaust and a slight risk of a fuel spill.

Natural Resources: No issues.

Cultural Resources: No issues.

Hazardous Materials: No issues.

Hazardous Waste: No issues.

Restoration: No issues.

Safety/Health: No issues.

# Appendix B

# NPDES Stormwater Discharge Permit Number TN0054630

STATE OF TENNESSEE
**DEPARTMENT OF ENVIRONMENT AND CONSERVATION**
**401 CHURCH STREET**
**L & C ANNEX 6TH FLOOR**
**NASHVILLE TN 37243-1534**

February 28, 2004

Mr. Joel Muehlhauser
Assistant Vice President and Dean for R&D
The University of Tennessee Space Institute
B.H. Goethert Parkway
Tullahoma, TN 37388-9700

Subject: NPDES Permit No. TN0056430
The University of Tennessee Space Institute
Tullahoma, Franklin County, Tennessee

Dear Mr. Muehlhauser:

In accordance with the provisions of the Tennessee Water Quality Control Act, Tennessee Code Annotated, Sections 69-3-101 through 69-3-120, the Division of Water Pollution Control hereby issues the enclosed NPDES Permit. The continuance and/or reissuance of this NPDES Permit is contingent upon your meeting the conditions and requirements as stated therein.

Please be advised that you have the right to appeal any of the provisions established in this NPDES Permit, in accordance with Tennessee Code Annotated, Section 69-3-110, and the General Regulations of the Tennessee Water Quality Control Board. If you elect to appeal, you should file a petition within thirty (30) days of the receipt of this permit.

If you have questions, please contact the Division of Water Pollution Control at your local Environmental Assistance Center at 1-888-891-TDEC; or, at this office, please contact Mr. Vojin Janjic at (615) 532-0670 or by E-mail at *Vojin.Janjic@state.tn.us*.

Sincerely,

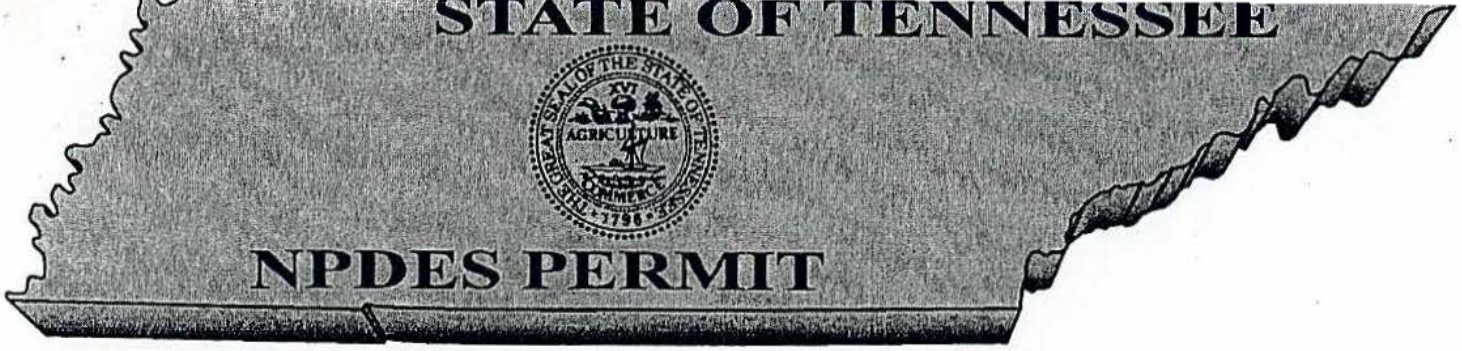
Saya Ann Qualls

Saya Ann Qualls, P.E.
Manager, Permit Section
Division of Water Pollution Control

SAQ/VMJ

Enclosure

cc: Division of Water Pollution Control, Permit Section
Division of Water Pollution Control, Environmental Assistance Center - Columbia




## No. TN0056430

Authorization to discharge under the
National Pollutant Discharge Elimination System (NPDES)

Issued By

**Tennessee Department of Environment and Conservation**
**Division of Water Pollution Control**
**401 Church Street**
**6th Floor, L & C Annex**
**Nashville, Tennessee 37243-1534**

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

| | |
|---|---|
| Discharger: | **The University of Tennessee Space Institute** |
| is authorized to discharge: | **coal pile runoff from Outfall 001** |
| from a facility located: | **in Tullahoma, Franklin County, Tennessee** |
| to receiving waters named: | **Rollins Creek at mile 1.1** |

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

| | |
|---|---|
| This permit shall become effective on: | **April 1, 2004** |
| This permit shall expire on: | **March 31, 2007** |
| Issuance date: | **March 1, 2004** |

Paul E. Davis, Director
Division of Water Pollution Control

CN-0759

RDAs 2352 and 2366

# TABLE OF CONTENTS

## PART III



## RATIONALE

# APPENDIX



VMJ

TN0056430.DOC

# PART I

## A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The University of Tennessee Space Institute is authorized to discharge coal pile runoff from Outfall 001 to Rollins Creek at mile 1.1.

These discharges shall be limited and monitored by the permittee as specified below:

**PERMIT LIMITS**

**OUTFALL 001**
**COAL PILE RUNOFF**

| EFFLUENT CHARACTERISTIC | EFFLUENT LIMITATIONS | | | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| | MONTHLY | | DAILY | | | |
| | AVG. CONC. (mg/l) | AVG. AMNT. (lb/day) | MAX. CONC. (mg/l) | MAX. AMNT. (lb/day) | MSRMNT. FRQNCY. | SAMPLE TYPE |
| FLOW | Report (MGD) * | | Report (MGD) * | | 1/Year | Estimate |
| pH | Report | | | | 1/Year | Grab |
| TSS | -- | -- | Report | -- | 1/Year | Grab |

* Flow shall be reported in million gallons per day (MGD).
** pH analyses shall be performed within fifteen (15) minutes of sample collection.

Additional monitoring requirements and conditions applicable to Outfall 001 include:

There shall be no distinctly visible floating scum, oil or other matter contained in the wastewater discharge. The wastewater discharge must not cause an objectionable color contrast in the receiving stream.

The wastewater discharge shall not contain pollutants in quantities that will be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

Sludge or any other material removed by any treatment works must be disposed of in a manner which prevents its entrance into or pollution of any surface or subsurface waters. Additionally, the disposal of such sludge or other material must be in compliance with the Tennessee Solid Waste Disposal Act, TCA 68-31-101 et seq. and the Tennessee Hazardous Waste Management Act, TCA 68-46-101 et seq.

## B. MONITORING PROCEDURES

### 1. Representative Sampling

Samples and measurements taken in compliance with the monitoring requirements specified herein shall be representative of the volume and nature of the monitored discharge, and shall be taken after treatment and prior to mixing with uncontaminated storm water runoff or the receiving stream.

### 2. Sampling Frequency

If there is a discharge from a permitted outfall on any given day during the monitoring period, the permittee must sample and report the results of analyses accordingly, and the permittee should not mark the 'No Discharge' box on the Discharge Monitoring Report form.

### 3. Test Procedures

**a.** Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304 (h) of the Clean Water Act (the "Act"), as amended, under which such procedures may be required.

**b.** Unless otherwise noted in the permit, all pollutant parameters shall be determined according to methods prescribed in Title 40, CFR, Part 136, as amended, promulgated pursuant to Section 304 (h) of the Act.

### 4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

**a.** The exact place, date and time of sampling;

**b.** The exact person(s) collecting samples;

**c.** The dates and times the analyses were performed;

**d.** The person(s) or laboratory who performed the analyses;

**e.** The analytical techniques or methods used, and;

**f.** The results of all required analyses.

### 5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of three (3) years, or longer, if requested by the Division of Water Pollution Control.

## C. DEFINITIONS

The ***Daily Maximum Concentration*** is a limitation on the average concentration, in milligrams per liter (mg/L), of the discharge during any calendar day. When a proportional-to-flow composite sampling device is used, the daily concentration is the concentration of that 24-hour composite; when other sampling means are used, the daily concentration is the arithmetic mean of the concentrations of equal volume samples collected during any calendar day or sampling period.

The ***Monthly Average Concentration***, a limitation on the discharge concentration, in milligrams per liter (mg/L), is the arithmetic mean of all daily concentrations determined in a one-month period. For the purpose of this definition, a frequency of 2/Month is representative of 2 separate daily samples, each sample having been collected on a separate day during the monitoring period.

The ***Instantaneous Concentration*** is a limitation on the concentration, in milligrams per liter (mg/L), of any pollutant contained in the discharge determined from a grab sample taken at any point in time.

A ***Grab Sample***, for the purposes of this permit, is defined as a single effluent sample of at least 100 milliliters collected at a randomly selected time over a period not exceeding 15 minutes. The sample(s) shall be collected at the period(s) most representative of the total discharge.

For the purpose of this permit, a ***Calendar Day*** is defined as any 24-hour period.

For the purpose of this permit, ***Annually*** is defined as a monitoring frequency of once every twelve (12) months beginning with the date of issuance of this permit so long as the following set of measurements for a given 12 month period are made approximately 12 months subsequent to that time.

***Wet Weather Flow*** shall be construed to represent storm water runoff which, in combination with all process and/or non-process wastewater discharges, as applicable, is discharged during a qualifying storm event.

A **Qualifying Storm Event** is one which is greater than 0.1 inches and that occurs after a period of at least 72 hours after any previous storm event with rainfall of 0.1 inches or greater.

## D. REPORTING

### 1. Monitoring Results

Monitoring results shall be recorded annually and submitted annually using Discharge Monitoring Report (DMR) forms supplied by the Division of Water Pollution Control. Submittals shall be postmarked no later than 15 days after the completion of the reporting period. The top two copies of each report are to be submitted. A copy should be retained for the permittee's files. DMRs and any communication regarding compliance with the conditions of this permit must be sent to:

**TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION**
**DIVISION OF WATER POLLUTION CONTROL**
**COMPLIANCE REVIEW SECTION**
**401 CHURCH STREET**
**L & C ANNEX 6TH FLOOR**
**NASHVILLE TN 37243-1534**

The first DMR is due on the fifteenth of the month following permit effectiveness.

DMRs and any other information or report must be signed and certified by a responsible corporate officer as defined in 40 CFR 122.22, a general partner or proprietor, or a principal municipal executive officer or ranking elected official, or his duly authorized representative. Such authorization must be submitted in writing and must explain the duties and responsibilities of the authorized representative.

The electronic submission of DMRs will be accepted only if approved in writing by the Division. For purposes of determining compliance with this permit, data submitted in electronic format will carry the same weight as data submitted on signed and certified DMR forms.

**2. Additional Monitoring by Permittee**

If the permittee monitors any pollutant specifically limited by this permit more frequently than required at the location(s) designated, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the DMR form. Such increased frequency shall also be indicated on the form.

**3. Falsifying Results and/or Reports**

Knowingly making any false statement on any report required by this permit or falsifying any result may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act, as amended, and in Section 69-3-115 of the Tennessee Water Quality Control Act.

**4. Outlier Data**

Outlier data include analytical results that are probably false based on operational knowledge and a properly implemented quality assurance program. They may include laboratory artifacts, potential sample tampering, broken or suspect sample containers, sample contamination or similar demonstrated quality control flaw.

Outlier data are identified through a properly implemented quality assurance program, and according to ASTM standards (e.g. Grubbs Test, 'h' and 'k' statistics). Furthermore, outliers should be verified, corrected, or removed, based on further inquiries into the matter. If an outlier was verified (through repeated testing and/or analysis), it should remain in the preliminary data set. If an outlier resulted from a transcription or similar clerical error, it should be corrected and subsequently reported.

Therefore, only if an outlier was associated with problems in the collection or analysis of the samples, and as such does not conform with the Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 CFR §136), it can be removed from the data set and not

reported on the Discharge Monitoring Report forms (DMRs). Otherwise, all results (including monitoring of pollutants more frequently than required at the location(s) designated, using approved analytical methods as specified in the permit), should be included in the calculation and reporting of the values required in the DMR form. You are encouraged to use "comment" section of the DMR form (or attach additional pages), in order to explain any potential outliers or dubious results.

## E. SCHEDULE OF COMPLIANCE

Full compliance and operational levels shall be attained from the effective date of this permit.

# PART II

## A. GENERAL PROVISIONS

### 1. Duty to Reapply

Permittee is not authorized to discharge after the expiration date of this permit. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit such information and forms as are required to the Director of Water Pollution Control (the "Director") no later than 180 days prior to the expiration date. Such applications must be properly signed and certified.

### 2. Right of Entry

The permittee shall allow the Director, the Regional Administrator of the U.S. Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials:

**a.** To enter upon the permittee's premises where an effluent source is located or where records are required to be kept under the terms and conditions of this permit, and at reasonable times to copy these records;

**b.** To inspect at reasonable times any monitoring equipment or method or any collection, treatment, pollution management, or discharge facilities required under this permit; and

**c.** To sample at reasonable times any discharge of pollutants.

### 3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Water Pollution Control Act, as amended, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division of Water Pollution Control. As required by the Federal Act, effluent data shall not be considered confidential.

### 4. Proper Operation and Maintenance

**a.** The permittee shall at all times properly operate and maintain all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory and process controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. Backup continuous pH and flow monitoring equipment are not required.

**b.** Dilution water shall not be added to comply with effluent requirements to achieve BCT, BPT, BAT and or other technology-based effluent limitations such as those in State of Tennessee Rule 1200-4-5-.03.

### 5. Treatment Facility Failure

The permittee, in order to maintain compliance with this permit, shall control production, all discharges, or both, upon reduction, loss, or failure of the treatment facility, until the facility is restored or an alternative method of treatment is provided. This requirement applies in such situations as the reduction, loss, or failure of the primary source of power.

### 6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

### 7. Severability

The provisions of this permit are severable. If any provision of this permit due to any circumstance, is held invalid, then the application of such provision to other circumstances and to the remainder of this permit shall not be affected thereby.

### 8. Other Information

If the permittee becomes aware that he failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, then he shall promptly submit such facts or information.

## B. CHANGES AFFECTING THE PERMIT

### 1. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

**a.** The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

**b.** The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

### 2. Permit Modification, Revocation, or Termination

**a.** This permit may be modified, revoked and reissued, or terminated for cause as described in 40 CFR 122.62 and 122.64, Federal Register, Volume 49, No. 188 (Wednesday, September 26, 1984), as amended.

**b.** The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

**c.** If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established for any toxic pollutant under Section 307(a) of the Federal Water Pollution Control Act, as amended, the Director shall modify or revoke and reissue the permit to conform to the prohibition or to the effluent standard, providing that the effluent standard is more stringent than the limitation in the permit on the toxic pollutant. The permittee shall comply with these effluent standards or prohibitions within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified or revoked and reissued to incorporate the requirement.

**d.** The filing of a request by the permittee for a modification, revocation, reissuance, termination, or notification of planned changes or anticipated noncompliance does not halt any permit condition.

### 3. Change of Ownership

This permit may be transferred to another party (provided there are neither modifications to the facility or it's operations, nor any other changes which might affect the permit limits and conditions contained in the permit) by the permittee if:

**a.** The permittee notifies the Director of the proposed transfer at least 30 days in advance of the proposed transfer date;

**b.** The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage, and liability between them; and

**c.** The Director, within 30 days, does not notify the current permittee and the new permittee of his intent to modify, revoke or reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

Pursuant to the requirements of 40 CFR 122.61, concerning transfer of ownership, the permittee must provide the following information to the Division in their formal notice of intent to transfer ownership: 1) the NPDES permit number of the subject permit; 2) the effective date of the proposed transfer; 3) the name and address of the transferor; 4) the name and address of the transferee; 5) the names of the responsible parties for both the transferor and transferee; 6) a statement that the transferee assumes responsibility for the subject NPDES permit; 7) a statement that the transferor relinquishes responsibility for the subject NPDES permit; 8) the signatures of the responsible parties for both the transferor and transferee pursuant to the requirements of 40 CFR 122.22(a), "Signatories to permit applications"; and, 9) a statement regarding any proposed modifications to the facility, it's operations, or any other changes which might affect the permit limits and conditions contained in the permit.

### 4. Change of Mailing Address

The permittee shall promptly provide to the Director written notice of any change of mailing address. In the absence of such notice the original address of the permittee will be assumed to be correct.

## C. NONCOMPLIANCE

### 1. Effect of Noncompliance

All discharges shall be consistent with the terms and conditions of this permit. Any permit noncompliance constitutes a violation of applicable State and Federal laws and is grounds for enforcement action, permit termination, permit modification, or denial of permit reissuance.

### 2. Reporting of Noncompliance

**a.** 24-Hour Reporting

In the case of any noncompliance which could cause a threat to public drinking supplies, or any other discharge which could constitute a threat to human health or the environment, the required notice of non-compliance shall be provided to the Division of Water Pollution Control in the appropriate Environmental Assistance Center within 24-hours from the time the permittee becomes aware of the circumstances. (The Environmental Assistance Center should be contacted for names and phone numbers of environmental response personnel).

A written submission must be provided within five days of the time the permittee becomes aware of the circumstances unless this requirement is waived by the Director

on a case-by-case basis. The permittee shall provide the Director with the following information:

**i.** A description of the discharge and cause of noncompliance;

**ii.** The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

**iii.** The steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

**b.** Scheduled Reporting

For instances of noncompliance which are not reported under subparagraph 2.a. above, the permittee shall report the noncompliance on the Discharge Monitoring Report. The report shall contain all information concerning the steps taken, or planned, to reduce, eliminate, and prevent recurrence of the violation and the anticipated time the violation is expected to continue.

**3. Overflow**

a. "***Overflow***" means the discharge to land or water of wastes from any portion of the collection, transmission, or treatment system other than through permitted outfalls.

b. Overflows are prohibited.

c. The permittee shall operate the collection system so as to avoid overflows. No new or additional flows shall be added upstream of any point in the collection system, which experiences chronic overflows (greater than 5 events per year) or would otherwise overload any portion of the system.

d. Unless there is specific enforcement action to the contrary, the permittee is relieved of this requirement after: 1) an authorized representative of the Commissioner of the Department of Environment and Conservation has approved an engineering report and construction plans and specifications prepared in accordance with accepted engineering practices for correction of the problem; 2) the correction work is underway; and 3) the cumulative, peak-design, flows potentially added from new connections and line extensions upstream of any chronic overflow point are less than or proportional to the amount of inflow and infiltration removal documented upstream of that point. The inflow and infiltration reduction must be measured by the permittee using practices that are customary in the environmental engineering field and reported in an attachment to a Monthly Operating Report submitted to the local TDEC Environmental Assistance Center. The data measurement period shall be sufficient to account for seasonal rainfall patterns and seasonal groundwater table elevations.

e. In the event that more than five (5) overflows have occurred from a single point in the collection system for reasons that may not warrant the self-imposed moratorium or completion of the actions identified in this paragraph, the permittee may request a meeting with the Division of Water Pollution Control EAC staff to petition for a waiver based on mitigating evidence.

**4. Upset**

**a.** "***Upset***" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

**b.** An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence that:

**i.** An upset occurred and that the permittee can identify the cause(s) of the upset;

**ii.** The permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

**iii.** The permittee submitted information required under "Reporting of Noncompliance" within 24-hours of becoming aware of the upset (if this information is provided orally, a written submission must be provided within five days); and

**iv.** The permittee complied with any remedial measures required under "Adverse Impact."

**5. Adverse Impact**

The permittee shall take all reasonable steps to minimize any adverse impact to the waters of Tennessee resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

**6. Bypass**

**a.** "***Bypass***" is the intentional diversion of wastewater away from any portion of a treatment facility. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

**b.** Bypasses are prohibited unless the following 3 conditions are met:

i. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There are not feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down-time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment down-time or preventative maintenance;

iii. The permittee submits notice of an unanticipated bypass to the Division of Water Pollution Control in the appropriate environmental assistance center within 24-hours of becoming aware of the bypass (if this information is provided orally, a written submission must be provided within five days). When the need for the bypass is foreseeable, prior notification shall be submitted to the Director, if possible, at least 10 days before the date of the bypass.

**c.** Bypasses not exceeding limitations are allowed **only** if the bypass is necessary for essential maintenance to assure efficient operation. All other bypasses are prohibited. Allowable bypasses not exceeding limitations are not subject to the reporting requirements of 6.b.iii, above.

**7. Washout**

**a.** For domestic wastewater plants only, a "washout" shall be defined as loss of Mixed Liquor Suspended Solids (MLSS) of 30.00% or more. This refers to the MLSS in the aeration basin(s) only. This does not include MLSS decrease due to solids wasting to the sludge disposal system. A washout can be caused by improper operation or from peak flows due to infiltration and inflow.

**b.** A washout is prohibited. If a washout occurs the permittee must report the incident to the Division of Water Pollution Control in the appropriate Environmental Assistance Center within 24-hours by telephone. A written submission must be provided within 5 days. The washout must be noted on the discharge monitoring report. Each day of a washout is a separate violation.

## D. LIABILITIES

### 1. Civil and Criminal Liability

Except as provided in permit conditions for "**Bypassing,**" "**Overflow,**" and "**Upset,**" nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the State of Tennessee, including but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the discharge of wastewater to any surface or subsurface waters. Additionally, notwithstanding this Permit, it shall be the responsibility of the

permittee to conduct its wastewater treatment and/or discharge activities in a manner such that public or private nuisances or health hazards will not be created.

**2. Liability Under State Law**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or the Federal Water Pollution Control Act, as amended.

## PART III

### OTHER REQUIREMENTS

### A. TOXIC POLLUTANTS

The permittee shall notify the Division of Water Pollution Control as soon as it knows or has reason to believe:

**1.** That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis, of any toxic substance(s) (listed at 40 CFR 122, Appendix D, Table II and III) which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

**a.** One hundred micrograms per liter (100 ug/l);

**b.** Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

**c.** Five (5) times the maximum concentration value reported for that pollutant(s) in the permit application in accordance with 122.21(g)(7); or

**d.** The level established by the Director in accordance with 122.44(f).

**2.** That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

**a.** Five hundred micrograms per liter (500 ug/l);

**b.** One milligram per liter (1 mg/L) for antimony;

**c.** Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 122.21(g)(7); or

**d.** The level established by the Director in accordance with 122.44(f).

## B. REOPENER CLAUSE

If an applicable standard or limitation is promulgated under Sections 301(b)(2)(C) and (D), 304(B)(2), and 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked and reissued to conform to that effluent standard or limitation.

## C. PLACEMENT OF SIGNS

Within sixty (60) days of the effective date of this permit, the permittee shall place and maintain a sign(s) at each outfall and any bypass/overflow point in the collection system. For the purposes of this requirement, any bypass/overflow point that has discharged five (5) or more times in the last year must be so posted. The sign(s) should be clearly visible to the public from the bank and the receiving stream or from the nearest public property/right-of-way, if applicable. The minimum sign size should be two feet by two feet (2' x 2') with one inch (1") letters. The sign should be made of durable material and have a white background with black letters.

The sign(s) are to provide notice to the public as to the nature of the discharge and, in the case of the permitted outfalls, that the discharge is regulated by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The following is given as an example of the minimal amount of information that must be included on the sign:

**INDUSTRIAL STORM WATER RUNOFF**
**The University of Tennessee Space Institute**
**(Permittee's Phone Number)**
**NPDES Permit NO. TN0056430**
**TENNESSEE DIVISION OF WATER POLLUTION CONTROL**
**1-888-891-8332 ENVIRONMENTAL ASSISTANCE CENTER - COLUMBIA**

## D. ANTIDEGRADATION

Pursuant to the Rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3-.06, titled "Tennessee Antidegradation Statement," and in consideration of the Department's directive in attaining the greatest degree of effluent reduction achievable in municipal, industrial, and other wastes, the permittee shall further be required, pursuant to the terms and conditions of this permit, to comply with the effluent limitations and schedules of compliance required to implement applicable water quality standards, to comply with a State Water Quality Plan or other State or Federal laws or regulations, or where practicable, to comply with a standard permitting no discharge of pollutants.

# RATIONALE

## The University of Tennessee Space Institute

**NPDES PERMIT NO. TN0056430**
**Tullahoma, Franklin County, Tennessee**

**Permit Writer: Mr. Vojin Janjic**

## I. DISCHARGER

The University of Tennessee Space Institute
B.H. Goethert Parkway
Tullahoma, Franklin County, Tennessee

Official Contact Person:
Mr. Joel W.Muehlhauser
Assistant Vice President and Dean for R&D
931 393-7286

Nature of Business:
University of Tennessee Graduate Research (MS & PhD), and operator of The Department of Energy's experimental coal research facility

| | |
|---|---|
| SIC Code(s): | 8221 |
| Industrial Classification: | Secondary w/o ELG |
| Discharger Rating: | Minor |

## II. PERMIT STATUS

Issued December 31, 1998
Expired December 31, 2002
Application for renewal received 06/21/2002

**Watershed Scheduling**

Environmental Assistance Center: Columbia
Primary Longitude: -86.105000 Primary Latitude: 35.321667
Hydrocode: 6030003 Watershed Group: 2
Watershed Identification: Elk-Upper
Target Reissuance Year: 2007

## III. FACILITY DISCHARGES AND RECEIVING WATERS

The University of Tennessee Space Institute discharges coal pile runoff from Outfall 001 to Rollins Creek at mile 1.1. Appendix 1 summarizes facility discharges and the receiving stream information for Outfall 001.

## IV. APPLICABLE EFFLUENT LIMITATIONS GUIDELINES

No federal guidelines are proposed or due to be promulgated for the coal pile runoff from Colleges, Universities, and Professional Schools, which are not considered to be associated with "industrial activity." Standards of performance for this discharge are therefore established in accordance with regulations using available treatability information.

## V. PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

Appendix 2 lists the permit limitations and monitoring requirements as defined in the previous permit.

## VI. HISTORICAL MONITORING AND INSPECTION

During the previous permit term, The University of Tennessee Space Institute did not have any discharges from Outfall 001 reported on the facility's DMRs.

## VII. NEW PERMIT LIMITS AND MONITORING REQUIREMENTS

The proposed new permit limits have been selected by determining a technology-based limit and evaluating if that limit protects the water quality of the receiving stream. If the technology-based limit would cause violations of water quality, the water quality-based limit is chosen. The technology-based limit is determined from EPA effluent limitations guidelines if applicable (see Part IV); or from State of Tennessee maximum effluent limits for effluent limited segments per Rule 1200-4-5-.03(2); or by way of operational and/or treatability data. Furthermore, effluent limitations in this permit must comply with any approved Total Maximum Daily Load (TMDL) studies.

There has not been any discharges from the coal pile area, which has been completely stabilized. The storm water runoff is directed to catch basin, and then flows to a pair of holding ponds in series, originally designed to discharge to Woods Reservoir. The holding ponds are no longer actively maintained and the discharge valve has been closed for several years. Continuation of permit coverage is based on a possibility of future discharges from this facility, which is currently inactive. The parameters to be monitored, in a case of discharge, are based on the permit writer's BPJ regarding potential contaminants expected in the coal pile runoff.

Appendix 5 lists all proposed effluent limitations and monitoring requirements to be included in the new permit

## IX. ANTIDEGRADATION

Tennessee's Antidegradation Statement is found in the Rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3-.06. This statement outlines the criteria for the two types of high quality waters. Outstanding National Resource Waters (ONRWs), as designated by the Water Quality Control Board, are commonly referred to as Tier 3 waters. Other high quality waters, as identified by the Division, are commonly referred to as Tier 2 waters. Other surface waters not specifically identified and/or designated as high quality are referred to as Tier 1 waters. Some Tier 1 waters may be identified by the Division as not meeting existing criteria and appear on a list of impacted waters per Section 303(d) of the Clean Water Act.

The Division is in the process of stream tier determination of the receiving waters associated with the subject discharge(s) and has found the (stream or river) to be neither a Tier 2 nor Tier 3 water. The Department has maintained, and shall continue to assess, the water quality of the stream to assure that the water quality is adequate to protect the existing uses of the stream fully, and to assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

## X. PERMIT DURATION

The proposed limitations meet the requirements of Section 301(b)(2)(A), (C), (D), (E), and (F) of the Clean Water Act as amended. It is the intent of the Division to organize the future issuance and expiration of this particular permit such that other permits located in the same watershed and group within the State of Tennessee will be set for issuance and expiration at the same time. In order to meet the target reissuance date for the Elk-Upper watershed and following the directives for the Watershed Management Program initiated in January, 1996, the permit will be issued for a 4 year term.

# APPENDIX 1

## FACILITY DISCHARGES AND RECEIVING WATERS

### FACILITY DISCHARGES AND RECEIVING WATERS

| OUTFALL 001 | |
|---|---|
| LONGITUDE | LATITUDE |
| 84-32-09 | 35-17-12 |

| FLOW (MGD) | DISCHARGE SOURCE |
|---|---|
| Intermittent | Coal pile runoff |
| | |
| | |
| | |
| | |
| | |
| Intermittent | TOTAL DISCHARGE |

| RECEIVING STREAM DISCHARGE ROUTE | | | |
|---|---|---|---|
| Rollins Creek at mile 1.1 to Woods Reservoir | | | |
| STREAM LOW FLOW (CFS) * | 7Q10 | 1Q10 | 30Q2 |
| | 0.0 | NA | NA |
| (MGD) | 0.0 | NA | NA |

| STREAM USE CLASSIFICATIONS (WATER QUALITY) | | | | |
|---|---|---|---|---|
| FISH | RECREATION | IRRIGATION | LW&W | DOMESTIC |
| X | X | X | X | X |
| INDUSTRIAL | NAVIGATION | | | |
| X | | | | |

Treatment: Sedimentation pond

# APPENDIX 2

## PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

### PERMIT LIMITS

**OUTFALL 001**

**TREATED PROCESS WASTEWATER, NON-CONTACT COOLING WATER, AND COAL PILE RUNOFF**

| | EFFLUENT LIMITATIONS | | | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| | MONTHLY | | DAILY | | | |
| EFFLUENT CHARACTERISTIC | AVG. CONC. (mg/l) | AVG. AMNT. (lb/day) | MAX. CONC. (mg/l) | MAX. AMNT. (lb/day) | MSRMNT. FRQNCY. | SAMPLE TYPE |
| FLOW | Report (MGD) * | | Report (MGD) * | | 1/Week | Instantaneous |
| OIL & GREASE | 15 | -- | 30 | -- | 2/Month | Grab |
| pH | Range 6.0 - 9.0 ** | | | | 1/Week | Grab |
| TSS | -- | -- | 40 | -- | 2/Month | Grab |
| TDS | -- | -- | 2000 | -- | 2/Month | Grab |
| TEMPERATURE | Report *** | | | | 2/Month | Grab |

* Flow shall be reported in million gallons per day (MGD).

** pH analyses shall be performed within fifteen (15) minutes of sample collection.

*** It is recognized that the temperature of the cooling water discharge will be greater than the temperature of the water prior to its use for cooling or other purposes. This discharge must not cause the temperature change in Rollins Creek to exceed 3 Deg.C relative to an upstream control point. Also, this discharge must not cause the temperature of Rollins Creek to exceed 30.5 Deg.C (except as a result of natural causes), and this discharge must not cause the maximum rate of temperature change in Rollins Creek to exceed 2 Deg.C per hour (except as a result of natural causes).

# APPENDIX 3

## NEW PERMIT LIMITS AND MONITORING REQUIREMENTS

### PERMIT LIMITS

**OUTFALL 001**
**COAL PILE RUNOFF**

| EFFLUENT CHARACTERISTIC | EFFLUENT LIMITATIONS | | | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|---|
| | MONTHLY | | DAILY | | | |
| | AVG. CONC. (mg/l) | AVG. AMNT. (lb/day) | MAX. CONC. (mg/l) | MAX. AMNT. (lb/day) | MSRMNT. FRQNCY. | SAMPLE TYPE |
| FLOW | Report (MGD) * | | Report (MGD) * | | 1/Year | Estimate |
| pH | Report | | | | 1/Year | Grab |
| TSS | -- | -- | Report | -- | 1/Year | Grab |

* Flow shall be reported in million gallons per day (MGD).
** pH analyses shall be performed within fifteen (15) minutes of sample collection.

VMJ
TN0056430.doc

# REQUIREMENTS FOR MAKING A PERMIT APPEAL

Permit Appeal (Tennessee Department of Conservation, Chapter 1200-4-1.05(6), and T.C.A. Section 69-3-110)

1. Petitions must be made within 30 days of the receipt of the final permit.

2. Petitions shall contain the following:

   (a) The name, mailing address, and telephone number of the person mailing the request and the names and addresses of all persons he or she represents;

   (b) A clear and concise statement of each legal of factual matter alleged to be issue; and

   (c) Specific reference to each permit condition which the petitioner contest. The petitioner may suggest alternate permit terms which would meet the requirements of the Water Quality Control Act; if the petitioner challenges permit conditions which are justified in the fact sheet (or Rationale), the petitioner should indicate how the basis for the permit condition is in error or indicate why an alternate condition is necessary.

3. Petitions should be addressed to the Water Quality Control Board and filed in duplicate at the following address: Mr. Paul E. Davis, Director; Division of Water Pollution Control; Department of Environment and Conservation; 401 Church Street; L & C Annex, Sixth Floor; Nashville, Tennessee 37243-1534.

4. The appeal of a permit or a permit condition has the effect of staying the contested provisions. Therefore, if a permit is being reissued, the permittee will be considered to be authorized under the terms of the old permit and/or any unappealed terms of the reissued permit. If it is a new permit, the applicant will be considered to be without a permit for the activity until final agency action.

E8060092-D4WPC1

# Appendix C

# Tennessee Air Pollution Control Board
# Permit Number 956920P

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-1531

Permit to Construct or Modify an Air Contaminant Source Issued Pursuant to Tennessee Air Quality Act

Date Issued: FEB 17 2004

Permit Number: 956920P

Date Expires: February 1, 2005

| Issued To: | Installation Address: |
|---|---|
| The University of Tennessee<br>Space Institute | 411 B.H.Goethert Parkway<br>Tullahoma |

| Installation Description: | Emission Source Reference No. |
|---|---|
| Turbojet Engine Testing Operation<br>General Electric Model 385-CE-5 with after burner | 26-0068-13 |

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. The application that was utilized in the preparation of this permit is dated November 25, 2003 and is signed by Dr. Joel Muehlhauser, assistant V.P. for R&D for the permitted facility. If this person terminates his/her employment or is reassigned different duties such that he/she is no longer the responsible person to represent and bind the facility in environmental permitting affairs, the owner or operator of this air contaminant source shall notify the Technical Secretary of the change. Said notification shall be in writing and submitted within thirty (30) days of the change. The notification shall include the name and title of the new person assigned by the source owner or operator to represent and bind the facility in environmental permitting affairs. All representations, agreement to terms and conditions and covenants made by the former responsible person that were used in the establishment of limiting permit conditions on this permit will continue to be binding on the facility until such time that a revision to this permit is obtained that would change said representations, agreements and covenants.

(conditions continued on next page)

Barry R. Stephens
TECHNICAL SECRETARY

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule, or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON-TRANSFERABLE

**POST AT INSTALLATION ADDRESS**

2. This permit covers one turbojet engine General Electric Model J85-GE-5 with after burner, fuel used is jet fuel or Kerosene.

3. The process fuel input for this source shall not exceed 8,320 pound per hour.

4. The maximum hours of operation for this installation shall not exceed 50 hour per calendar year. This operation limitation is established pursuant to the information contained in the agreement letter dated January 8, 2004 from the permittee.

5. Particulate matter (PM) emitted from this source shall not exceed 0.016 pound per hour and 0.0004 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.01(7) of the Tennessee Air Pollution Control Regulations and the information contained in the agreement letter received February 10, 2004 from the permittee. The permittee has requested this limit in order to reduce annual emission fees.

6. Sulfur dioxide ($SO_2$) emitted from this source shall not exceed 9.00 pound per hour and 0.22 ton per year and the sulfur content of the fuel used shall not exceed 0.3 weight percent. This emission limitation is established pursuant to Rule 1200-3-14-.01(3) of the Tennessee Air Pollution Control Regulations and the information contained in the agreement letter received February 10, 2004 from the permittee. The permittee has requested this limit in order to reduce annual emission fees.

7. Carbon monoxide (CO) emitted from this source shall not exceed 81.6 pound per hour and 2.04 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

8. Volatile Organic compounds (VOC) emitted from this source shall not exceed 8.04 pound per hour and 0.2 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

9. Nitrogen oxides ($NO_x$) emitted from this source shall not exceed 3.12 pound per hour and 0.08 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

10. Visible emissions from this source shall not exceed 20 percent or greater opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, Number 219 on November 12, 19-74. (6-minute average)

11. A monthly log of the operating time in hour, fuel usage in pounds, and shipment receipt from the fuel supplier for each shipment of the fuel delivered certifying that the shipment contains no more than 0.3 weight percent of sulfur must be maintained at the source location and kept available for inspection by the Technical Secretary or his representative. This log must be retained for a period of not less than five years.

12. The issuance of this permit does not exempt the permitte from any requirements of the Environmental Protection Agency Pertaining to emissions from the operation of this source.

(conditions continued on next page)

13. The permittee shall certify the start-up date of the air contaminant source regulated by this permit by submitting

A COPY OF ALL PAGES OF THIS PERMIT,

with the information required in A) and B) of this condition completed, to the Technical Secretary's representatives listed below:

A) DATE OF START-UP: _____ / ____ / _____
month day year

B) Anticipated operating rate: ____ percent of maximum rated capacity

For the purpose of complying with this condition, "start-up" of the air contaminant source shall be the date of the setting in operation of the source for the production of product for sale or use as raw materials or steam or heat production.

The undersigned represents that he/she has the full authority to represent and bind the permittee in environmental permitting affairs. The undersigned further represents that the above provided information is true to the best of his/her knowledge and belief.

| Signature | | Date |
|---|---|---|
| Signer's name (type or print) | Title | Phone (with area code) |

Note: This certification is not an application for an operating permit. At a minimum, the appropriate application form(s) must be submitted requesting an operating permit. The application must be submitted in accordance with the requirements of this permit.

The completed certification shall be delivered to the Compliance Validation Program and the Environmental Assistance Center at the addresses listed below, no later than thirty (30) days after the air contaminant source is started-up.

Compliance Validation Program
Division of Air Pollution Control
9th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1531

Columbia Environmental Assistance Center
Division of Air Pollution Control
2484 Parks Plus Drive
Columbia, TN 38401

(End of conditions)

The permit application gives the location of this source as 35°19'30" Latitude and 86°05'57" Longitude.

# Appendix D

# Tennessee Air Pollution Control Board
# Permit Number 057684P

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-1531

OPERATING PERMIT Issued Pursuant to Tennessee Air Quality Act

Date Issued: NOV 04 2004

Permit Number: 057684P

Date Expires: April 1, 2013

| Issued To: | Installation Address: |
|---|---|
| The University of Tennessee<br>Space Institute | 411 B.H.Goethert Parkway<br>Tullahoma |
| **Installation Description:** | **Emission Source Reference No.** |
| Turbojet Engine Testing Operation<br>General Electric Model J85-GE-5 with afterburner | 26-0068-13 |

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. The application that was utilized in the preparation of this permit is dated October 4, 2004 and is signed by Dr. Joel Muehlhauser, assistant V.P. for R&D for the permitted facility. If this person terminates his/her employment or is reassigned different duties such that he/she is no longer the responsible person to represent and bind the facility in environmental permitting affairs, the owner or operator of this air contaminant source shall notify the Technical Secretary of the change. Said notification shall be in writing and submitted within thirty (30) days of the change. The notification shall include the name and title of the new person assigned by the source owner or operator to represent and bind the facility in environmental permitting affairs. All representations, agreement to terms and conditions and covenants made by the former responsible person that were used in the establishment of limiting permit conditions on this permit will continue to be binding on the facility until such time that a revision to this permit is obtained that would change said representations, agreements and covenants. This permit does not cover any air contaminant source that does not conform to the conditions of this permit and the information given in the approved application.

(conditions continued on next page)

TECHNICAL SECRETARY

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule, or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON-TRANSFERABLE

**POST AT INSTALLATION ADDRESS**

CN-0827 (Rev. 9-92)

RDA-1298

2. This permit covers one turbojet engine General Electric Model J85-GE-5 with after burner, fuel used is jet fuel or Kerosene.

3. The process fuel input for this source shall not exceed 8,320 pounds per hour.

4. The maximum hours of operation for this installation shall not exceed 50 hours per calendar year. This operation limitation is established pursuant to the information contained in the agreement letter dated January 8, 2004 from the permittee.

5. Particulate matter (PM) emitted from this source shall not exceed 0.016 pound per hour and 0.0004 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.01(7) of the Tennessee Air Pollution Control Regulations and the information contained in the agreement letter received February 10, 2004 from the permittee. The permittee has requested this limit in order to reduce annual emission fees.

6. Sulfur dioxide ($SO_2$) emitted from this source shall not exceed 9.00 pounds per hour and 0.22 ton per year and the sulfur content of the fuel used shall not exceed 0.3 weight percent. This emission limitation is established pursuant to Rule 1200-3-14-.01(3) of the Tennessee Air Pollution Control Regulations and the information contained in the agreement letter received February 10, 2004 from the permittee. The permittee has requested this limit in order to reduce annual emission fees.

7. Carbon monoxide (CO) emitted from this source shall not exceed 81.6 pounds per hour and 2.04 tons per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

8. Volatile Organic compounds (VOC) emitted from this source shall not exceed 8.04 pounds per hour and 0.2 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

9. Nitrogen oxides ($NO_x$) emitted from this source shall not exceed 3.12 pounds per hour and 0.08 ton per year. This emission limitation is established pursuant to Rule 1200-3-6-.03(2) of the Tennessee Air Pollution Control Regulations.

10. Visible emissions from this source shall not exhibit greater than twenty percent (20%) opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, Number 219 on November 12, 1974. (six-minute average)

11. A monthly log of the operating time in hour, fuel usage in pounds, and shipment receipt from the fuel supplier for each shipment of fuel delivered, certifying that the shipment contains no more than 0.3 weight percent of sulfur must, be maintained at the source location and kept available for inspection by the Technical Secretary or his representative. This log must be retained for a period of not less than five years.

12. The issuance of this permit does not exempt the permittee from any requirements of the Environmental Protection Agency pertaining to emissions from the operation of this source.

13. The permittee shall apply for renewal of this permit not less than sixty (60) days prior to the permit expiration date, pursuant to Division Rule 1200-3-9-.02(3).

(End of conditions)

# Appendix E

# Plant Associations Occurring in Upland Forest Communities on Arnold Air Force Base

# Plant Associations Occurring in Upland Forest Communities on Arnold Air Force Base

The following plant associations (Call, 2003) occur in plant forest communities on Arnold AFB:

- *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