FINAL

U.S. AIR FORCE
ENVIRONMENTAL ASSESSMENT
STEAM DECENTRALIZATION PROJECT

TINKER AIR FORCE BASE, OKLAHOMA

United States Air Force

Air Force Materiel Command

Tinker Air Force Base, Oklahoma

August 2011

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Final U.S. Air Force Environmental Assessment: Steam Decentralization Project Tinker Air Force Base, Oklahoma	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) **AMEC Earth and Environmental, Inc,104 W Anapamu St Ste 204a,San Barbara,CA,93101**	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)**	**162**	

FINDING OF NO SIGNIFICANT IMPACT AND FINDING OF NO PRACTICABLE ALTERNATIVE STEAM DECENTRALIZATION PROJECT TINKER AIR FORCE BASE, OKLAHOMA

Pursuant to the Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act (NEPA), Title 40 of the Code of Federal Regulations (CFR), Parts § 1500 – 1508; Air Force Environmental Impact Analysis Process regulations, 32 CFR Part § 989 and Department of Defense Directive 6050.1, the Air Force has prepared an environmental assessment (EA) to identify and evaluate the potential impacts on the natural and human environment associated with the decentralization and optimization of four central steam plants (CSPs) located at Tinker Air Force Base (AFB), Oklahoma.

Purpose and Need for the Proposed Action (EA Sections 1.1 and 1.2, pgs 1-1 to 1-4)

Tinker AFB currently utilizes a centralized steam heating system to provide heat to a large portion of the installation. This system consists of four CSPs, which are connected to 71 buildings that cover 9,090,704 square feet and represent approximately 48 percent of the installation's total building area. Three of the plants (CSP 208, CSP 3001 and CSP 5802) were installed in the 1940s/50s with the fourth plant (CSP 2212) installed in 1990 to supplement CSP 3001 during the winter months.

Because these plants are more than 20 years old, they do not operate at maximum efficiency nor are all the boilers equipped with economizers or systems to control combustion or manage burners. Several of the boilers are equipped with out-dated control systems, which further reduce operating efficiency and lower safety standards. In addition, much of the pipeline has aged, causing leaks, which result in further energy lost. Tinker AFB estimates the average yearly cost to repair the system is $2 to $3 million based on the past five years.

The Proposed Action evaluated in this document consists of decentralizing and optimizing the operation of the four CSPs to modernize Tinker AFB's central steam distribution system. Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy and Transportation Management* and EO 13514, *Federal Leadership in Environmental, Energy and Economic Performances* require federal agencies to reduce energy intensity by three percent each year, leading to a 30 percent reduction by the end of fiscal year (FY) 2015 as compared to their FY 2003 baseline. By implementing the Proposed Action, Tinker AFB would see improvements in energy efficiencies, achieve and exceed the mandated energy reduction as defined by EOs 13423 and 13514, and reduce overall utility costs.

Description of Proposed Action and Alternatives

Under the Proposed Action a new heating system would be developed to service facilities on Tinker AFB. Additionally, the Proposed Action would result in increased heating efficiencies, improved operations and reduced energy consumption while providing a maintenance-friendly atmosphere. As part of the selection process, each alternative had to be able to (1) reduce energy consumption by at least 15 percent, (2) not require extensive architectural modifications to minimize mission impact from construction down time

and (3) use a reliable primary energy source (EA Section 2.3, pgs 2-1 to 2-2). Three alternatives were identified but only one met the purpose and need. The two alternatives dismissed from further analysis were Replacement of Existing CSP Distribution System Alternative and Renewable Energy Alternative (EA Section 2.5, pg 2-17). The CSP Replacement Alternative analyzed updating and replacing the entire steam plant distribution system with new heating equipment and infrastructure. Because the total energy reduction associated with this alternative was five percent, it did not meet the 15 percent reduction selection requirement and was dismissed from further analysis. The Renewable Energy Alternative looked at using passive solar and geothermal energy sources. Because the passive solar system would require new infrastructure and significant building modifications to retrofit the existing system, it was dismissed from further analysis due to the impact on the military mission. Many buildings were evaluated for use by geothermal technology; however, it was determined Building 510 was the only facility which had adequate land space and became included within the Preferred Alternative.

Preferred Alternative (Section 2.4.1, pgs 2-2 to 2-16)

Central Steam Plant 208 (EA Figure 2-1, pg 2-6) would be decommissioned, CSP 2212 (EA Figure 2-4, pg 2-11) and 5802 (EA Figure 2-2, pg 2-7) would be demolished and CSP 3001 (EA Figure 2-4, pg 2-11) would be decentralized and downsized. The steam distribution system (i.e. pipeline, tunnels, etc.) between the existing CSPs and buildings would be abandoned and any associated above and underground storage tanks would be removed. It is estimated demolition and construction activities would occur over a 30-month period. Once completed, the new heating system would use natural gas to fuel new building boilers or heating equipment at the remaining 66 of the 71 buildings currently served by the existing steam distribution system. Buildings 2280, 3001, 3125 and 3221 would receive steam heating exclusively from the downsized CSP 3001. Building 208 is under consideration for a separate unrelated action and is not part of this analysis.

All boilers would be connected to the water supply system and would have backflow prevention in place. Natural gas would be conveyed to the new systems through the existing natural gas distribution infrastructure. Additional distribution and circulation pipelines would be installed to ensure a sufficient natural gas supply and create a complete gas distribution loop on-base for energy redundancy. Storage of natural gas would not be required. The Preferred Alternative also includes installation of a ground source heat pump system and a variable refrigerant flow system; a renewable, energy-efficient technology. The ground source heat pump system would be used in conjunction with new heating and cooling equipment proposed during decentralization at Building 510 (EA Figure 2-3, pa 2-9). Ten geothermal wells would be installed as part of this action.

No Action Alternative (Section 2.3.2, pgs 2-16 to 2-17)

Under the No-Action Alternative, the Air Force would not implement the Preferred Alternative. Tinker AFB would continue operating and maintaining the centralized steam distribution system as is. The No Action Alternative is the baseline for the rest of the analyses and helps determine the level of impact the Preferred Alternative would have on the environment.

Environmental Consequences

Environmental analyses focused on the following areas: air quality, biological resources, cultural resources, hazardous materials and wastes, safety, socioeconomics, sustainability, transportation and circulation, utilities and infrastructures, solid waste and water resources. Resource areas eliminated from further study included geology/soils, land use, visual resources, noise/vibration, and environmental justice/protection of children (EA Section 1.4.2.2, pgs 1-11 to 1-13) since the proposed action did not impact these areas.

Air Quality (EA Section 4.1, pgs 4-1 to 4-5): Temporary, short-term fugitive dust emissions would be generated during ground disturbance and related site preparation activities for demolition and renovation activities. It is estimated unmitigated particulate matter emissions emitted during this 30-month project to be 0.05 tons. Combustion and greenhouse gas (GHG) emissions would also result from operation of vehicles and heavy-duty equipment. Analysis indicated combustion emissions to be 289 tons per year, which is within de minimis levels. Greenhouse gas emissions are expected to increase by 885 tons over the duration of construction activities; however, this increase would end once construction is finished. Operation of the new centralized steam distribution system would have long-term, beneficial impacts on air quality by decreasing the level of criteria air pollutants and GHG emissions emitted to the atmosphere. Because Tinker AFB is located within an attainment area for criteria air pollutants, conformity analysis is not required. Tinker AFB will need to revise their Title V permit with implementation of the Preferred Alternative.

Biological Resources (EA Section 4.2, pgs 4-5 to 4-11): There are no federal or state listed, threatened or endangered species within the project area. However, the proposed natural gas pipeline would be adjacent to habitat areas identified for the Texas horned lizard (EA Figure 4-1, pg 4-9). Prior to any ground-disturbing activities, the Tinker Natural Resources Program Manager and contractor shall perform a search of the project site to clear the area of any Texas horned lizards. During and after demolition and construction activities, the contractor will regularly inspect all holes and trenches and fill in immediately once finished; thereby, preventing potential trapping of the lizards. Negligible, short-term impacts on vegetation and wildlife would result during demolition and renovation activities; however, there are no long-term impacts from operations.

Cultural Resources (EA Section 4.3, pgs 4-11 to 4-15): The Area of Potential Effects of this action is within the vicinity of several historic properties eligible for National Register of Historic Places (EA Table 4-3, pg 4-12). Buildings 208, 230, 240, 3001, 3105, and 3113 (EA Figure 4-2, pg 4-13) are part of the Douglas Cargo Aircraft Manufacturing Historic District, whose historic significance is due to efforts to produce C-47 transport aircraft during World War II. Building has architectural significance because of its size, making it the largest building in the state of Oklahoma. Consultation with the State Historic Preservation Officer was completed with a finding of no adverse effect dated 7 July 2011. Consultation with Native American Tribes regarding the Preferred Alternative was also completed; no comments were received (Refer to Appendix D of EA for consultation letters).

Hazardous Materials and Wastes (EA Section 4.4, pgs 4-15 to 4-18): Implementation of the Preferred Alternative would involve potential removal of asbestos-containing materials during demolition

and construction activities. Prior to these activities commencing, asbestos testing and reporting would be performed and if identified, appropriate asbestos management and/or abatement plans would be implemented. Six fuel tanks would also be removed under the Preferred Alternative. All tank removal would be performed in accordance with Oklahoma Corporation Commission (OCC) policies and regulations and preformed by OCC-licensed personnel. Any contaminated soils encountered during tank removal would be remediated. All oils and refrigerants as well as mercury-containing light bulbs, ballasts and thermostats would be disposed of properly in accordance with the Tinker AFB Hazardous Wastes Management program. Overall there would be beneficial impacts from removing toxic materials such as asbestos, fuel oil and mercury-containing material during demolition activities. Trichloroethane ground water contamination is present within the vicinity of Building 510, which is the location for the ground source heat pump system. Because the proposed system would be closed loop and installation of wells would be above 30 feet, there would be no impacts from exposure to contaminated groundwater. Environmental conditions are unknown along the Tinker AFB/BNSF Railway railroad property boundary relating to contaminated soils; however, no spills or releases onto land in this area have been recorded with the U.S. Environmental Protection Agency. Due to potential contamination within the project area, the contractor shall collect four to five samples along the proposed pipeline alignment and at the proposed pipeline depth prior to construction activities.

Safety (EA Section 4.5, pgs 4-18 to 4-21): Negligible impacts relating to exposure to hazardous materials from demolition or construction activities would occur. No impacts from exposure to contaminated groundwater would occur; no adverse impacts on airfield safety are anticipated. Personnel would be required to follow safety procedures currently in place for all activities within Clear Zones (CZ) or Accident Potential Zones. Because a portion of the proposed natural gas pipeline fall within the defined CZ, the contractor will need to submit an airfield waiver request 90 days to 72 CEG/CEP prior to any digging or boring activities. Adherence to all applicable OSHA regulations is required.

Socioeconomics (EA Section 4.6, pgs 4-21 to 4-22): Short-term, beneficial impacts would occur resulting from generation of temporary construction jobs for off-base personnel and local spending for construction materials. No long-term impacts would occur on the local economy from operations of the new heating system. Approximately 30 contract personnel at Tinker AFB would be reduced because of lower manpower requirements for operating and maintaining the new system.

Sustainability (EA Section 4.7, pgs 4-22 to 4-23): Implementation of the Preferred Alternative would see a reduction in water consumption by 17,846,000 gallons, electricity consumption by 6,557,523 kilowatt-hours and natural gas consumption by 520,662 mBtu. It is estimated project payback for utility savings is 13.24 years and 21 years when financials are included.

Transportation (EA Section4.8, pgs 4-23 to 4-25): Temporary, negligible impacts on local and area traffic and circulation would occur. To help minimize traffic congestion, construction activities would be staged to occur in localized areas and would move as project components are completed during the 30-month estimated construction period duration.

Utilities and Infrastructures (EA Section 4.9, pgs 4-25 to 4-26): No net impact on base energy redundancy would occur because the removal of backup fuel tanks at CSPs would be compensated

through the provision of a complete natural gas pipeline loop to provide on-base energy redundancy. Beneficial impacts on water utilities would occur as a result of reduced net water consumption. Temporary impacts (i.e. disruption of power) on electrical service would occur. The contractor would schedule and coordinate shutdown(s) through written notice(s) at least 21 days prior to completion of work. To minimize the inconvenience to building occupants, the contractor shall install boilers during summer month and chillers during winter months as the schedule permits. There would be no impact on wastewater or potable water services.

Solid Waste (EA Section 4.10, pgs 4-26 to 4-28): The decommissioning and decentralization of the CSPs and associated equipment would generate construction and demolition debris, solid waste and recyclable materials. Such waste would be processed in accordance with the Tinker AFB Integrated Solid Waste Management Plan and would be coordinated with 72 ABW/CEA, who manages this program. In addition the local solid waste facilities have adequate capacity to accommodate the collection, conveyance, processing and disposal of these materials. Overall impacts to solid waste would be minimal under the Preferred Alternative.

Water Resources (EA Section 4.11, pgs 4-28 to 4-32): Implementation of the Preferred Alternative would involve ground-disturbing activities, which would increase potential for soil erosion. Temporary impacts on surface waters would be minimized through the implementation of nonpoint pollution controls and spill prevention and response procedures. The contractor will be required to obtain a Storm Water General Permit for Construction Activities (Permit No. OKR10) from Oklahoma Department of Environmental Quality. In addition the contractor will incorporate best management practices (BMPs) to include silt fencing, compost berms, filter socks, or vegetation-base erosion control measures to minimize storm water runoff. With these procedures in place, there would be no long-term impacts to surface waters from construction activities.

While no jurisdictional wetlands fall within the location of the Preferred Alternative, a non-jurisdictional wetland along a tributary of Elm Creek is adjacent to the construction area of the natural gas pipeline. The contractor shall implement erosion control BMPs identified within the Storm Water General Permit for Construction Activities to minimize secondary impacts to the wetland. Installation of the natural gas pipeline falls within the Elm Creek 100-year floodplain (EA Figure 4-3, pg 4-30). Pursuant to Executive Orders 11988, *Floodplain Management,* in order for the Preferred Alternative to be implemented within a floodplain, the Air Force must find there are no practicable alternatives in doing so and that all practicable measures have been taken to minimize harm to the floodplain. The Air Force considered several alternative alignments for installing the proposed pipeline; however, it was determined critical, key locations, which were needed to provide continuous gas delivery for a closed loop system, could not be avoided within the floodplain. To minimize this impact, installation of the pipeline would occur along the existing utility corridor of Alert Road on previously developed land. Upon completion, the pipeline would be buried and the surface returned to its current conditions (i.e. elevation, topography, ground cover). Therefore, there would be no permanent impacts to the floodplain from installing the new heating system.

Cumulative Impacts (EA Section 5, 5-1 pgs to 5-5): The cumulative impacts of implementing the Preferred Alternative along with other past, present, and future projects identified in Table 5-1 on page 5-

1 of the EA were assessed and no significant impacts to air quality, traffic and circulation, solid waste and water quality were identified.

Public Notice

A Notice of Availability for public review of the Draft EA was published in *The Oklahoman* and *Tinker Take Off* on July 15, 2011. The document was also available for review at the Midwest City Public Library. The public review period lasted for 30 days, and no public comments were received; therefore, no such comments were incorporated as part of the Final EA (Refer to Appendix A of EA).

FINDING OF NO PRACTICABLE ALTERNATIVE

Taking the above information into consideration, pursuant to Executive Order 11988 Floodplain Management and the authority delegated by the Secretary of the Air Force Order 791.1, I find there is no practicable alternative to conducting the proposed action within the floodplain and the proposed action includes all practicable measures to minimize impacts to the environment. This finding fulfills both the requirements of the referenced Executive Order and the Air Force EIAP regulation, 32 CFR Part § 989.14 for a Finding of No Practicable Alternative.

FINDING OF NO SIGNIFICANT IMPACT

Based upon my review of the facts and analyses contained in the attached EA and as summarized above, I find the Proposed Action to modernize Tinker AFB central heating system will not have a significant impact on the natural or human environment; therefore an environmental impact statement is not required. This analysis fulfills the requirements of NEPA, the President's Council on Environmental Quality 40 CFR § 1500-1508 and the Air Force EIAP regulations 32 CFR Part § 989.

Date 23 Sep 2011

PAUL A. PARKER, SES
Command Civil Engineer
Communications, Installations
and Mission Support

THIS PAGE INTENTIONALLY LEFT BLANK

FINAL

ENVIRONMENTAL ASSESSMENT
STEAM DECENTRALIZATION PROJECT

TINKER AIR FORCE BASE, OKLAHOMA

 **Printed on 30% Recycled Paper**

August 2011

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

APPENDICES

1 **LIST OF ACRONYMS**

§	section
°F	degrees Fahrenheit
ACOG	Association of Central Oklahoma Governments
AFB	Air Force Base
AFI	Air Force Instruction
AP	accumulation point
APE	area of potential effect
APZ	Accident Potential Zone
AST	aboveground storage tank
AW	Air Wing
B	Building
BLS	United States Bureau of Labor Statistics
BMP	best management practice
BMS	burner management system
Btu	British thermal unit
C&D	construction and demolition
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CCS	combustion control system
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CG	consolidated groundwater
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	equivalent carbon dioxide
CRP	Compliance Restoration Program
CSP	central steam plant
CZ	Clear Zone
DEQ	Oklahoma Department of Environmental Quality
DoD	United States Department of Defense
EA	Environmental Assessment
ECAMP	Environmental Compliance Assessment and Management Program
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EO	Executive Order
EPA	United States Environmental Protection Agency

2

LIST OF ACRONYMS (Continued)

ERP	Environmental Restoration Program
FS	feasibility study
FY	fiscal year
GHG	greenhouse gas
GWMU	groundwater management unit
HAP	hazardous air pollutant
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
HMMP	Hazardous Materials Management Program
HMMS	Hazardous Materials Management System
Honeywell	Honeywell International
HVAC	heating, ventilating, and air conditioning
I-	Interstate
IAP	initial accumulation point
ICE	internal combustion engine
ICRMP	Integrated Cultural Resources Management Plan
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
INRMP	Integrated Natural Resources Management Plan
IRA-O	interim remedial action in place
IRP	Installation Restoration Program
JP	jet propellant
L_{dn}	day-night average sound level
LEED	Leadership in Energy and Environmental Design
MACT	maximum achievable control technology
mBtu	million British thermal units
Mogas	motor gasoline
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFRAP	No Further Response Action Planned
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NWI	National Wetlands Inventory
OAC	Oklahoma Administrative Code
OAS	Oklahoma Archeological Survey
OC-ALC	Oklahoma City Air Logistics Center

OCARTS	Oklahoma City Area Regional Transportation Study
OCC	Oklahoma Corporation Commission
OCCVB	Oklahoma City Convention and Visitors Bureau
ODWC	Oklahoma Department of Wildlife Conservation
ONG	Oklahoma Natural Gas Company
ONHI	Oklahoma Natural Heritage Inventory
OSHA	Occupation Safety and Health Administration
OT	other
OWRB	Oklahoma Water Resources Board
PCE	perchloroethene
PF	pulverized fuel
PFC	perflurocarbon
PM_{10}	particulate matter 10 microns in diameter
$PM_{2.5}$	particulate matter 2.5 microns in diameter
PSD	prevention of significant deterioration
PTE	potential to emit
PVC	polyvinyl chloride
RA-O	remedial action – in operation
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RI	remedial investigation
RW	radioactive waste
SE	Southeast
sf	square foot (feet)
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
ST	storage tank
SWPPP	Storm Water Pollution Prevention Plan
TACX	Tinker Aerospace Complex
TCE	trichloroethene
tpy	tons per year
TSDF	treatment, storage, and disposal facility
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VI	vapor intrusion
VRF	variable refrigerant flow
WP	waste pit

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 1.0
OVERVIEW

1.1 Introduction

Tinker Air Force Base (AFB) currently utilizes a centralized steam heating system to provide heat to a large portion of the base. The existing system is aging and inefficient; portions of the system leak steam and condensate to the environment (Figures 1-1 and 1-2). Much of the system has required replacement or overhaul, which has resulted in a cost of $2 to $3 million each year over the past five years (Honeywell International [Honeywell] 2010).

The project evaluated in this document consists of decentralizing and optimizing the operation of four central steam plants (CSPs) in separate buildings on Tinker AFB. These four steam plants are connected to 71 buildings that cover 9,090,704 square feet (sf) and represent approximately 48 percent of the total building area at Tinker AFB (Honeywell 2010).

1.1.1 Existing Centralized Steam Heating System

The centralized steam heating system at Tinker AFB consists of CSPs that generate high-pressure steam that is distributed via both aboveground and belowground pipelines to provide heat to connected buildings across the base. Some buildings use the steam to heat the building directly, while other buildings have systems that convert steam to hot water via an exchanger and then distribute hot water for use throughout the facility. Steam from the CSPs is also provided for process steam systems (e.g., chemical industrial processes that use steam as the principal energy source for process heating, pressure control, and mechanical drives).

Each CSP burns natural gas to generate steam for heating multiple buildings. The CSPs also use fuel oil as backup to natural gas. The Oklahoma Natural Gas Company (ONG) delivers natural gas to Tinker AFB at three metered delivery points (Tinker AFB 2005b). Natural gas is brought to each CSP via the base's gas distribution pipeline system. From each CSP, the steam distribution system consists of steam and condensate return piping that is primarily buried; however, some piping is contained in concrete trenches (i.e., small tunnels) that are covered by concrete caps, metal plates, or sidewalk; a small portion of piping is above ground, suspended by pipe racks.

1.1.2 Current Centralized Steam Heating System Operations

The existing system consists of multiple boilers that generally operate at efficiency levels ranging from 72 to 83 percent. Many of the boilers are not equipped with economizers (i.e., heat exchange devices that capture wasted energy from exhaust gases and return it to the system, improving boiler efficiency), combustion control, or burner management systems. The boilers use older technology that is not efficient; therefore, new economizers, combustion control, and burner management systems would improve efficiency and operational safety of the boilers. Portions of the aging pipeline vent steam and condensate to the environment, presenting environmental hazards to nearby streams and aquatic wildlife, as well as to ground vegetation. Further, the aged condition of the existing pipeline infrastructure results in energy losses great

Figure 1-1. Condensate Leaks near Building 215

Figure 1-2. Steam Tunnel Piping Leaks between Buildings 3001 and 3105

enough to warrant the disconnection and removal of the existing central steam boilers and the installation of more efficient gas-fired boilers, infrared systems, and other heating equipment in the facilities currently supplied by the CSPs (Honeywell 2010).

The United States Air Force (USAF) has estimated the cost to replace the majority of the aging connected steam and condensate return piping at more than $100 million (Honeywell 2010). The USAF is proposing optimization of the CSP system to provide a more efficient heating distribution system. The Proposed Action, decentralization of the CSP system, would enable Tinker AFB to realize energy and maintenance savings over the existing CSP system without negatively impacting the Tinker AFB mission.

This Environmental Assessment (EA) addresses the potential impacts of the Proposed Action on the human and natural environment as required by the National Environmental Policy Act (NEPA) of 1969, as amended (Title 42, United States Code Sections 4321 through 4347 [42 USC § 4321-4347]), and in accordance with the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA (Title 40, Code of Federal Regulations Parts 1500 through 1508 [40 CFR 1500-1508]) and Air Force Instruction (AFI) 32-7061, entitled *Environmental Impact Analysis Process* (EIAP) (32 CFR 989).

1.2 Purpose and Need

The *purpose* of the Proposed Action is to establish a heating system for facilities currently serviced by the central steam distribution systems on Tinker AFB that would result in improvements over the efficiency, operations, and maintenance of the existing system as well as contribute to efforts to meet mandated energy reduction goals, reduce utility costs, and provide service in a maintenance-friendly manner. The Proposed Action would result in increased energy efficiency for Tinker AFB without causing any negative impacts on the Tinker AFB mission.

The *need* for the Proposed Action is that the current central steam distribution system is outdated, leaky, and costly for Tinker AFB to continue to operate. The current system does not operate efficiently, not all boilers are equipped with economizers or systems to control combustion or manage burners, and some boilers are equipped with old control systems that further impact the operating efficiency and safety of the system. Much of the pipeline is also aging, leading to leaks that result in energy losses.

Executive Order (EO) 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, was signed on 5 October 2009. It expanded upon the energy reduction and environmental performance requirements of EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, signed on 24 January 2007. EO 13423 was executed to direct federal agencies to implement sustainable practices for:

- Energy efficiency and reductions in greenhouse gas (GHG) emissions
- Use of renewable energy
- Reduction in water consumption intensity

- Acquisition of green products and services
- Pollution prevention, including reduction or elimination of the use of toxic and hazardous chemicals and materials
- Cost-effective waste prevention and recycling programs
- Increased diversion of solid waste
- Sustainable design/high-performance buildings
- Vehicle fleet management, including the use of alternative fuel vehicles and alternative fuels and the further reduction of petroleum consumption
- Electronics stewardship

EO 13423 requires federal agencies to reduce energy intensity by 3 percent each year, leading to a 30-percent reduction by the end of fiscal year (FY) 2015 as compared to an FY 2003 baseline. Energy intensity is defined as the total million British thermal units (mBtu) per square feet of base facilities.

The Proposed Action would provide a means for the USAF to achieve and exceed the mandated energy reduction goals at Tinker AFB as defined by EOs 13514 and 13423.

If the Proposed Action is not implemented, Tinker AFB would continue to consume large amounts of electricity, natural gas, and water, resulting in costs greater than if a more efficient system were operating. Further, Tinker AFB would incur increasing operations and maintenance costs resulting from the need to replace or repair large portions of the aging system.

1.3 Location, History and Current Mission

1.3.1 Tinker AFB

Tinker AFB is within the city limits of Oklahoma City, 5 miles east of downtown (Figure 1-3). The main portion of the base is bordered by Interstate 40 (I-40), Southeast (SE) 15th Street, and SE 29th Street to the north; Douglas Boulevard and Post Road to the east; SE 74th Street to the south; and Sooner Road to the west (Figure 1-4). Midwest City and Del City are north and northwest of Tinker AFB, respectively.

Tinker AFB's largest organization is the Oklahoma City Air Logistics Center (OC-ALC). The OC-ALC is the largest of three air logistics centers in the USAF Materiel Command and provides depot maintenance and product support, services, and supply chain management, as well as information support for 31 weapon systems, 10 commands, 93 USAF bases, and 46 foreign nations. The OC-ALC is the worldwide manager for a wide range of aircraft, engines, missiles, software, and avionics and accessories components.

Currently, Tinker AFB encompasses approximately 5,000 acres and contains an airfield and other facilities that support various associated units at the base (Figure 1-4) (Tinker AFB 2006). Tinker AFB provides specialized logistics support, management, maintenance, and distribution for defense weapons systems worldwide. Tinker AFB is divided into seven districts, each with specific land uses. The 72nd Air Base Wing is the host command. Associated units at the base include the OC-ALC, the 552nd Air Control Wing, the 507th Air Refueling Wing, the United States Navy Command Strategic Communications Wing One, the 3d Combat Communications Group, and the 38th Cyberspace Engineering Group. Approximately 27,000 personnel, plus additional visitors, access the base each day.

1.3.2 Central Steam Plants

The existing steam distribution system relies on CSPs and the boilers residing within to generate steam. Tinker AFB utilizes five CSPs, four of which are included in this project and are housed in buildings that function as heating facility buildings (Figure 1-5). Table 1-1 presents general information on the buildings within which each CSP is housed, the number of boilers and buildings served, and boiler operating efficiency.

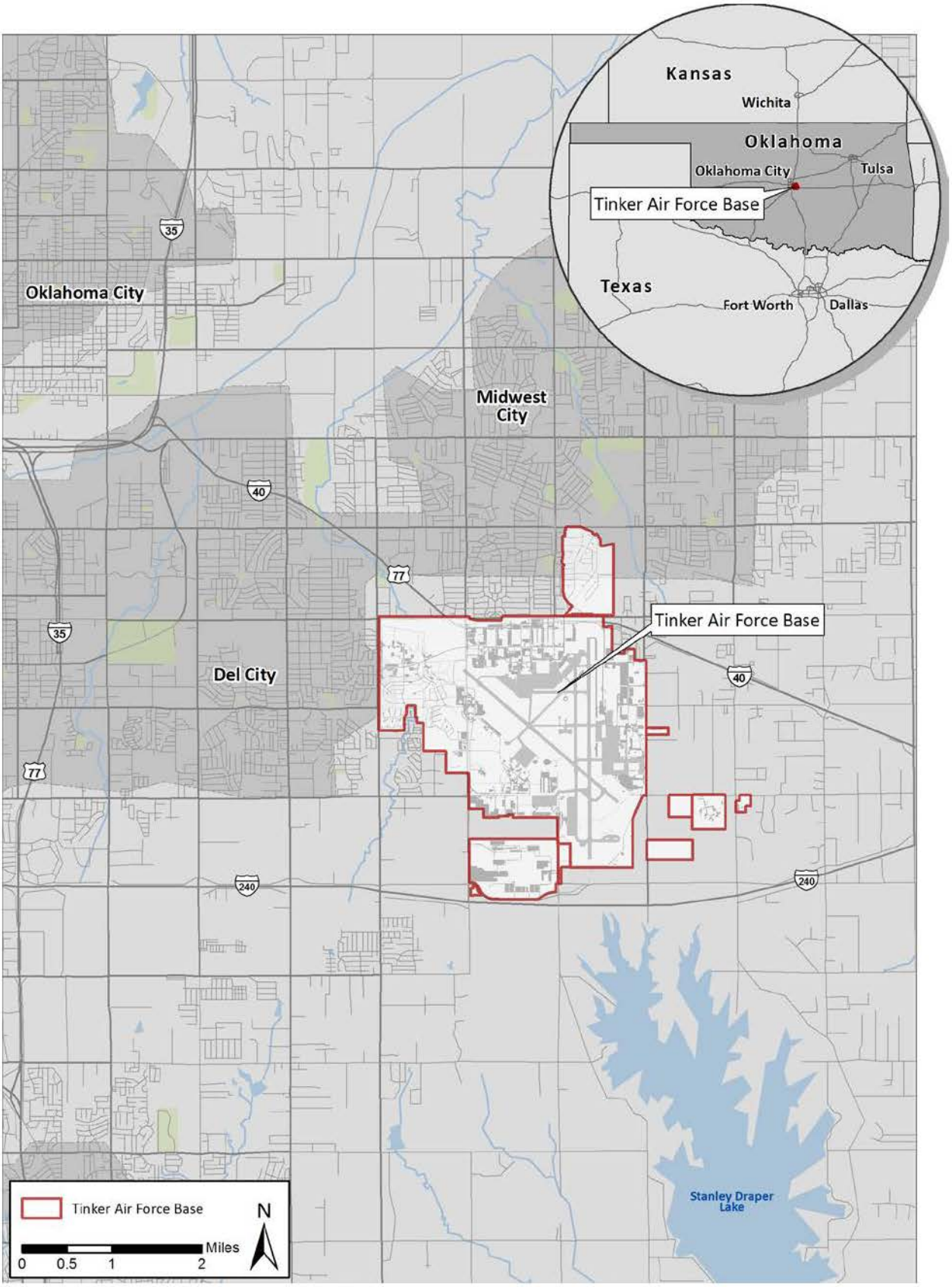


Figure 1-3. Regional Location of Tinker AFB

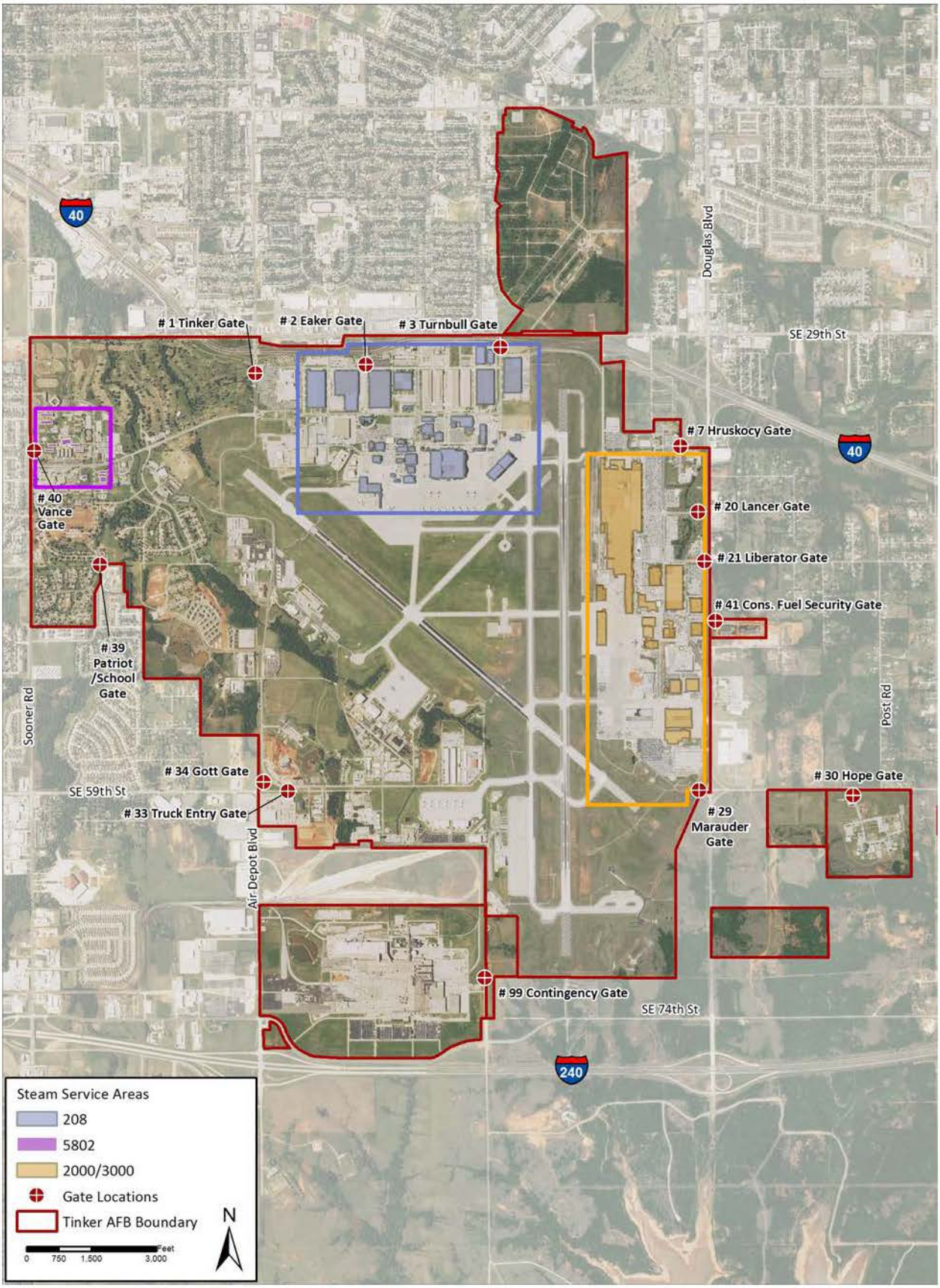


Figure 1-4. Current Tinker AFB Layout

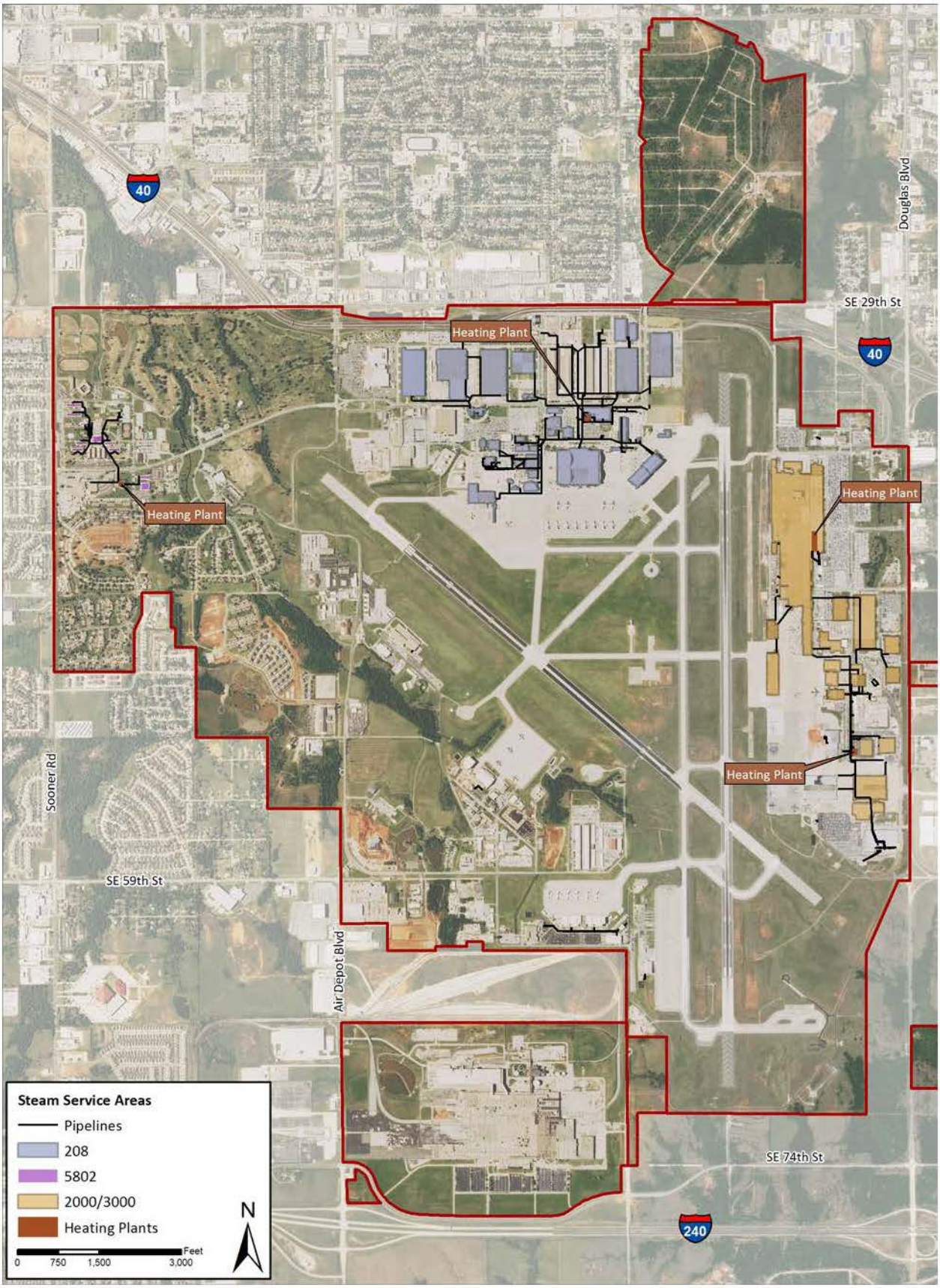


Figure 1-5. Central Steam Distribution System

Table 1-1. Central Steam Plant Characteristics

	CSP 208		CSP 2212	CSP 3001			CSP 5802
Year Building Constructed	1942[a]		1990	1943			1959
Number of Boilers	4 Large	2 Small	3	2	1	1	2
Year Boilers Installed	1942	2006	1987	1953	2008	Not Provided	Not Provided
Number Buildings Served	35 (Winter)	9 (Summer)	7 (Winter)	22 (Winter and Summer)			11 (Winter) 8 (Summer)
Boiler Efficiency	73%	78%	Not Provided	72% to 75%	83%	83%	Not Provided
Economizers in Use	4	0	0	2	0	0	0

Source: Honeywell 2010

Note: [a] Building 208 is considered an historic building—any proposed activities affecting the historical integrity of the structure or its unique features must be coordinated with the State Historic Preservation Office.

Each CSP contains boilers that operate at various efficiencies and most CSPs require upgrades in order to remain in service (Honeywell 2010), as described below.

CSP 208

- During periods of low loads, the four large boilers experience some burner outages.
- Upgrades to the combustion control system (CCS) and burner management system (BMS) must be made if CSP 208 is to remain in service.

CSP 2212

- Boilers operate in conjunction with CSP 3001 to accommodate for CSP 3001's lack of sufficient steam pressure to serve all connected buildings during winter months.
- Upgrades to the CCS and BMS should be considered if CSP 2212 is to remain in service.

CSP 3001

- CSP 3001's steam pressure is inadequate to serve all 22 buildings in the winter and requires the combined use of CSP 2212 and CSP 3001 for winter heating.
- Turbine-driven fans serve two boilers, enabling operations in the event of power interruption; these fans are at the end of their usable life cycle and require replacement.
- One boiler is used to start the steam plant in the event of a steam outage.
- Spare boiler space is available for future installation of an additional boiler.

- Excess exhaust steam from the turbines is evident due to the frequently visible steam plume in CSP 3001 boiler room.

CSP 5802

- Boilers would require retrofitting with a single, packaged burner if CSP 5802 were to remain in service.
    - Retrofitting would enable improved fuel-to-air-ratio control.
    - The CCS and BMS would be required to maintain safe operation.

Buildings receive steam heat from the CSPs via a distribution system of steam and condensate return piping. The majority of piping between buildings is buried; however, some piping is contained in concrete trenches (i.e., small tunnels) that are covered by concrete caps, metal plates, or sidewalk, and a small portion of piping is above ground, suspended by pipe racks. Although the steam pipes and tunnels have not been surveyed for the presence of asbestos-containing material, Tinker AFB personnel have estimated that most of the piping and steam tunnels contain asbestos, considering that portions of the steam distribution system were installed as early as the 1940s, following construction of the first CSP in Building 208 (B208). Asbestos testing would be performed before demolition or construction activities occur.

1.4 Summary of Environmental Study Requirements

The EIAP is the process by which federal agencies facilitate compliance with environmental regulations. NEPA is the primary legislation affecting these agencies' decision-making processes. This act and other facets of the EIAP are described below.

1.4.1 National Environmental Policy Act

NEPA requires that federal agencies consider potential environmental consequences of proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions. The CEQ was established under NEPA for the purpose of implementing and overseeing federal policies as they relate to this process. In 1978, the CEQ issued *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 CFR 1500-1508 [CEQ 1978]). The USAF developed its own procedural regulations for implementing NEPA, entitled EIAP (AFI 32-7061, codified at 32 CFR 989). These regulations specify that an EA be prepared to accomplish the following:

- Briefly provide sufficient analysis and evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact
- Aid in an agency's compliance with NEPA when no EIS is necessary
- Facilitate preparation of an EIS when one is necessary

Further, to comply with other relevant environmental requirements (e.g., the Safe Drinking Water Act, Endangered Species Act, and National Historic Preservation Act) and to assess potential environmental impacts, the EIAP and decision-making process for a proposed action

involves a thorough examination of all environmental issues pertinent to the action. The decision-making process includes a study of environmental issues related to the proposed construction and operations changes at Tinker AFB.

1.4.2 Scope of the Environmental Assessment

This EA addresses the full breadth of potential environmental, cultural, and socioeconomic impacts associated with the Proposed Action. The geographic area addressed includes the Proposed Action site and immediately surrounding environs. In addition to the Proposed Action, the EA assesses potential impacts associated with a No-Action Alternative. Resources analyzed include the standard, required critical elements of the human environment, as defined by NEPA, as well as additional issues identified by Tinker AFB staff and the USAF. The scope of analyses is based on the requirements of CEQ and the additional resources identified by Tinker AFB staff.

1.4.2.1 Resource Areas Addressed in Detail

Resource areas that could be affected by implementation of the Preferred Alternative or the No-Action Alternative have been advanced for detailed analysis in the EA. These resources are identified in Section 2.7.1.

1.4.2.2 Resource Areas Eliminated from Further Study

Resource areas that are not evaluated because no impacts on those resources would result from implementation of the Preferred Alternative or the No-Action Alternative are described below.

Geology and Soils

No sensitive geologic features or soils exist within Tinker AFB. Potential impacts on geology and soils associated with the Proposed Action would be limited to ground-disturbing activities during construction. Impacts on geology and soils from these construction activities would be insignificant. Construction activities would occur on previously disturbed or developed land that can support such development. The majority of naturally occurring soils within the proposed construction areas have been physically altered (e.g., cut, graded, or covered) or removed and replaced by imported fill to support existing structures and parking areas.

Land Use

Implementation of the Proposed Action would consist of infrastructure upgrade and installation and would not introduce any new uses to the base. All components of the Proposed Action would be consistent with applicable land use plans, would not preclude the viability of existing land use, would not preclude continued use or occupation of an area, would be compatible with adjacent land use, and would not conflict with airfield planning criteria. Included in the Proposed Action is the demolition of the interior infrastructure of B208 and the demolition of B5802, which could result in potential new future uses of these buildings/areas as they would become available following the implementation of the Preferred Alternative. Therefore, land use at Tinker AFB would remain relatively unchanged.

Visual Resources

Tinker AFB is characterized by a mixture of large industrial facilities, hangars, and the airfield. Visual resources are characteristic of an active military airfield. The Proposed Action would occur within the Douglas Cargo Aircraft Manufacturing Historic District, which is eligible for listing in the National Register of Historic Places (NRHP), as discussed in Section 3.3, *Cultural Resources.* However, implementation of the Proposed Action would not alter the appearance of historic buildings or the district. Given that the visual environment of Tinker AFB does not constitute a unique or sensitive viewshed, and proposed modifications of the existing buildings would be visually consistent with existing structures and activities at the installation and in the vicinity of the proposed project, no detrimental impact on regional visual resources would occur upon implementation of the Proposed Action. Further, the proposed natural gas pipeline would be installed below ground and would not be visible following construction activities. Therefore, implementation of the Proposed Action would result in no impacts on visual resources at Tinker AFB.

Noise and Vibration

The Proposed Action would not result in a change in ambient noise levels at Tinker AFB. Noise and vibration would likely be noticeable in the immediate vicinity of construction activities; however, these activities would be short-term, localized, and would not create adverse impacts. The Proposed Action would be implemented near an airfield that is in constant use. Therefore, ambient noise and vibration at Tinker AFB would remain relatively unchanged from existing conditions.

Environmental Justice/Protection of Children

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* instructs each federal agency to make "achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations."

Because children may suffer disproportionately from environmental health risks and safety risks, EO 13045, *Protection of Children from Environmental Health and Safety Risks,* was introduced in 1997 to prioritize the identification and assessment of environmental health risks and safety risks that may affect children and to ensure that federal agencies' policies, programs, activities, and standards address such risks to children.

Demographic data obtained from the United States Census Bureau were used to determine if minority populations, low-income populations, and risks to children exist within the project area (Table 1-2).

Table 1-2. Minority Populations and Low-Income Populations

Geographical Area	Total Population[1]	Total Minority Population[2]	Percent Minority	Percent Low-Income[3]	Percent under 18 Years
Oklahoma City	544,157	255,582	47.0	16.5	26.0
Midwest City	53,674	21,875	40.8	15.1	26.8
Del City	22,446	7,829	34.9	11.3	27.0
Oklahoma County	699,440	340,466	48.7	16.2	26.2
Oklahoma	3,606,200	1,154,229	32.0	16.2	24.9

Source:
United States Census Bureau 2008
Notes: [1] Data are estimated and have a margin of error of ± 0.1 percent.
[2] Minorities are persons classified by the United States Census Bureau as Hispanic/Latino, Asian-American, African American, Native American, Alaska Native, Native Hawaiian, Pacific Islander, Other Race, or Multi-Racial.
[3] Individuals below poverty level. Data are estimated and contain a margin of error of ± 0.1 percent

Based on the information above, there is a minority population present within the area; however, all impacts associated with the Proposed Action and the No-Action Alternative would occur within the perimeter of Tinker AFB and would be restricted to the project site. Effects of the activities resulting from the Proposed Action would not extend to areas where children might be affected. Effects from the Proposed Action would not directly or indirectly impact the minority population. Therefore, no further analysis of environmental justice or the protection of children is warranted.

1.4.3 Interagency and Intergovernmental Coordination for Environmental Planning

Public involvement is a useful component of the EA process; it includes both agencies and members of the public. Public involvement occurs primarily during the public comment period. At this time, no members of the public have requested to be informed about the Proposed Action. The Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) is a federally mandated process for informing and coordinating with other governmental agencies regarding proposed actions. As detailed in 40 CFR 1501.4(b), CEQ regulations require intergovernmental notifications prior to making any detailed statement of environmental impacts. Through the IICEP process, the USAF notifies relevant federal, state, and local agencies and allows them sufficient time to make known their environmental concerns specific to a proposed action. Comments and concerns submitted by these agencies during the IICEP process are subsequently incorporated into the analysis of potential environmental impacts conducted as part of the EA. Agencies contacted through the IICEP process included the Federal Emergency Management Agency, Oklahoma Department of Environmental Quality (DEQ), Oklahoma Archeological Survey (OAS), and State Historic Preservation Office (SHPO). Coordination included consultation with Native American tribes including the Seminole Nation, Osage Nation, Muscogee (Creek) Nation, Caddo Nation of Oklahoma, and Wichita and affiliated Tribes.

For the Proposed Action, a draft EA was issued and the document sent directly to identified agencies, a Notice of Availability was published in *The Oklahoman and Tinker Take Off* on

July 15, 2011. Copies of the draft EA were placed for public review at the Midwest City Library. Publication of the Notice of Availability and placement of the draft EA in the public library began the 30-day public comment period, which closed on 15 August 2011. During the public comment period, any interested individuals were able to request to view a copy of the draft EA at the selected library and to submit written comments. No public comments were received. Comments from agencies were limited to a recommendation from the Oklahoma Water Resources Board to contact the local floodplain administrator for possible permit requirements for the project. A copy of the public notice, notification to agencies, and written comments received from agencies are provided in Appendix A, *Public Notice*, at the end of this document.

1.4.3.1 Required Permits and Consultation

The following federal, state, or local permits, licenses, and consultation requirements are required prior to implementation of the Proposed Action:

- Tinker AFB Airfield Waiver – An airfield waiver is required prior to any digging or boring activities. During this process, safety measures by which contractors must abide would be detailed to ensure the safety of all personnel on site. The contractor should submit the request for an airfield waiver at least 90 days prior to the start of construction activities.
- Clean Water Act – Regulates water quality by establishing standards and facilitating permit programs. The Proposed Action would require a Stormwater General Permit for Construction Activities – Permit No. OKR10.
- Clean Air Act (CAA) – Regulates air quality by establishing standards and permit programs, and by providing framework for enforcement actions. The Proposed Action will not require a construction permit or revisions to Tinker AFB's Title V Operating Permit.
- National Historic Preservation Act (NHPA) – Involves any activities affecting historic properties on federal land or through a federally proposed action. The Proposed Action would require consultation with the Oklahoma SHPO and the OAS on a determination of *no adverse effect*.
- Endangered Species Act – The established mechanism for listing threatened and endangered species as well as establishing species recovery programs. The Proposed Action requires coordination with the U.S. Fish and Wildlife Service (USFWS) and the Oklahoma Department of Wildlife Conservation (ODWC) on a determination of *no effect.*
- Resource Conservation and Recovery Act (RCRA) – Regulates storage, handling, and generation of hazardous and nonhazardous solid waste. The Proposed Action would require the removal of fuel oil storage tanks and completion of a clean closure report in accordance with Oklahoma Administrative Code (OAC) 165:25, OAC 165:26, and Tinker AFB Standards 0700, 0710, and 0720.

SECTION 2.0
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

The current central steam distribution system at Tinker AFB is outdated, leaking, inefficient, and costly to maintain and operate. Some of the system boilers are not equipped with modern control and monitoring equipment, further impacting efficiency and safety of the system (Honeywell 2010). System optimization is needed to address steam distribution system deficiencies, excessive resource use, high maintenance needs, safety issues, aging infrastructure, and environmental impacts. Implementation of the Proposed Action would result in long-term increased energy efficiency, decreased utility and resource consumption, financial savings, elimination of environmental impacts resulting from the existing system, and fulfillment of Tinker AFB heating needs without presenting any negative impacts to the Tinker AFB mission. As required by NEPA, the potential impacts of the Proposed Action on the human and natural environment must be evaluated, and reasonable alternatives to the Proposed Action must be considered.

2.2 Proposed Action

The Proposed Action is to establish a heating system for facilities serviced by the central steam distribution systems on Tinker AFB that would result in improvements over the efficiency, operations, and maintenance of the current system as well as contributing to efforts to meet mandated energy reduction goals, reduce utility costs, and provide service in a maintenance-friendly manner. The Proposed Action would enable the Air Force to achieve increased energy efficiency and decreased utility consumption goals at Tinker AFB as outlined in EOs 13514 and 13423. Additionally, the Proposed Action would result in improvements to the distribution system such that most existing leaks would be eliminated, minimizing environmental impacts resulting from current operations.

2.3 Alternatives Selection Criteria

The range of reasonable alternatives considered in this Description of Proposed Action and Alternatives is limited to those alternatives that would satisfy the purpose and need for the Proposed Action as described in Section 1.2. The current central steam distribution system operates in a manner that relies on aging and inefficient infrastructure, requires excessive resource use and high levels of maintenance, and presents risks to human health and safety and the surrounding environment (Honeywell 2010). Reasonable alternatives would fulfill the goal of providing improvements over the efficiency, operations, and maintenance of the current system as well as contributing to efforts to meet mandated energy reduction goals, reduce utility costs, and provide service in a maintenance-friendly manner with the capability to serve the associated heating needs of the portions of the base presently served by the existing system. For the purposes of this EA, viable alternatives must meet all of the following criteria:

- Result in at least a 15-percent reduction in energy intensity in order to meet the 30 percent reduction in energy intensity compared to the FY 2003 baseline.
    - Tinker AFB FY 2003 baseline is 215.1 Mbtu per square foot (SF).
    - Tinker AFB FY 2009 baseline is 177.9 Mbtu per SF.
    - Total energy consumption for Tinker AFB in FY 2009 was 3,234,808 Mbtu.
    - A 30-percent reduction of energy intensity would equal 150.6 Mbtu per SF by FY 2015.
- Not require extensive architectural modifications that would result in downtime, which would impact the mission.
- Utilize a reliable primary energy source.

To the maximum extent possible, renewable energy generation projects should be implemented on agency property for agency use.

Based on an alternatives analysis, the Preferred Alternative is the only reasonable action that would satisfy the project's purpose and need.

2.4 Alternatives

Alternative project approaches to implement the Proposed Action were identified and evaluated. Two alternatives were identified, including the No-Action Alternative (which, under NEPA, is an alternative required to be analyzed). Alternatives that were initially identified but do not satisfy the project's purpose and need are described in Section 2.5, *Alternatives Considered but Not Carried Forward.* Each alternative's adequacy for satisfying the project's alternative selection criteria was evaluated, and a summary of those evaluations is provided in the following sections.

2.4.1 Preferred Alternative: Decentralization of Three CSPs

2.4.1.1 Overview

The Preferred Alternative entails the decommissioning of one CSP (208), demolition of two CSPs (2212 and 5802), and optimization of the heating distribution system by replacing the CSP boilers with new boilers or other gas-fired heating equipment within most of the buildings currently served by those existing CSP systems. The steam distribution system (e.g., pipeline, tunnels) between the existing CSPs and buildings would be abandoned. The Proposed Action includes 70 of the 71 buildings currently served by the steam distribution system; one building is excluded from this Proposed Action and is under consideration for a separate unrelated action. Under the Preferred Alternative, CSP 3001 would be decentralized and downsized to provide steam heating to just four of the buildings it currently serves (B2280, B3001, B3125, and B3221). The new heating system would use natural gas to fuel new building boilers or heating equipment at the remaining 66 of the 71 buildings currently served by the steam distribution

system. Boilers would be connected to the water supply and would have backflow prevention installed. Natural gas would be conveyed to the new systems via the existing natural gas distribution infrastructure at the base; additional distribution/circulation pipelines would be installed where required to ensure a sufficient natural gas supply. No natural gas storage is included as part of the proposed project.

Renewable Energy and Energy Efficient Technologies

The Preferred Alternative also includes the installation of a ground source heat pump system and a variable refrigerant flow (VRF) system, a renewable energy and energy-efficient technology, respectively. The ground source heat pump system would be used in conjunction with new heating and cooling equipment proposed during decentralization and would be located at B510, which is currently served by CSP 208. Other buildings were evaluated for the use of this technology, but they were determined to be infeasible due to building-specific infrastructure and heating/cooling needs. B510 was the only building where the installation of a ground source heat pump system could be integrated into the building's existing infrastructure, and it was the only building with adequate open area available for the installation of wells. Replacement of the entire heating, ventilating, and air conditioning (HVAC) system is also planned for B510, which is preferable when replacing an existing system with a ground source heat pump system. Other buildings evaluated were not candidates for complete replacement of the HVAC system, an additional reason why a ground source heat pump system is not recommended for those locations. VRF systems are proposed for B240 and B506 to replace the existing HVAC systems.

Construction and Demolition Activities

Under the Preferred Alternative, construction activities would occur over 30 months. Demolition and construction activities to install the proposed equipment and upgraded components, as well as trenching of new natural gas pipeline, would entail the use of various construction vehicles (e.g., bulldozers, trenchers, backhoes). Construction equipment and vehicles would be kept on site at temporary staging areas, which would be relocated as construction activities move around base. Staging areas would generally be sited in disturbed or previously developed sites to minimize construction impacts.

Hazardous materials are present in buildings and CSPs that would be affected by the Proposed Action. Such materials are likely to be encountered during implementation of the Preferred Alternative and would include fuel oil, refrigerants, mercury, asbestos, and lead-based paint. Disposal of all hazardous materials would be conducted in accordance with all applicable regulations and in compliance with Tinker AFB's hazardous materials management system.

General Components of the Preferred Alternative

The Preferred Alternative includes an extensive list of actions to be completed in the decentralization process. Implementation of the Preferred Alternative would require extensive ground-disturbing activities to install the proposed additions to the natural gas pipeline distribution system. Descriptions of proposed activities have been grouped into areas that correspond to the buildings served by each CSP and the proposed natural gas pipeline:

- CSP 208 Area
- CSPs 2000/3000 Area (served by CSPs 2212 and 3001)
- CSP 5802 Area
- Proposed natural gas pipeline

Because of the similarities of the proposed component activities, CSP 208 Area and CSP 5802 are described jointly below. Proposed activities for the CSP 2000/3000 Area and the proposed pipeline installation are discussed separately.

For the purposes of this document, general descriptions of the activities to be included in the Preferred Alternative are provided in the following sections. Detailed descriptions of the activities proposed for each building affected by the Proposed Action are provided in Appendix B.

2.4.1.2 CSP 208 and CSP 5802 Areas

CSPs 208 and 5802

Implementation of the Preferred Alternative would result in the decentralization and decommissioning of CSPs 208 and 5802 and the demolition of CSP 5802 (Figures 2-1 and 2-2).

The following activities would occur for the both CSPs:

- Decommission CSP
- Remove and dispose of fuel from underground and aboveground fuel oil tanks
- Remove fuel oil storage tanks, and ensure completion of a clean closure report in accordance with OAC 165:25, OAC 165:26, and Tinker AFB 0700, 0710, and 0720.
- Demolish equipment inside facility
- Demolish portions of outside steam and condensate return piping
- Abandon in place all buried steam and condensate return piping of the steam heat distribution system

Further:

- Built in 1942, B208 is eligible for listing on the NRHP. Once the CSP at B208 has been decommissioned and associated infrastructure either demolished or abandoned in place (see above), B208 would remain in place and would be mothballed in accordance with *Preservation Brief 31: Mothballing Historic Buildings*.
- B5802 would be demolished.

The activities identified above would be performed without affecting the physical structure or historic elements or features of B208, B230, or B240, all of which are eligible for listing on the NRHP. Refer to Section 4.3.2 for details to ensure the avoidance of adverse impacts. Under the

Preferred Alternative, the steam distribution system (e.g., pipeline, tunnels) between the existing CSPs and buildings would be abandoned in place. All abandoned lines would be emptied, capped, marked as *abandoned*, and memorialized in such a way that the information would be available for future reference by the USAF. Pipelines would not be filled (e.g., with sand) as part of the abandonment process.

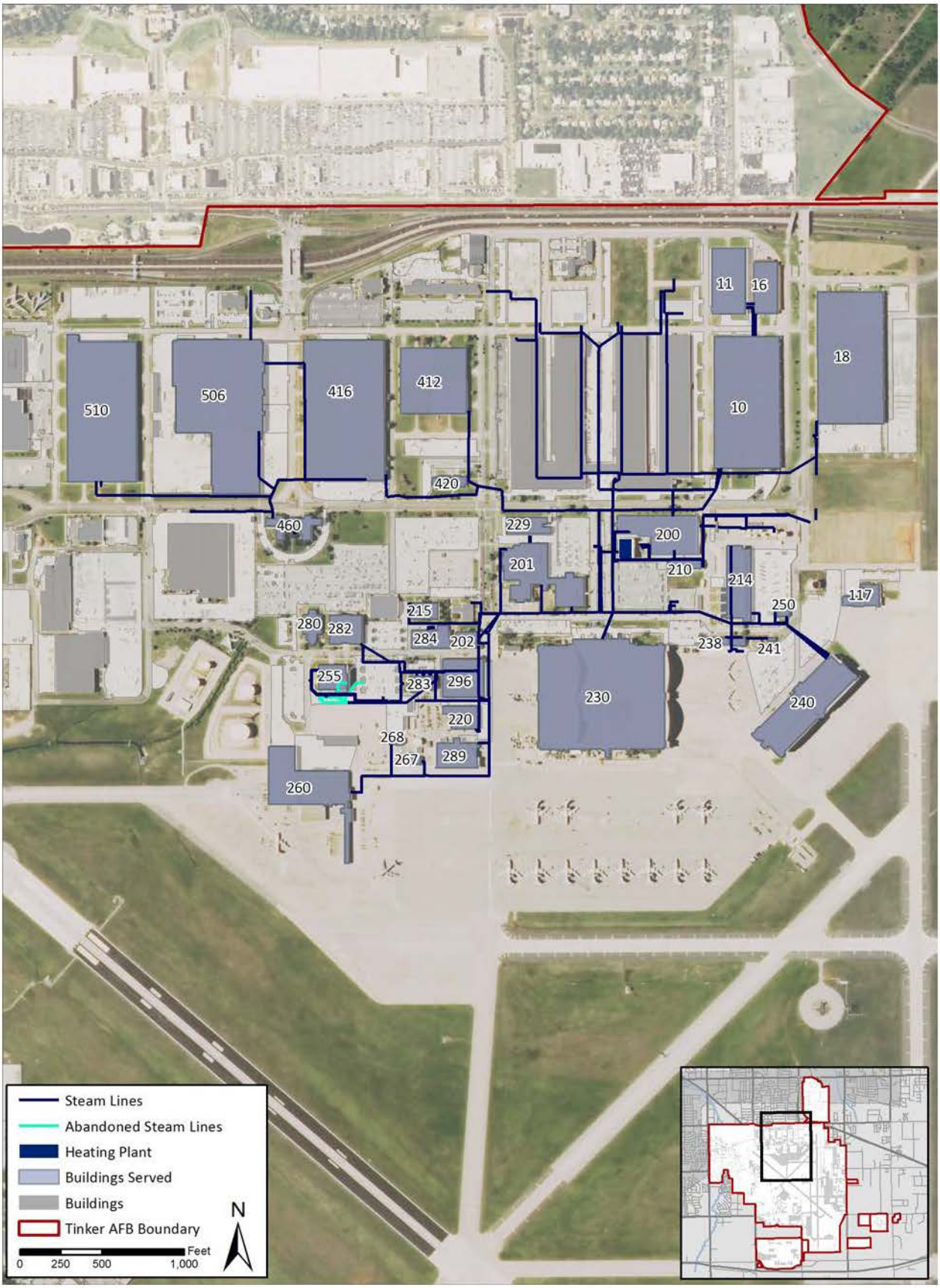
Buildings Currently Served by CSPs 208 and 5802

Under the Preferred Alternative, buildings currently served by CSPs 208 and 5802 would be disconnected from the central steam distribution system (Figures 2-1 and 2-2). There are several buildings not included in the Proposed Action that are served by the CSPs; these buildings are scheduled for demolition by Tinker AFB under separate actions and would not be included in the upgrades of the heating distribution system.

Some of these buildings were included in an EA for demolition of facilities at Tinker AFB prepared in 2002 (Tinker AFB 2002a). The preparation of an EA to address the current list of buildings proposed for demolition is scheduled for FY 2013. Buildings not covered by the EA for demolition of facilities prepared in 2002 would be mothballed (i.e., closed and preserved without major structural alteration) in order to prevent informal demolition by neglect prior to the completion of appropriate NEPA-compliant documentation.

In each building except B510, new boiler or heating equipment would be installed as required by building-specific needs. The proposed activities for all buildings except B510 would include the following:

- Disconnect power, controls, piping from existing steam/hot water exchangers, pneumatic, and low-voltage controls
- Remove existing steam/hot water exchangers in buildings that use this equipment
- Install new gas service entrance, including regulator, meter, piping, and accessories
- Install new concrete equipment pads where required to support new equipment



1 **Figure 2-1. Central Steam Plant 208 Area**

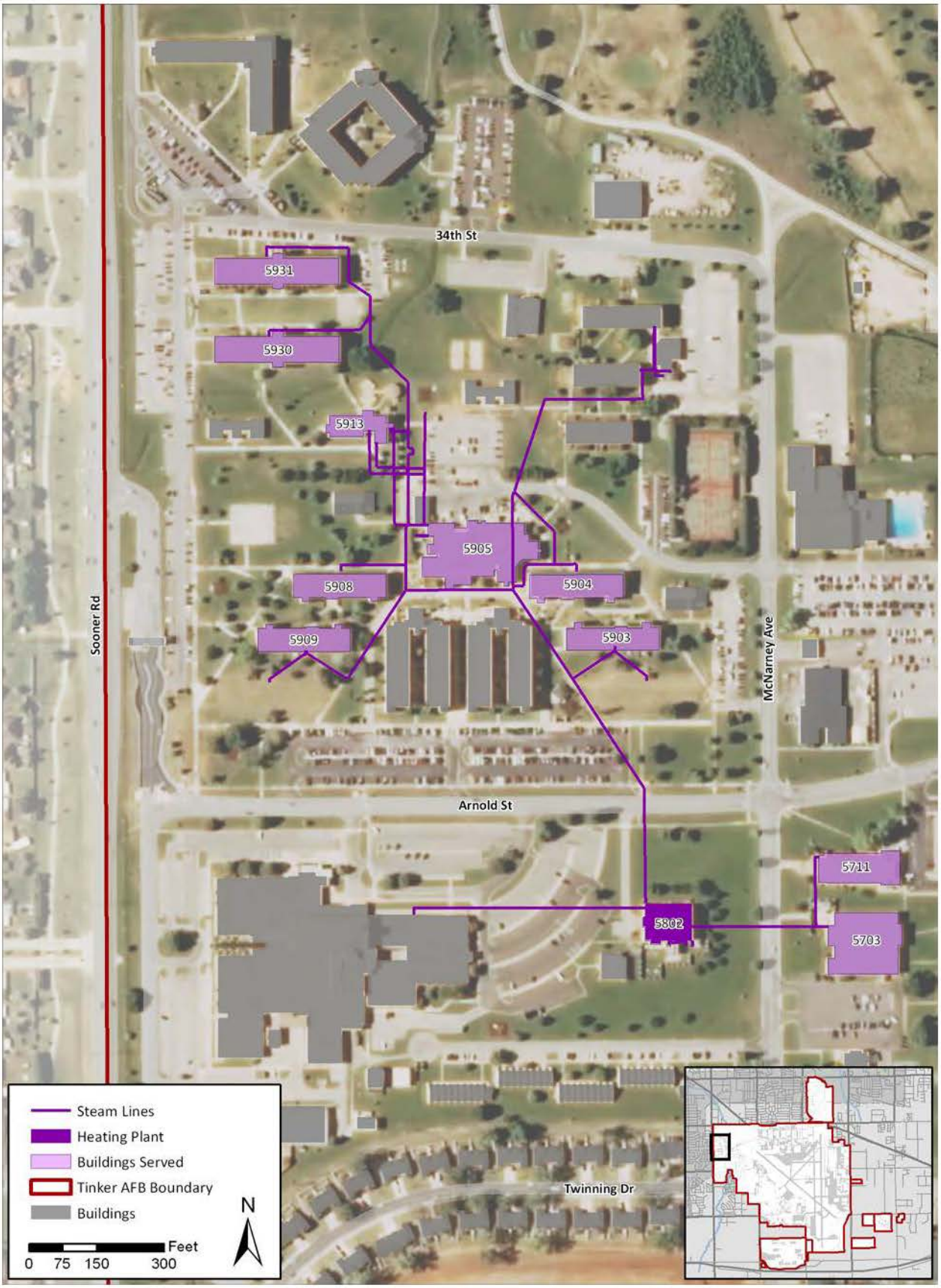


Figure 2-2. Central Steam Plant 5802 Area

- For buildings currently using steam/hot water exchangers, install new high-efficiency boilers (domestic, heating water, or steam) as required to meet building needs
- For buildings currently using steam-heated equipment or that use process steam systems, remove and retrofit such equipment or replace it with gas-fired equipment (gas-fired infrared heating or gas-fired heating units)
- Connect new high-efficiency water heaters to existing plumbing system
- Modify existing motor control centers in mechanical rooms for additional power circuits as needed

In addition to the activities described above, B240 and B506 contain air-cooled chillers that are proposed for replacement under the Preferred Alternative. Work pertaining to chiller plants would include the following:

- Remove existing air-cooled chiller
- Remove existing multizone air handling unit and return air fan and replace with a VRF system
- Remove pipe fan-coil units and replace with a VRF system
- Install dedicated outside air unit with electric heat, direct cooling, and heat recovery for ventilating purposes
- Install packaged HVAC rooftop units (as appropriate)

B510 Decentralization and Optimization

B510 is a large warehouse currently served by CSP 208 that requires heating throughout its warehouse and storage areas. Under the Preferred Alternative, a gas-fired infrared heating system is proposed to serve the needs of B510. The proposed activities would include the following:

- Remove mechanical room steam service, including condensate pump, piping, and accessories
- Cap or seal condensate service at the mechanical room
- Remove heating water system (including pumps, piping, tanks, and accessories)
- Install a new gas service tie-in for boiler and infrared systems
- Install a gas-fired hot water boiler system (including pumps, variable-frequency drive, tank, and accessories)
- Provide one-hour fireproofing for new and existing mechanical room walls
- Install hot water unit heater in mechanical room
- Install an energy management control system and a metering system

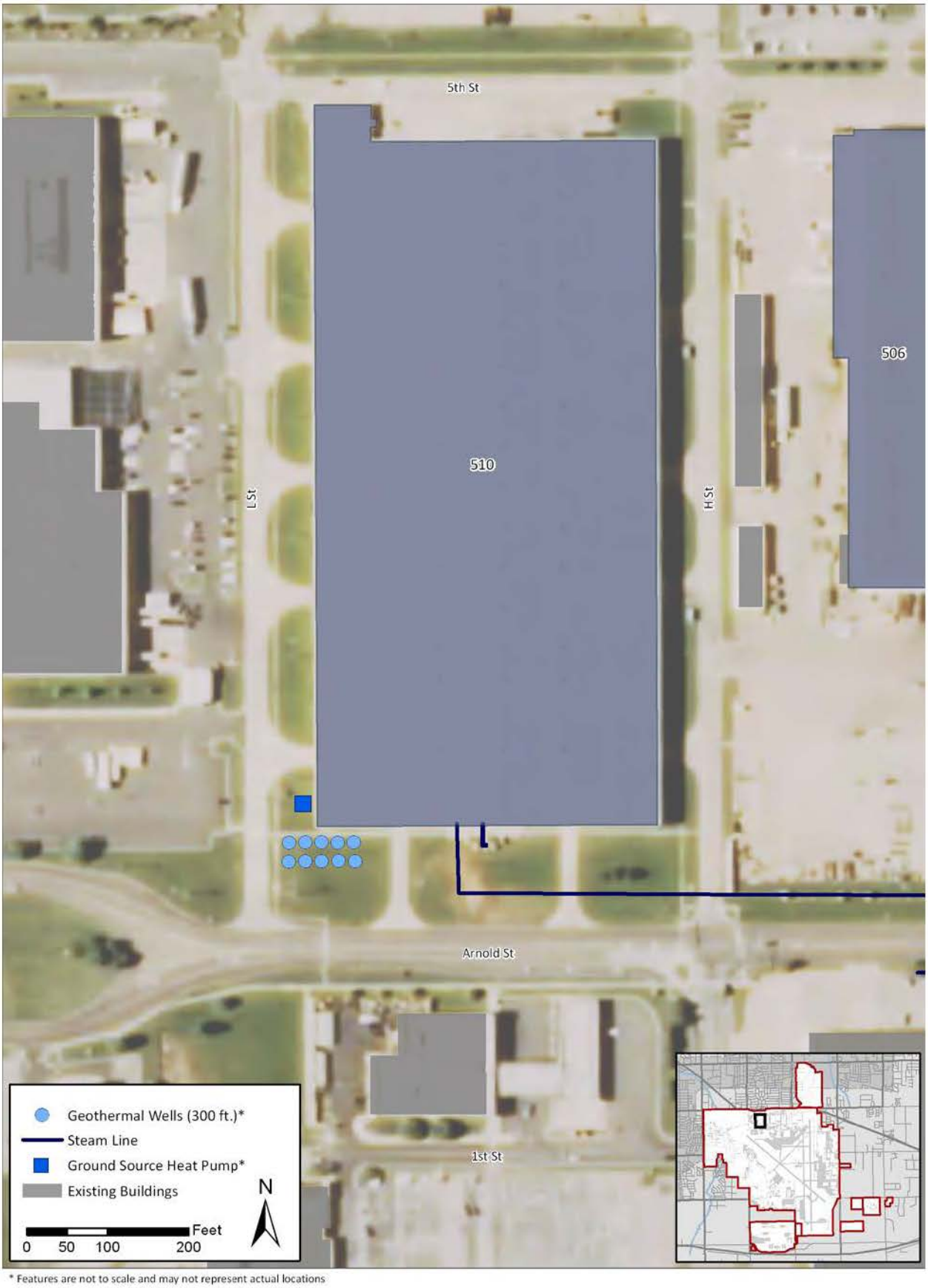


Figure 2-3. Ground Source Heat Pump Array at B510

- Remove the vertical air handling unit from administration space
- Remove the condensing unit from administration space

In addition, a ground source heat pump and geothermal well field are proposed for installation in the vicinity of B510 (Figure 2-3). Ground source heat pumps are electrically powered systems that tap the energy stored beneath the earth's surface to provide heating, cooling, and hot water for buildings (International Ground Source Heat Pump Association 2011). The following activities are included for B510:

- Install a ground source heat pump with external pump module
- Connect a ground source heat pump to the existing supply and ductwork
- Install a geothermal well field consisting of ten 300-foot-deep wells with a separation of 20 feet

2.4.1.3 CSP 2000/3000 Area

CSPs 2212 and 3001 operate in conjunction to serve all connected buildings within the CSP 2000/3000 Area (Figure 2-4). CSP 3001 does not generate sufficient steam pressure to serve all the buildings in this area during winter months. As a result, CSP 2212 is operated only during the winter months to provide additional steam pressure.

CSP 2212

Under the Preferred Alternative, CSP 2212 would be decentralized, decommissioned, and demolished in a manner similar to that described for CSP 5802. None of the buildings serviced by CSP 2212 are considered historic properties. (Please refer to Section 2.4.1.2, *CSP 208 and 5802 Areas,* for a general list of activities and to Appendix B for detailed actions that would also be implemented at CSP 2212 under the Preferred Alternative.)

CSP 3001

CSP 3001 would be decentralized from the existing base steam distribution system and downsized to serve only four buildings (B2280, B3001, B3125, and B3221). Boiler improvements would be implemented to improve operating efficiency and safety controls. Included in the proposed activities for CSP 3001 are the following:

- Install a new condensing economizer to serve two of the four existing boilers
- Demolish steam turbine boiler fans
- Install new variable-frequency drive motors in one boiler to improve boiler operating efficiency and eliminate the need to vent turbine exhaust steam to a roof vent
- Demolish steam and condensate return piping in steam turbine boiler fan area
- Install BMS and CCS on two boilers

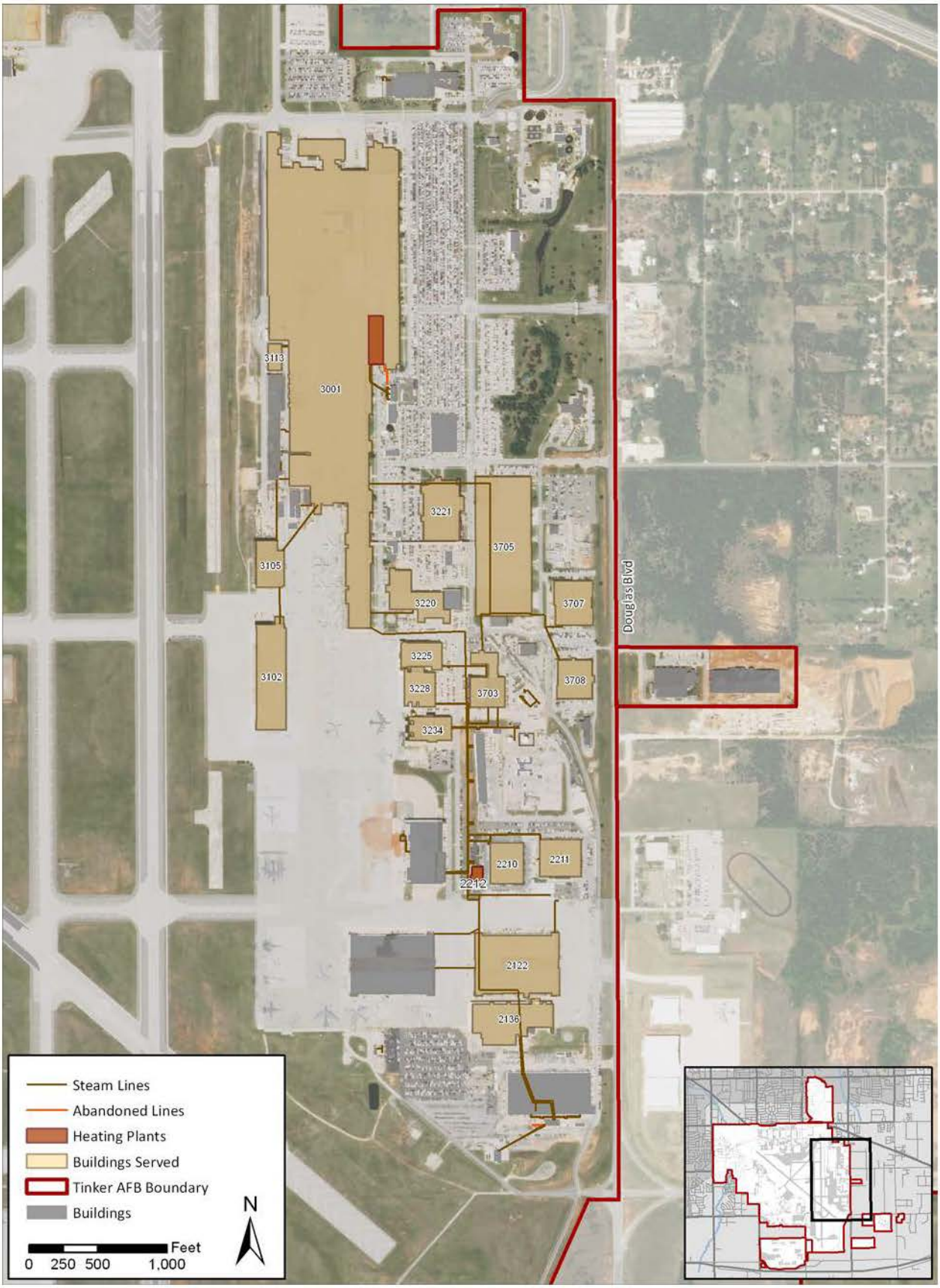


Figure 2-4. Central Steam Plant 2000/3000 Area

- Disconnect and abandon in place one boiler, including disconnecting steam lines and locking out electrical power and gas supply; cap, mark, and document abandoned steam lines for future reference
- Install new boiler blowdown heat recovery system to improve heat capture and reduce steam venting to the roof
- Install a new 750-kilowatt emergency generator outside B3001 to provide standby power to boiler feed pumps and emergency backup power to some critical electrical loads in the CSP 3001
- Retain the use of steam and condensate return piping distribution system to supply B2280, B3001, B3125, and B3221
- Drain and abandon in place the buried steam and condensate return piping distribution system, excluding portions of the system serving the four buildings that are to remain connected to CSP 3001; cap, mark/tag, and document abandoned steam lines for future reference
- Install new concrete equipment pads where required to support new equipment

The activities identified above would be performed without affecting the physical structure or historic elements or features of B3001, B3105, B3113, or the Douglas Cargo Aircraft Manufacturing Historic District, all of which are eligible for listing on the NRHP. Refer to Section 4.3.2 for details to ensure avoidance of adverse impacts.

Buildings Currently Served by CSPs 2212 and 3001

All buildings currently served by CSP 2212, and all but four buildings currently served by CSP 3001 (B2280, B3001, B3125, and B3221), would be disconnected from the central steam distribution system. New boiler or heating equipment would be installed in each building as required by building needs. The proposed activities would be the same as those for buildings currently served by CSPs 208 and 5802. (Please refer to Section 2.4.1.2, *CSP 208 and 5802 Areas*, for a general list of activities and to Appendix B for detailed actions by building proposed under the Preferred Alternative.)

2.4.1.4 Proposed Natural Gas Pipeline

Under the Preferred Alternative, the existing steam distribution system would be replaced with individual heating units in each building. The new heating system would use natural gas to fuel the new building boilers or heating equipment. To accommodate the new heating system, the base's existing natural gas distribution system would be used, and a new natural gas pipeline would be installed where required to provide sufficient natural gas supply. As part of the proposed pipeline installation, two cross ties would be installed, one to ONG's main base connection and one along South Munitions Road. Figure 2-5 illustrates the general layout of the proposed gas pipeline installation. This portion of the proposed project would occur near the end of the 30-month period of construction activities.

All new pipeline alignments would fall within base property and would follow existing utility corridors or be aligned in previously disturbed or developed areas. At the southern end of the base, the pipeline is proposed to follow the existing Alert Road alignment to restrict ground disturbance and floodplain encroachment to previously disturbed areas (e.g., the roadway) to the extent practicable.

Installation of the additional pipeline is required to reliably provide sufficient natural gas to the proposed heating system. Additionally, the pipeline would serve as a connection between the existing natural gas pipeline at the Tinker Aerospace Complex (TACX) on the southwestern portion of the base to the natural gas pipeline currently serving the CSP 2000/3000 Area. At this time the natural gas distribution system on base does not form a closed loop; if a disruption were to occur in the system, all users downgradient from that point would lose natural gas service. However, the current system includes backup fuel tanks that the CSPs can use to maintain operations if the natural gas supply is cut off and is unable to maintain heating in all buildings. As a result of implementation of the Preferred Alternative, the backup fuel system would be removed for CSP 208 and CSP 5802 areas, and all new boilers and generators would operate using individual connections to the base's natural gas distribution system. The completed gas distribution loop should compensate for any potential disruptions of natural gas service at a point along the system; therefore, energy redundancy would be maintained on base.

2.4.1.5 Proposed Activities in Common for all Areas

The Preferred Alternative includes an extensive list of actions to be completed in the decentralization process. Many of the proposed activities would be performed for all areas affected by the Proposed Action. Such activities common to all areas in addition to those discussed in the preceding sections include the following:

- Demolish aboveground steam and condensate return piping where indicated on demolition drawings/plans
- Cap, mark, and document locations of abandoned belowground steam and condensate return piping
- Install new equipment pads where existing concrete pads are inadequate to support new equipment
- Reuse existing power wiring where possible
- Reuse existing piping where possible
- Modify existing motor control centers in mechanical rooms to provide additional power circuits as needed
- Modify existing roofing where new equipment may protrude outside of existing building shell

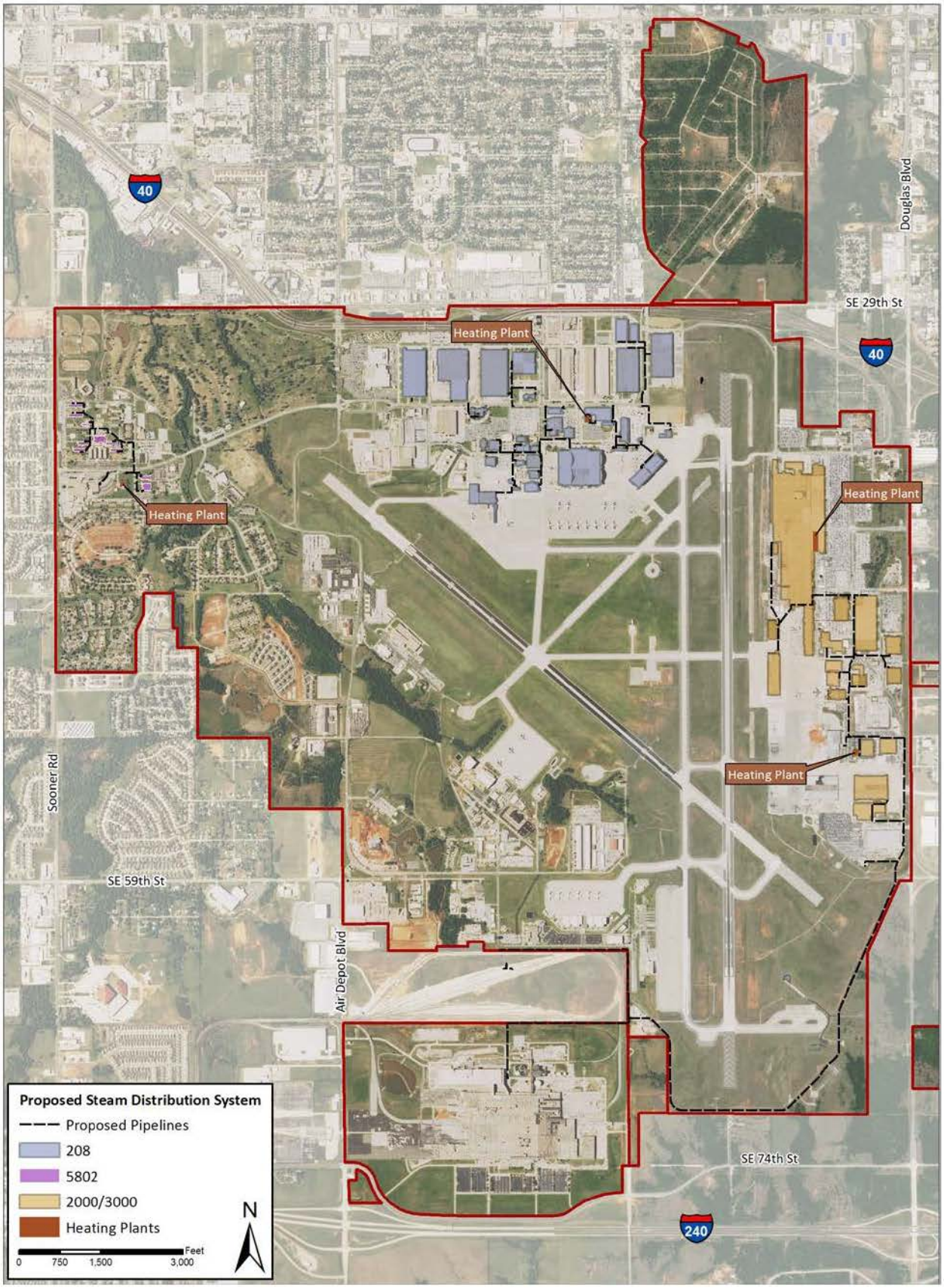


Figure 2-5. Proposed Pipeline Installation

- Modify existing mechanical room walls or construct new walls where new equipment may protrude outside of existing mechanical room limits
- Schedule temporary utility interruptions to minimize impacts on users and occupants
    - Electrical service interruption would be required for installation of new equipment, meters, and connections to existing distribution system for each affected building.
    - There would be limited gas interruption in isolated areas on base.
    - Boiler installations would occur outside of peak usage times to minimize disruption to users.

2.4.1.6 Resultant Improvements from the Preferred Alternative

The steam decentralization project and optimization as proposed in the Preferred Alternative would result in multiple benefits to Tinker AFB, including improved heat service, energy savings, and reduced maintenance needs. The final energy intensity once implementation of the Preferred Alternative is complete is estimated to be 138.7 mBtu per SF, or a reduction in energy intensity of 41 percent (personal communication, Jeff Springfield, P.E., LEED AP, 20 May 2011). This would equate to an 11 percent greater reduction than established by the EO 13423 goal for FY 2015.

Energy Savings

Tinker AFB has set a goal of reducing its utility and operations and maintenance costs by 30 percent. Implementation of the Preferred Alternative would yield annual savings of $7,729,207 and would contribute to efforts by Tinker AFB to meet or exceed the goal for 30 percent reduction in energy usage (Honeywell 2010). These savings would comprise the following annual consumption reductions:

- Water consumption would be reduced by approximately 17,846,000 gallons.
    - Tinker AFB would gain about 2 percent toward its water reduction goal.
- Electricity consumption would be reduced by approximately 6,557,000 kilowatt-hours.
- Natural gas consumption would be reduced by approximately 520,000 mBtu.

The entire proposed project under the Preferred Alternative is estimated to cost $102.4 million. The simple payback of the project is estimated at 13.24 years based on the utilities and in operations and maintenance savings that would be generated by the project; the total term of the project payback, including finance charges, is 21 years (Honeywell 2010).

New equipment would enable building managers and civil engineering staff to monitor and track energy consumption for the proposed system. Inclusion of a ground source heat pump system would provide a means for Tinker AFB to implement renewable energy alternatives to contribute towards meeting the renewable energy goals stated in the Energy Policy Act of 2005; EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*; and EO 13514,

Federal Leadership in Environmental, Energy, and Economic Performance, as well as in 10 USC § 2911, *DoD* [United States Department of Defense] *Energy Performance Plan*.

Operations and Maintenance

Implementation of the Preferred Alternative is being proposed as a turnkey project under a self-funded energy savings performance contract (Honeywell 2010). In preparation of the project proposal, engineers have conducted surveys of Tinker AFB to identify the CSPs and all buildings served by the four CSPs included in the Proposed Action. Interviews with building personnel and analysis of boiler operator log data to evaluate natural gas, makeup water, chemical usage and CSP electrical consumption has been performed. To determine the amount of energy loss in this distribution system, estimated heat loss for the steam and condensate return piping connected to buildings has been calculated (Honeywell 2010). Using these extensive surveys, audits, and data analyses, the Preferred Alternative was developed as a means to implement the Proposed Action.

As part of the Preferred Alternative, a full-time, on-site technical resource manager would oversee the maintenance and measurement and verification programs to ensure that operations and maintenance savings are achieved for the 21-year life of the contract for the project. In addition, the technical resource manager would ensure the performance of the following ongoing services:

- Steam traps – Annual steam trap testing and full coverage of maintenance
- Energy management control system – Full coverage hardware and software maintenance for front-end computers and servers
- British thermal unit (Btu) meters – Annual calibration and full coverage maintenance
- VRF systems – Full coverage maintenance for these systems in B240 and B506

Future Development on Tinker AFB

Implementation of the Preferred Alternative would also benefit other future development projects at Tinker AFB by providing the following:

- Acceleration of portions of Tinker AFB's 10-year *General Plan* (construction and demolition plans)
- Installation of an additional gas pipeline tie-in

2.4.2 No-Action Alternative

Under the No-Action Alternative, Tinker AFB would not implement the Proposed Action, and the aging centralized steam distribution system would not be replaced or overhauled to correct existing inefficient and expensive operation, excessive energy consumption, or impacts on the environment resulting from leaks throughout the system.

Although this alternative would not fulfill the purpose and need of the Proposed Action, it will be carried forward as required by the CEQ. CEQ's regulations for the implementation of NEPA

stipulate that the No-Action Alternative must be considered to assess environmental consequences that may occur if the Proposed Action is not implemented.

2.5 Alternatives Considered but Not Carried Forward

Replacement of Existing CSP Distribution System

This alternative would have entailed the wholesale upgrade and/or replacement of the entire steam plant distribution system with new infrastructure while maintaining current system generation and distribution alignments and characteristics. Under this alternative, CSPs would continue to serve the heating needs of the 71 buildings currently connected to the CSP distribution system. CSPs, boilers, and accessories to that equipment would also require replacement or repairs to continue operating at sufficient levels of service and safety control.

The total energy reduction associated with the alternative is 5 percent and therefore does not meet the alternative selection criteria of 15 percent. Continued operation of a central steam system would heat loss occurs through the use of steam as a mode of heat distribution; even with repaired equipment and pipelines, significant heat loss would continue to occur by nature of the system's design. Given that improvements to the CSP would not yield a 15-percent reduction in energy intensity nor improved efficiency, this alternative would not satisfy the project's purpose and need and was not carried forward for further analysis.

Renewable Energy Alternatives

Renewable energy options were evaluated and include the use of passive solar and geothermal.

Passive Solar. This alternative would entail the use of a passive solar system and would abandon the entire steam plant distribution system. New infrastructure would be required to develop system generation and distribution alignments and characteristics. Under this alternative, significant building modifications would be required to retrofit existing systems. Due to the significant architectural modifications required, and the impact that downtime (i.e., disruption to operations) could have on the military mission at Tinker AFB, this alternative would not satisfy the project's purpose and need and was not carried forward for further analysis.

Geothermal. The use of geothermal resources was evaluated, and implementation of this renewable technology alternative would only be possible in specific locations within Tinker AFB. The area around B510 was identified as the only location viable for the use of geothermal technology. As such, a ground source heat pump and geothermal well field are proposed for installation in the vicinity of B510 as a component of the Preferred Alternative.

2.6 Reasonably Foreseeable Concurrent Actions

Implementation of the Proposed Action and associated potential environmental impacts would occur concurrently with other projects and developments proposed on Tinker AFB in the vicinity of the central steam distribution line and the buildings served by the system. Several buildings currently served by the CSPs are not included in the Proposed Action because they are scheduled

for future demolition under separate actions. In addition to the Proposed Action, other projects occurring or planned on Tinker AFB within the next three years include the following:

- Henry Twaddle Facility Acquisition
- Demolition of B3108
- Depot Maintenance, Reengineering, and Transformation of Three-Bay Multi-Aircraft Hangar Construction
- Air Traffic Controller Tower Construction
- Medical Clinic Construction
- 507th Base Realignment and Closure Action
- Physical Fitness Center Construction
- Child Development Construction
- Consolidated Security Forces, South Forty Development Construction
- Military Family Housing Privatization
- Air Depot Road/Tinker Gate Realignment
- Vance Gate Relocation
- Airborne Warning and Control System Maintenance Group Complex at B230 Repair and Renovation
- Maintenance, Repair, and Overhaul Technology Center Acquisition
- Large Engine Test Cell Construction
- Chemical Cleaning Line in B3001 Renovation
- T9 Test Cell at TACX Construction
- Midwest Boulevard Gate Construction
- Fee/Title Acquisition for TACX
- Retrofit Boilers and Install Landfill Gas Generation Serving TACX Facility

The projects listed above and their associated cumulative impacts are further discussed and analyzed in Section 5, *Cumulative Impacts*, of this EA.

2.7 Summary of Potential Impacts

Potential impacts are evaluated and described in Section 4, *Environmental Consequences*.

2.7.1 Resource Areas Evaluated

Table 2-1 provides a summary of the potential impacts for resource areas fully evaluated and associated with the Preferred Alternative or the No-Action Alternative.

Table 2-1. Summary of Impacts for Fully Evaluated Resources

Resource/Issue	Preferred Alternative	No-Action Alternative
Air Quality	Temporary (short-term) negligible construction emissions (i.e., construction dust) generated during demolition and renovation activities. Temporary combustion and GHG emissions generated during demolition and renovation activities resulting in temporary adverse impacts. Operational impacts would be beneficial. Long-term beneficial impacts on operational emissions from installation of energy-efficient equipment, resulting in a net reduction in air pollutant emissions from steam generation and distribution. The Proposed Action will not require a construction permit or revisions to Tinker AFB's Title V Operating Permit.	Conditions would remain as described in Section 3.1, *Air Quality*. Implementation of the No-Action Alternative would result in steam distribution system operations continuing as currently performed; under such conditions, no reduction in GHG emissions would occur which would represent a negative impact on air quality.
Biological Resources	CSP Areas: Negligible short-term impacts on vegetation and wildlife during demolition and renovation activities. No long-term impacts on vegetation and wildlife. No impacts on federal or state listed threatened or endangered species. Proposed Natural Gas Pipeline: Temporary impacts on vegetation and wildlife during pipeline installation. Installation is proposed in areas identified as the habitat of the Texas horned lizard (a state species of concern). No long-term impacts on vegetation and wildlife. No impacts on federal or state listed threatened or endangered species.	Conditions would remain as described in Section 3.2, *Biological Resources*; adverse impacts on vegetation and wildlife resulting from leaking steam and condensate return piping would continue.
Cultural Resources	CSP Areas: A determination of no adverse effect on historic properties has been determined in consultation with SHPO and OAS. Proposed Natural Gas Pipeline: A determination of no adverse effect on historic properties or cultural landscape has been determined in consultation with SHPO and OAS.	Conditions would remain as described in Section 3.3, *Cultural Resources*.

1 **Table 2-1. Summary of Impacts for Fully Evaluated Resources (Continued)**

Resource/Issue	Preferred Alternative	No-Action Alternative
Hazardous Materials and Wastes	CSP Areas: Negligible impacts related to exposure of hazardous materials during demolition activities. Negligible impacts related to removal and disposal of hazardous materials and wastes from buildings. No impacts on or from hazardous materials and wastes resulting from installation or operation. No impacts from exposure to contaminated groundwater would occur. Beneficial impact from removing toxic materials such as asbestos, lead-based paint, and fuel oil during demolition activities. Proposed Natural Gas Pipeline: Conditions unknown along Tinker AFB/BNSF Railway railroad property boundary relating to contaminated soils; however, no spills or releases onto land in this area have been recorded with the United States Environmental Protection Agency (EPA 2011b); nevertheless, soil sampling and evaluation would be required to determine actual soil conditions. No impacts on or from hazardous materials or wastes along the remaining portion of the pipeline alignment.	Conditions would remain as described in Section 3.5, *Hazardous Materials and Wastes*.
Safety	CSP Areas: Negligible impacts relating to exposure to hazardous materials from demolition activities. No impacts from exposure to contaminated groundwater. No adverse impacts on airfield safety. Proposed Natural Gas Pipeline: No adverse impacts resulting from exposure to hazardous materials during pipeline installation. Adherence to all applicable Occupation Safety and Health Administration (OSHA) regulations is required.	Conditions would remain as described in Section 3.7, *Safety*.

2

1 **Table 2-1. Summary of Impacts for Fully Evaluated Resources (Continued)**

Resource/Issue	Preferred Alternative	No-Action Alternative
Safety (continued)	No adverse impacts on airfield safety. Personnel would be required to follow safety procedures currently in place for all activities within Clear Zones (CZs) or Accident Potential Zone (APZ) I on the base.	
Socioeconomics	Short-term negligible beneficial impacts resulting from generation of temporary construction jobs for off-base personnel and local spending for construction materials. No long-term impacts on local socioeconomic conditions resulting from spending. Long-term reduction in civilian staff (approximately 30 contract personnel) for operations and maintenance of the new system at Tinker AFB.	Conditions would remain as described in Section 3.8, *Socioeconomics*.
Sustainability	Long-term beneficial impacts on sustainability at Tinker AFB and the region through decreased energy and utility consumption.	Conditions would remain as described in Section 3.9, *Sustainability*.
Transportation and Circulation	Temporary negligible impacts on local and area traffic and circulation. Construction activities would be staged to occur in localized areas and would move as project components are completed during the 30-month estimated construction period duration.	Conditions would remain as described in Section 3.10, *Transportation and Circulation*.
Utilities and Infrastructure	No net impact on base energy redundancy. The removal of backup fuel tanks at CSPs would be compensated through the provision of a complete natural gas pipeline loop to provide on-base energy redundancy. Beneficial impacts on Tinker AFB water utilities by reducing net water consumption. Temporary impacts (e.g., disruption of power) on electrical service during coordinated, scheduled connection of new equipment to existing electrical services. No impact on wastewater or potable water services.	Conditions would remain as described in Section 3.11, *Utilities and Infrastructure*.
Solid Waste	Negligible impact on solid waste disposal or recycling services or facilities, including the processing and disposal of construction and demolition debris.	Conditions would remain as described in Section 3.12, *Solid Waste*.

2

1 **Table 2-1. Summary of Impacts for Fully Evaluated Resources (Continued)**

Resource/Issue	Preferred Alternative	No-Action Alternative
Water Resources	CSP Areas: Temporary impacts on surface waters would be minimized through the implementation of nonpoint pollution requirements and spill prevention and response procedures as well as the use of best management practices. A Storm Water General Permit for Construction Activities – Permit No. OKR10 would be obtained. No long-term impacts on surface waters. No impacts on wetlands or floodplains. Negligible impacts on groundwater resources. Proposed Natural Gas Pipeline: Temporary impacts on surface waters would be minimized through the implementation of nonpoint pollution requirements and spill prevention and response procedures as well as the use of best management practices. No long-term impacts on surface waters. No impacts on jurisdictional wetlands. Negligible impacts on groundwater resources. Negligible temporary impacts on a non-jurisdictional wetland and floodplain along Elm Creek tributary adjacent to the proposed pipeline alignment.	Conditions would remain as described in Section 3.14, *Water Resources*; negative impacts on surface water resources resulting from leaking steam and condensate return piping would continue.

2

SECTION 3.0
AFFECTED ENVIRONMENT

This section describes relevant existing environmental conditions for resources potentially affected by implementation of the Proposed Action and the No-Action Alternative. In compliance with NEPA, CEQ regulations, and 32 CFR 989, this description of the affected environment focuses on only those aspects potentially subject to impacts.

In the case of the Proposed Action, the description of the affected environment is limited to Tinker AFB and Oklahoma County. Resource areas that clearly would not be affected by the Proposed Action are omitted from discussion and include the following: environmental justice and protection of children, and noise and vibration. Resource descriptions focus on the following areas: air quality, biological resources, cultural resources, geology and soils, hazardous materials and wastes, land use, safety, socioeconomics, sustainability, transportation and circulation, utilities and infrastructure, visual resources, and water resources.

3.1 Air Quality

3.1.1 Definition of Resource

Air quality in a given location is determined by the concentration of various pollutants in the atmosphere. National Ambient Air Quality Standards (NAAQS) are established by the United States Environmental Protection Agency (EPA) under the CAA for criteria pollutants, including ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than 10 microns in diameter (PM_{10}), particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead. The primary NAAQS set limits to protect public health, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease, with an adequate margin of safety. The secondary NAAQS set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

In addition, the EPA regulates hazardous air pollutants (HAPs) through the National Emission Standards for Hazardous Air Pollutants (NESHAP) program and rules.

Air quality management at USAF installations is established in AFI 32-7040, *Air Quality Compliance*. AFI 32-7040 requires installations to achieve and maintain compliance with all applicable federal, state, and local standards.

EO 13514 also introduced new GHG emission management requirements for the federal government. The EO requires agencies to establish reduction targets for GHG emissions as well as to develop an inventory of GHG emissions. The principal GHGs that enter the atmosphere because of human activities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases.

3.1.1.1 Criteria Pollutants

Air quality is affected by emissions from stationary sources (e.g., industrial development), fugitive sources (e.g., windblown dust), and mobile sources (e.g., motor vehicles). Air quality at a given location is a function of several factors, including the quantity and type of pollutants emitted locally and regionally, and the dispersion rates of pollutants in the region. Factors affecting pollutant dispersion include wind speed, wind direction, atmospheric stability, temperature, the presence or absence of inversions, and topography.

Ozone. Most ground-level (i.e., terrestrial) ozone is formed as a result of complex photochemical reactions in the atmosphere involving volatile organic compounds, and nitrogen oxides (NO_x) in the presence of sunlight. Ozone is a highly reactive gas that damages lung tissue, reduces lung function, and sensitizes the lung to other irritants. Although stratospheric ozone shields the earth from damaging ultraviolet radiation, ground-level ozone is a highly damaging air pollutant and is the primary source of smog. In March 2008, the EPA published a new standard for 8-hour ozone, and revoked the 1-hour NAAQS for ozone in most areas. The 8-hour standard is more protective of public health and more stringent than the 1-hour standard, and nonattainment areas for the 8-hour ozone standard have now been established. On 19 January 2010, EPA published in the *Federal Register* RIN 2060–AP98, Volume 75, Number 11, a proposed new rule revising the NAAQS for ground-level ozone. The comment period for the proposed revisions to the ozone standard ended on 22 March 2010. As of the date of this report, the proposed revisions for a new ground-level ozone standard have not been published in the *Federal Register.*

Carbon Monoxide. CO is a colorless, odorless, poisonous gas produced by incomplete burning of carbon in fuel. The health threat from CO is most serious for those who suffer from cardiovascular disease, particularly those with angina and peripheral vascular disease.

Nitrogen Dioxide. NO_2 is a highly reactive gas that can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Repeated exposure to high concentrations of NO_2 may cause acute respiratory disease in children. Because NO_2 is an important precursor in the formation of ozone, or smog, control of NO_2 emissions is an important component of overall pollution reduction strategies. The two primary sources of NO_2 in the United States are fuel combustion and transportation emissions. On 22 January 2010, EPA strengthened the health-based NAAQS for NO_2. This action set a new 1-hour standard that defines the maximum allowable concentration observed in any monitoring area. The new NAAQS for NO_2 was published in the *Federal Register* on 9 February 2010 RIN 2060–AO19, Volume 75, Number 26.

Sulfur Dioxide. SO_2 is emitted primarily from stationary-source coal and oil combustion, steel mills, refineries, pulp and paper mills, and nonferrous smelters. High concentrations of SO_2 may aggravate existing respiratory and cardiovascular disease; asthmatics and those with emphysema or bronchitis are the most sensitive to SO_2 exposure. SO_2 also contributes to acid rain, which can lead to the acidification of lakes and streams and damage trees. On 2 June 2010, EPA strengthened the primary NAAQS for SO_2. The new NAAQS for SO_2 established a new 1-hour

standard in order to protect the public from high, short-term exposures to SO_2. Additionally, the EPA is revoking the existing annual and 24-hour standards due to insufficient evidence linking long-term exposure to SO_2 and health effects. The secondary SO_2 NAAQS 3-hour standard of 0.5 parts per million, established to protect the public welfare, including effects on soil, water, visibility, wildlife, crops, vegetation, national monuments and buildings, will remain in effect, but the EPA is assessing the need for a change in the standard under a separate review.

Particulate Matter (PM_{10} and $PM_{2.5}$). Particulate matter is a mixture of tiny particles that vary greatly in shape, size, and chemical composition and can be composed of metals, soot, soil, and dust. PM_{10} includes large, coarse particles, whereas $PM_{2.5}$ includes small, fine particles. Sources of coarse particles include crushing or grinding operations and dust from paved or unpaved roads. Sources of fine particles include all types of combustion activities (e.g., motor vehicles, power plants, wood burning) and certain industrial processes. Exposure to PM_{10} and $PM_{2.5}$ levels exceeding current standards can result in increased lung- and heart-related respiratory illnesses. The EPA has concluded that finer particles (less than 2.5 microns in diameter) are more likely to contribute to long-term health problems than those particles greater than 10 microns in diameter, which typically result in short-term health problems.

Airborne Lead. Airborne lead can be inhaled directly or ingested indirectly through the consumption of lead-contaminated food, water, or nonfood materials such as dust or soil. Fetuses, infants, and children are most sensitive to lead exposure, which has been identified as a factor in high blood pressure and heart disease. Exposure to lead has declined dramatically in the last several decades as a result of the reduction of lead in gasoline and paint, and the elimination of lead from soldered cans.

3.1.1.2 Hazardous Air Pollutants

The EPA designated approximately 187 compounds as Hazardous Air Pollutants (HAPs) based on their toxicity and use throughout various industries. The EPA has not established ambient air quality standards for the compounds, but regulates HAPs through industrial sources.

3.1.1.3 Greenhouse Gases (GHG)

GHGs are measured by the global warming potential a given type of GHG may cause. The functionally equivalent amount or concentration of CO_2 is used as the reference for measuring global warming potential. Equivalent carbon dioxide (CO_2e) is a unit of measurement for describing GHG concentration. The principal GHGs that enter the atmosphere because of human activities are described below.

Carbon Dioxide. CO_2 is a GHG that enters the atmosphere through the burning of fossil fuels (e.g., oil, natural gas, coal), solid waste decay, and trees and wood products and also as a result of chemical reactions (e.g., manufacture of cement). The two primary sources of CO_2 in the United States are fuel combustion, including transportation emissions. CO_2 can be removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of photosynthesis and the

biological carbon cycle. (Simply put, a plant takes in CO_2 molecules and using sunlight combines them with water molecules to make a sugar that feeds the plant; excess oxygen splits from the CO_2 molecules and is released back into the atmosphere.) However, in areas where CO_2 concentration ratios exceed the intake capabilities by plants, this gas contributes to negative GHG effects.

Methane. CH_4 is a GHG that is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

Nitrous Oxide. N_2O is a GHG that is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

Fluorinated Gases. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), chlorofluorocarbons (CFCs), and hydrochlorofluorocarbons (HCFC) are synthetic GHGs with high CO_2e factors that are emitted from a variety of industrial processes. HFCs, PFCs, and SF_6 are sometimes used as substitutes for ozone-depleting fluorinated gases (i.e., CFCs, HCFCs, and halons). HFCs, PFCs, and SF_6 are typically emitted in smaller quantities and, while these substances do not deplete ozone, they are potent GHGs and are referred to as *high global warming potential* gases.

3.1.1.4 Clean Air Act Amendments

The Clean Air Act Amendments (CAAA) of 1990 place most of the responsibility to achieve compliance with NAAQS on individual states. Areas not in compliance with any of the NAAQS can be declared *nonattainment* areas by the EPA or the appropriate state or local agency. Nonattainment areas are declared for each pollutant addressed by the NAAQS. Once the EPA declares an area as *nonattainment,* the EPA requires each state to prepare a State Implementation Plan (SIP). A SIP is a compilation of goals, strategies, schedules and enforcement actions that will lead the state into compliance with the NAAQS. Should the state and local air agencies fail to develop adequate SIPs, then the EPA will develop a Federal Implementation Plan to remedy the state's failure. To be redesignated to *attainment,* the area must show through monitoring and modeling that the pollutant levels are consistently meeting the NAAQS and have been maintained for 10 consecutive years. During this time, the declared area is in transitional attainment, also known as a *maintenance area*.

Under 40 CFR 93, the EPA issued conformity regulations that mandate the federal government not engage, support, or provide financial assistance for licensing, permitting, or approval of any activity that does not conform to an approved SIP or Federal Implementation Plan. This rule applies to all federal actions except for those projects requiring funding or approval from the U.S. Department of Transportation, the Federal Highway Administration, the Federal Transit Administration, or the Metropolitan Planning Organization; such projects must instead comply with the conformity rules established by the U.S. Department of Transportation. The General Conformity Rule establishes conformity as a process in which economic, environmental, and social aspects of transportation and air quality planning are considered. This rule applies to any

federal action that results in direct or indirect emissions for criteria pollutants that exceed the rates specified in 40 CFR 93.153(b)(1) and (2) in a *nonattainment* or *maintenance area*.

3.1.1.5 Air Quality Regulations

Air quality regulatory standards are periodically reviewed by the EPA. Both the DEQ Air Quality Division and the EPA are planning for review of major environmental laws that will likely result in more stringent standards for the criteria pollutants and the determination of prevention of significant deterioration (PSD) rules. The changes that are expected to have the greatest impact on the Proposed Action are changes to the NAAQS.

The EPA's Fall 2009 Regulatory Plan and Semiannual Regulatory Agenda identifies the agency's plans to reexamine NAAQS for particulate matter, SO_2, ozone, and NO_2 and to determine the PSD implications of declaring CO_2 as an air quality pollutant. The anticipated revision of the NAAQS for ground-level ozone to an estimated range of 60 to 70 parts per billion would place Oklahoma County in nonattainment status for ozone (EPA 2010a, 2010b). In 2010 the EPA strengthened the SO_2 and NO_2 standards and has since received comments regarding the proposed revisions to ground-level ozone. As of the date of this report, proposed revisions for a new ground-level ozone standard have not been published in the *Federal Register*.

On 13 May 2010, the EPA issued the final rule on addressing GHG emissions from stationary sources under the CAA. This final rule, also known as the Tailoring Rule, establishes a schedule of CAA permitting programs to define which facilities will be required to obtain PSD and Title V permits. The first scheduled phase began on 2 January 2011, establishing a GHG permitting program for large GHG emitters, such as power plants, refineries, and cement production facilities subject to PSD permitting. Under this new rule, any newly constructed facility or existing facility modified in a way that substantially increases emissions of pollutants other than GHGs will be subject to permitting requirements for GHG emissions under PSD. For these projects, only GHG emissions above 75,000 tons per year (tpy), on a CO_2e basis, will be required to undergo a best available control technology analysis. Similarly under the operating permit program, only sources subject to the program (i.e., newly constructed or existing major sources for pollutants other than GHGs) will be subject to a Title V requirements for GHG (EPA 2010d).

Phase 2 of this rule will begin in July 2011 and continue through June 2013. This phase will involve sources subject to PSD permitting requirements for new construction projects that emit GHG emissions of at least 100,000 tpy even if they do not exceed PSD permitting thresholds for any other pollutant. Modifications to existing facilities that increase GHG emissions by at least 75,000 tpy will be subject to permitting requirements, even if they do not significantly increase emissions of any other pollutant. Additionally, operating permit requirements will, for the first time, apply to sources based on their GHG emissions even if they do not apply based on emissions of other pollutants. Facilities emitting at least 100,000 tpy CO_2e will be subject to Title V permitting requirements (EPA 2010d).

Hazardous Air Pollutants

The EPA promulgated 40 CFR 63, Subpart DDDDD, *National Emission Standards for Hazardous Air Pollutants,* for industrial, commercial, and institutional boilers and process heaters on 9 March 2011. This federal regulation is also known as the Maximum Achievable Control Technology (MACT) Boiler Rule.

The NESHAP for boilers applies to major sources of HAPs and therefore will apply to Tinker AFB. The rule establishes emission limits, work practice standards, and operating limits for boilers. Additionally, recordkeeping and source testing will be required under this subpart. The Air Force will be required to modify its existing Title V operating permit for Tinker AFB to include the requirements under this subpart.

Internal Combustion Engines

The EPA has developed standards to regulate exhaust gases from stationary reciprocating internal combustion engines (ICEs). The rules stem from the applicability of each rule to a wide range of engine design types (i.e., nearly the full span of horsepower ratings), the different types of air pollutants regulated, and an assortment of control options. The promulgation of these regulations means that many previously unregulated smaller engines, including those designated for emergency use, are now subject to federal regulation, emissions standards, and associated control requirements. The set of rules developed by the EPA to regulate emissions from stationary reciprocating ICE that apply to this action include:

- MACT Subpart ZZZZ (NESHAP for stationary reciprocating ICE)
- New Source Performance Standards (NSPS) IIII (standards of performance for stationary compression ignition ICE)

On 9 March 2011, EPA promulgated updates to MACT Subpart ZZZZ for HAPs from new and reconstructed stationary reciprocating ICEs at HAP area sources, or ICEs that have a site rating of less than or equal to 500 horsepower and are located at major sources of HAP emissions (76 *Federal Register* 12863).

NSPS Subpart IIII regulates emissions from stationary compression-ignition engines and was promulgated on 11 July 2006 (71 *Federal Register* 39154). Compression-ignition engines constructed, reconstructed, or modified after 11 July 2005 are potentially subject to NSPS Subpart IIII. The applicability of the NSPS Subpart IIII rule to new engines is determined by the date of engine "construction" or the date that the engine was ordered by the owner or operator. These regulations include emergency generators used in a wide array of industrial and nonindustrial settings.

Both the MACT Subpart ZZZZ and NSPS Subpart IIII rules establish emission limits and work practice standards for reciprocating ICEs. Additionally, recordkeeping and source testing may be required during the permitting process to show compliance with these standards. The USAF will be required to modify its existing Title V operating permit for Tinker AFB to include requirements under these rules.

3.1.2 Existing Conditions

3.1.2.1 Climate

Oklahoma County is in the Interior Lowlands physiographic region. The county has two major land resource areas: the eastern half of the county is in the Northern Cross Timbers area, and the western half is in the Central Rolling Red Prairies area (U.S. Department of Agriculture [USDA] 2003). In winter, the average daily temperature is 38.6 degrees Fahrenheit (°F), and the average daily minimum temperature is 27.8°F. In summer the average temperature is 80°F, and the average daily maximum temperature is 91.1°F. The average annual precipitation is 33.35 inches. The majority of precipitation, 74 percent, usually falls from April through October; the average seasonal snowfall is 9.1 inches. Prevailing winds blow from the south with the average speed of 14 miles per hour in March and April (USDA 2003).

3.1.2.2 Local Air Quality

Oklahoma County is currently designated by the EPA as an *attainment* area for CO, SO_2, NO_2, and particulate matter (PM_{10} and $PM_{2.5}$). A five-year ozone *Early Action Compact* for Oklahoma City was completed in December 2007. In June 2008, the Association of Central Oklahoma Governments (ACOG) developed an 8-hour ozone flex plan for Oklahoma City for the successive five years, similar to the Ozone *Early Action Compact* (ACOG 2008). This voluntary plan identified strategies that would reduce transportation-related emissions by improving traffic flow and reducing congestion throughout the region. Typical control strategies included intersection improvements, traffic signal modifications, signal coordination efforts, intelligent transportation techniques, and travel reduction programs.

Eleven air quality monitoring stations are located within Oklahoma County, including one CO monitoring station, one PM_{10} monitoring station, three $PM_{2.5}$ monitoring stations, one SO_2 monitoring station, three ozone monitoring stations, and two NO_2 monitoring stations. According to EPA AirData, ambient-level concentrations for PM_{10}, $PM_{2.5}$, NO_2, and CO within Oklahoma County have not exceeded the primary NAAQS from 1998 through 2008; however, concentrations of ozone have exceeded the 8-hour NAAQS within that period (EPA 2010c).

3.1.2.3 Tinker AFB

The DEQ, which publishes regulations for air quality and permitting for all counties in Oklahoma, has jurisdiction over and regulates air emissions associated with Tinker AFB. Under the CAA, the Title V Operating Permit Program imposes requirements for air quality permitting on air emission sources. Also under the CAA, the NESHAP program specifies various provisions for regulated sources, including limits on HAP emissions, compliance demonstrations and performance testing, monitoring, recordkeeping, and reporting. Tinker AFB is categorized as a major source under the Title V program and is also regulated under NESHAP since its potential emissions from stationary sources exceed 100 tpy of any of the criteria pollutants, 10 tpy of any

single HAP, or 25 tpy of any combination of HAPs. Tinker AFB maintains a Title V Air Permit (DEQ 2010). The following are the primary onsite emission sources at Tinker AFB:

- Stationary combustion sources (e.g., boilers, water heaters, furnaces, gasoline and diesel-fuel generators, engine test cells).
- Operational sources (e.g., chemical usage, paints, degreasers, abrasive blasting, welding operations, fuel cell maintenance, wastewater treatment, small arms firing range).
- Fuel-storage/transfer operations (e.g., horizontal tanks, internal floating roof tanks).
- Mobile sources (e.g., vehicle operations, aircraft operations, trim and power checks, aerospace ground equipment). Mobile sources are not regulated under the Title V program but rather fall under the Non-Road Mobile Source program, fuel efficiency and corporate average fuel economy standards.

Table 3-1 presents estimated air pollutant emissions for boilers at CSPs at Tinker AFB; these estimates provide an emissions baseline and are based on the collective total air emissions potential, or *potentials-to-emit* (PTEs), for the boilers.

Table 3-1. Estimated Air Pollutant Emissions for Boilers at CSPs at Tinker AFB*

Pollutant	Current PTE Emissions of Boilers at CSPs (tpy)
PM_{10}	31.5
$PM_{2.5}$	31.5
VOC	22.8
NOx	1,054.3
SO_2	2.5
CO	348.7
HAPs**	9.3
CO_2	498,145.9

Notes: * This table is based on information provided from Tinker AFB representatives regarding the current/actual steam boiler emissions and the air quality analysis performed by AMEC Earth & Environmental, Inc. (see Appendix C).

** HAPs reported by Tinker AFB to the DEQ are formaldehyde and hexane. Formaldehyde and hexane are being presented in this table for comparison purposes.

3.2 Biological Resources

3.2.1 Definition of Resource

Biological resources include native or naturalized plants and animals and the habitats in which they occur. Sensitive biological resources are defined as those plant and animal species listed as threatened or endangered, candidate, rare and other sensitive flora and fauna, or proposed as

such, by the USFWS and respective state agencies. Federal and state species of concern are not protected by law; however, these species could become listed or protected at any time if not properly managed. Threatened and endangered species are federally protected plants and animals that are in danger of becoming extinct without protection. These species may be rare because of specialized habitat needs or habitat destruction. The Endangered Species Act of 1973 protects listed species against killing, harming, harassment, or any action that may damage their habitat.

3.2.2 Existing Conditions

3.2.2.1 Regional Setting

The landscape of Oklahoma County is characterized by level to gently rolling hills, broad flat plains, and bottomlands intersected by small to medium sized watercourses. The county is part of the Cross Timbers Vegetation Area of the Midwest and the Central Oklahoma/Texas Plains or Central Great Plains (USDA 2003).

Vegetation

The original vegetation cover in the central Oklahoma uplands consisted of mixed forests and woodlands interspersed with areas of open grasslands. These original plant communities have been radically altered through development, deforestation, intensive agriculture, and the introduction of invasive species (Tinker AFB 2007). However, smaller areas of these vegetative communities remain in Oklahoma County. Oklahoma County's primary vegetative community comprises upland forests integrated with woodlands and prairie. Intermixed in this community are woodlands of oaks, upland forests of deciduous or evergreen trees, and grasslands intermixed with blue grama (*Bouteloua gracilis*), buffalo grass (*Bouteloua dactyloides*), and nonnative grasses (Hoagland 1999). The county's vegetative community also includes riparian areas adjacent to streams, and drainage channels and in low-lying areas where the available water is relatively greater than that in the surrounding landscape (U.S. Army Corps of Engineers [USACE] 2002).

Much of the native vegetative communities associated with Oklahoma City and the Tinker AFB area has been replaced with developed landscape and ornamental and nonnative vegetation (University of Oklahoma 2006).

Wildlife

Approximately 350 native vertebrate species and a much greater unknown number of invertebrates have historically occurred in either the Central Oklahoma/Texas Plains or Central Great Plains ecoregions (ODWC 2011). Some species that probably occurred on this land during presettlement times include prairie dogs, bear, bison, wolves, elk, and horses. Numerous other species have been displaced by urban and industrial activities on and around Tinker AFB.

Three species are federally listed as threatened or endangered in Oklahoma County by USFWS (2011b). The state of Oklahoma has an endangered species act for plants and animals. Table 3-2 identifies the species listed on the federal and state list (Oklahoma Natural Heritage Inventory [ONHI] 2003, 2010; Tinker AFB 2007; USFWS 2011b).

Table 3-2. Special Status Plant and Animal Species of Oklahoma County

Scientific Name	Common Name	State Status[1]	Federal Status[1]
Birds			
Athene cunicularia	Burrowing Owl	SS2	
Buteo swainsoni	Swainson's Hawk	SS2	
Charadrius melodus	Piping Plover	T	T
Grus americana	Whooping Crane	E	E
Haliaeetus leucocephalus	Bald Eagle	E	Delisted[2]
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	SS2	
Sterna antillarum	Least Tern	E	E
Tyto alba	Barn Owl	SS2	
Vireo atricapillus	Black-Capped Vireo	E	
Mammals			
Marmota monax	Woodchuck	SS2	
Reptiles			
Phrynosoma cornutum	Texas Horned Lizard	CS, SS2	
Plants			
Penstemon oklahomensis	Oklahoma Penstemon	S3	

Sources: ONHI 2003, 2010; Tinker AFB 2007; USFWS 2011b
Notes: [1]Legal Status: E – Endangered, T – Threatened, R – Recovery
CS – Statewide closed season (state ranking). It is unlawful at any time to possess or to kill individuals of these species or to remove any individuals of these species from their natural habitats.
SS2 - Species of special concern (state ranking). These species have been identified by technical experts as possibly threatened of extirpation but for which additional information is needed.
S3 - Rare and local in Oklahoma (though it may be abundant at some of its locations); in the range of 21 to 100 occurrences.
[2] The bald eagle was delisted from threatened status by USFWS on 28 June 2007.

3.2.2.2 Tinker AFB

Vegetation

The area now occupied by Tinker AFB was historically dominated by tall and/or mixed grass prairie (Tinker AFB 2007). Less than 2 percent of the presettlement prairie ecosystem currently remains on Tinker AFB. No pristine native prairie or bottomland areas are present on the installation. Only a few small, fragmented prairie remnants remain, less than 100 acres in total, and these are in degraded condition. Much of the original prairie was farmed, as evidenced by remaining terraces at numerous locations on the base (USACE 2002). Tinker AFB grounds are classified into four basic categories:

- **Improved grounds (paved/built).** Approximately 37 percent of the Tinker AFB land area (1,640 acres) has been developed for buildings, roads, parking lots, runways, and other permanent structures.
- **Improved grounds (turf/landscape beds).** Approximately 22 percent of the Tinker AFB land area (945 acres) consists of highly maintained areas such as lawns, athletic fields, golf courses, cemeteries, and landscape plantings.

- **Semi-improved grounds.** Approximately 28 percent of the land area on Tinker AFB (1,205 acres) is periodically maintained; maintenance is performed primarily for operational reasons (e.g., erosion and dust control, bird control, visual clear zones). These lands include areas adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; antenna facilities; and golf course roughs.
- **Unimproved grounds.** The remaining 13 percent of Tinker AFB's land area (565 acres) consists of areas requiring relatively low maintenance of vegetation. Unimproved grounds include natural woodland and grassland areas, ponds, wetlands, creeks, and other areas where natural vegetation is allows to grow essentially unimpeded by maintenance activities, including other natural areas like Glenwood or the base's Urban Greenway.

Five general vegetation types (including 31 vegetation communities within those vegetation types) are found at Tinker AFB, according to the Tinker AFB *Integrated Natural Resources Management Plan* (INRMP) (Tinker AFB 2007):

- **Prairie.** Characteristic of a native midgrass prairie.
- **Herbaceous.** Areas dominated by forbs, with low levels of grasses present. Wetland and marsh areas are also included, which are areas dominated by mesophytes (plants growing under medium moisture conditions) and/or hydrophytes (plants growing under high moisture conditions) and located in areas temporarily or permanently inundated by water.
- **Grass/Grassland.** Dominated by turf grass, associated forbs, and ornamental herbaceous and woody plants.
- **Shrubland.** Close or open growth of native shrub species with mixed native and/or exotic species of grasses and forbs.
- **Forest/Woodland.** Close stand (forest) or open growth (woodland) in a natural area. May include successional stages of native and/or exotic trees configured in close or open stands, primarily in previously disturbed areas.

Areas on base that have been converted to urban and industrial use are characterized by a plant community consisting primarily of turf grasses and ornamental trees and shrubs. The predominant turf grass on Tinker AFB is Bermuda grass (*Cynodon dactylon*). Native buffalo grass (*Bouteloua dactyloides*) is often found mixed with Bermuda grass. More rural areas are typically a mixture of exotic and native plants. Trees and shrubs are composed of native and exotic plants and, contrary to presettlement plant distribution, many woody plants are found on upland as well as bottomland sites (Tinker AFB 2007).

Proposed Project Area

Most of the land encompassed by the CSP areas is characterized as improved and semi-improved grounds; these sites consist predominantly of planted grasses and are classified as a grass/grassland vegetation community (Figure 3-1) (Tinker AFB 2007). Additional areas on base are proposed for installation of the natural gas pipeline; these areas are located on the

southeastern portion of Tinker AFB and would include activities in areas characterized as improved, semi-improved, and some unimproved grounds. Vegetation communities in this area include primarily nonnative grasslands and improved turf grass (classified as grass/grassland), with some areas of mixed native/nonnative prairie and mixed native prairie (classified as prairie) (Figure 3-1) (Tinker AFB 2007).

Wildlife

Tinker AFB is classified as a Category 1 installation, as defined in AFI 32-7064, *Integrated Natural Resource Management*, meaning that suitable habitat for conserving and managing fish and wildlife exists on the base (Tinker AFB 2007).

The available habitat includes movement corridors (e.g., riparian zones along creeks) and pockets of undeveloped acreage surrounded by urbanized land (Tinker AFB 2007; USAF 1991) (Figure 3-1). The results of a 1990 reconnaissance survey indicated that approximately 1,800 acres were suitable or potentially suitable as wildlife habitat (USAF 1991). Included in this estimate were approximately 400 improved acres (military family housing and golf course), 600 semi-improved acres (mostly airfield), and 800 unimproved acres.

A total of 244 vertebrate species occur on the base, consisting of 26 reptiles, 11 amphibians, 24 mammals, 157 birds, and 26 fish. Common mammalian species found on Tinker AFB include fox squirrel (*Sciurus niger*), eastern cottontail (*Sylvilagus floridanus*), opossum (*Didelphis virginianus*), raccoon (*Procyon lotor*), and various rodent species (e.g., *Peromycscus* sp., *Neotoma* sp., *Sigmodon* sp.). Less common mammalian species found in unimproved portions of the base include beaver (*Castor canadensis*), coyote (*Canis latrans*), bobcat (*Felis rufus*), muskrat (*Ondatra zibethicus*), white-tailed deer (*Odocoileus virginianus*) and others (Tinker AFB 2007).

Resident bird species include mourning dove (*Zenaida macroura*), barn swallow (*Hirundo rustica*), red-winged blackbird (*Agelaius phoeniceus*), meadowlark (*Sturnella* spp.), scissor-tailed flycatcher (*Tyrannus forficatus*), great-horned owl (*Bubo virginianus*), and bobwhite quail (*Colinus virginianus*).

Several reptile and amphibian species are commonly found at Tinker AFB. These include the Texas red-eared slider (*Trachemys [Pseudemys] scripta*), three-toed box turtle (*Terrapene carolina*), and plain-bellied water snake (*Nerodia erythrogaster*). Other reptiles observed on base include the racerunner (*Cnemidophorus sexlineatus*) and the Texas horned lizard (*Phrynosoma cornutum*). (The Texas horned lizard is discussed further in this section under *Threatened and Endangered Species*.)

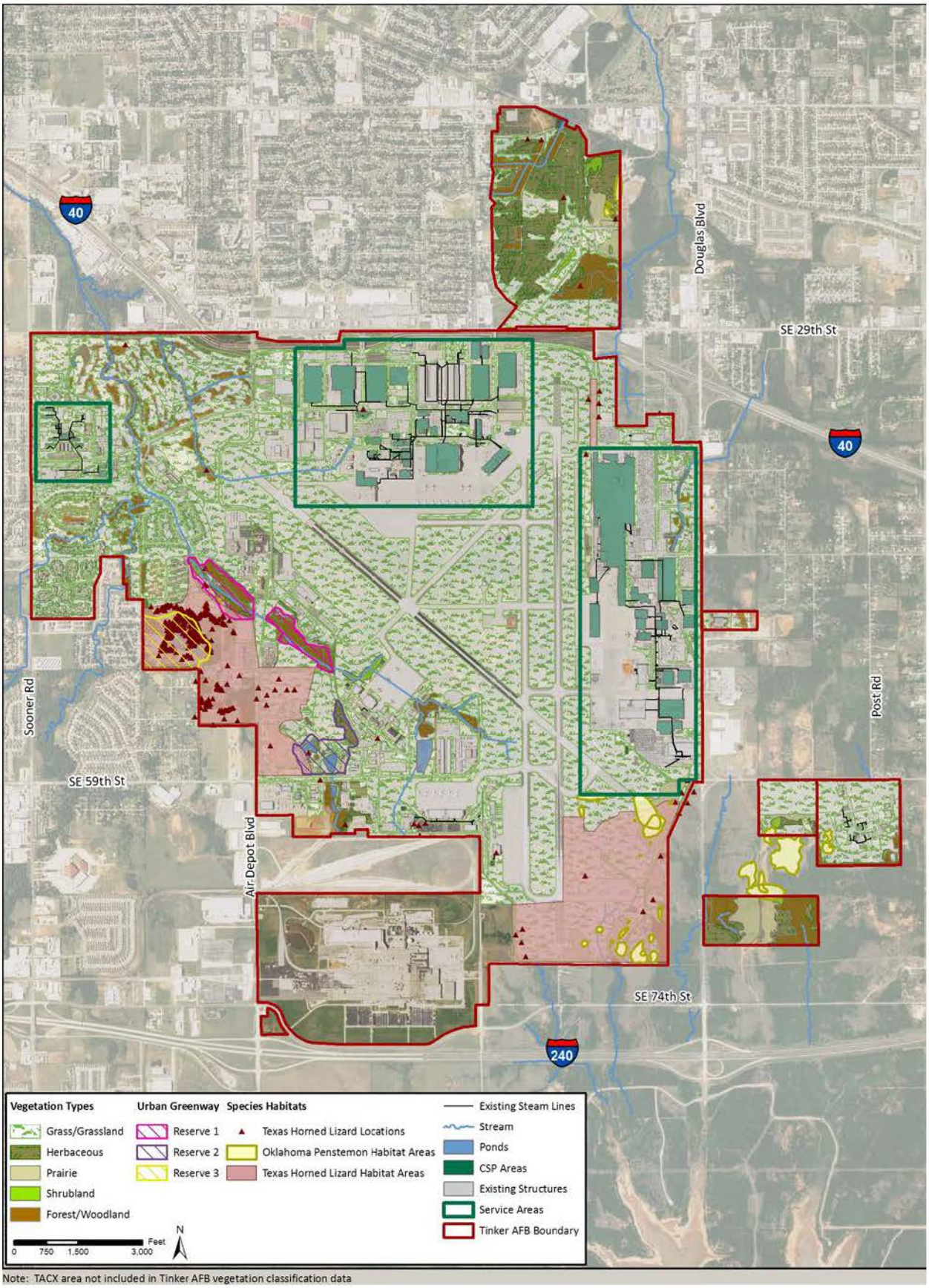


Figure 3-1. Biological Resources on Tinker AFB

Seven species of fish occur in ponds on the base while 19 species of fish occur in those portions of Crutcho, Kuhlman, and Soldier creeks that are on Tinker AFB (personal communication, Raymond Moody, 24 February 2011). Several ponds on base are managed for largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*); some ponds on the facility have been stocked with fish, including channel catfish (*Ictalurus punctatus*). Other fish found in the base's ponds include red-ear sunfish (*Lepomis microlophus*), green sunfish (*Lepomis cyanellus*), warmouth (*Leopomis gulosus*), and white crappie (*Pomoxis annularis*). During winter, ponds are stocked with rainbow trout (*Oncorhynchus mykiss*).

Proposed Action Area

The existing steam distribution system is aging, and portions of the steam pipeline leak steam and condensate to the environment as discussed in Section 1.1, *Overview*. Some of these leaks have entered streams and creeks on Tinker AFB and have resulted in negative impacts on aquatic wildlife. Steam leaks have also killed grass in some areas within the steam service area.

Wildlife throughout the areas of Tinker AFB that would be affected by proposed activities for the Preferred Alternative site is limited to those species already adapted to high levels of human activity and disturbance. The majority of areas proposed for activities under the Preferred Alternative would provide very little habitat for wildlife species, given that much of the area is characterized as improved grounds and consists of developed areas (e.g., buildings, paved areas, roadways).

Some activities proposed under the Preferred Alternative would occur in areas characterized as semi-improved grounds and classified as grass/grassland. These areas may provide habitat for typical grassland species such as cottontail, fox squirrel, raccoon, red-winged blackbird, mourning dove, and meadowlark, which can tolerate disturbed urbanized habitats (Figure 3-1).

Threatened and Endangered Species

Field surveys were conducted at Tinker AFB during 1993 and 1994 to identify federally listed endangered or threatened species (USACE 1995) or state-designated sensitive species (Johnson et al. 1995). No federal or state listed threatened or endangered species were found during this survey or documented on other occasions on Tinker AFB (Tinker AFB 2007; USACE 1995). However, several species designated as state species of special concern by the ODWC or sensitive species by the ONHI do occur on the base. Table 3-3 lists all special status species documented as occurring on base.

Table 3-3. Special Status Species Occurring on Tinker AFB

Common Name	Scientific Name	State Rank
American White Pelican	*Pelecanus erythrorhynchos*	S3N
Barn Owl	*Tyto alba*	SS2
Burrowing Owl	*Athene cunicularia*	SS2
Migrant Loggerhead Shrike	*Lanis ludovicianus migrans*	SS2
Oklahoma Penstemon	*Penstemon oklahomensis*	S3
Swainson's Hawk	*Buteo swainsoni*	SS2
Texas Horned Lizard	*Phrynosoma cornutum*	CS, SS2

Source: Tinker AFB 2007

Notes: SS2 = Species of special concern. These species have been identified by technical experts as possibly threatened of extirpation but for which additional information is needed.

CS = Statewide closed season (state ranking).It is unlawful at any time to possess or to kill individuals of this species or to remove any individuals of these species from their natural habitats.

S3 = Rare and local (restricted range) in Oklahoma (though it may be abundant at some of its locations).

N = Nonbreeding in Oklahoma.

Seven state special concern species have been recorded on Tinker AFB. These include American white pelican (*Pelecanus erythrorhynchos*), barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), migrant loggerhead shrike (*Lanis ludovicianus migrans*), Oklahoma penstemon (*Penstemon oklahomensis*), Swainson's hawk (*Buteo swainsoni*), and Texas horned lizard (*Phrynosoma cornutum*). The USFWS defines species of concern for the future well-being of the species, but the species does not receive any protection under the Endangered Species Act. AFI 32-7064 states that species of concern should be considered in future planning and facility sitting as well as provided protection wherever possible. The state special concern species identified at Tinker AFB are discussed below.

American white pelican. Large flocks of the American white pelican are often sighted during spring and fall migration. The species has also been observed south of the base over Draper Lake (Tinker AFB 2007).

Barn owl. The barn owl is found throughout most of the United States and is a rare resident of most of Oklahoma. It usually occupies relatively open areas, such as prairies, meadows, and marshes. The barn owl nests and roosts in buildings, cliffs, and trees. The diet of the owl consists primarily of rodents, small birds, and occasionally insects (Oberholser 1974). Barn owls have been observed in the northeastern portions of Tinker AFB (USAF 1991).

Burrowing owl. Burrowing owls inhabit grasslands and are frequently associated with prairie dog colonies. They have been observed in winter months on the airfield and in the western portion of base, southeast of the military family housing area between East Crutcho Creek and the base boundary (Tinker AFB 2007). The species is believed to be a winter visitor to Tinker AFB, and no nests have been documented.

Loggerhead shrike. This species has been observed basewide. The migrant race of loggerhead shrike has been listed by Tinker AFB as a possible occurrence (Tinker AFB 2007). Due to taxonomic uncertainty concerning this species, it is not known whether the loggerhead shrikes observed on base were the migrant race (*migrans*) (Tinker AFB 2007).

Oklahoma penstemon. Oklahoma penstemon is found only in Oklahoma, where in many places it is very abundant (ONHI 2003). It is found in prairies, oak savannas, abandoned fields, and along roadsides (Johnson et al. 1995). Oklahoma penstemon colonies were mapped at Tinker AFB in 1992, 1994, and 2005. The penstemon is in fragmented, remnant native prairie communities, primarily in the southeastern portion of the base that includes the airfield, Engineering Installation Group, and Douglas Field. Other small populations occur in the northeastern portion of Glenwood and at the fuel control facility (Tinker AFB 2007). Due to conflicts with airfield operations, penstemon populations within the airfield fence boundary southeast of Runway 12/30 (crosswind runway) will no longer be maintained as no-mow zones in the spring months. As stated in the Tinker AFB INRMP, unless these populations can tolerate repeated spring mowing, it is expected that these populations will be lost over time (Tinker AFB 2007).

Swainson's hawk. Swainson's hawk occurs throughout the Tinker AFB on relatively open lands and has historically nested along Kuhlman Creek (Tinker AFB 2007).

Texas horned lizard. Texas horned lizards range from the south-central United States to northern Mexico (Texas Parks and Wildlife 2000). They occur in open areas with sparse to slightly more dense plant cover with corridors of sparse vegetation, in arid and semiarid habitats in Oklahoma. They primarily eat harvester ants (Sherbrooke 2003). The species has been documented in sparsely vegetated grassland areas in the southwestern corner of Tinker AFB with isolated observations in the southeastern and northern areas of the base (Tinker AFB 2007). Sparsely vegetated areas within proposed project sites are quite limited. The species could possibly, but not likely, occur in these areas.

Proposed Action Area

All DoD installations are required to perform a threatened and endangered species survey prior to any activities that disturb habitat that potentially supports such species. However, there are no threatened or endangered species known to occur in the immediate vicinity of the CSP 208, CSP 5802, or CSP 2000/3000 areas. The proposed natural gas pipeline would be installed in proximity to some areas known to contain special status species; however, no designated critical habitat or wilderness areas are located on or in the immediate vicinity of the base (ODWC 2011; USFWS 2011b). Additional information summarizing special status species potentially found at the proposed project site is included in Section 4.2, *Biological Resources*.

3.3 Cultural Resources

3.3.1 Definition of Resource

Cultural resources represent and document activities, accomplishments, and traditions of previous civilizations and link current and former inhabitants of an area. Depending on their conditions and historic use, these resources may provide insight into living conditions in previous civilizations and may retain cultural and religious significance to modern groups.

Archaeological resources include areas where prehistoric or historic activity measurably altered the environment or deposits of physical remains (e.g., arrowheads, bottles) discovered therein. Architectural resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for inclusion in the NRHP, an inventory of culturally significant resources identified in the United States; however, more recent structures, such as Cold War–era resources, may warrant protection if they have the potential to gain significance in the future. Traditional cultural resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the persistence of traditional culture.

The principal federal law addressing cultural resources is the NHPA of 1966, as amended (16 USC § 470), and its implementing regulations (36 CFR 800). The regulations describe the procedures for identifying and evaluating historic properties, assessing the effects of federal actions on historic properties, and consulting to avoid, reduce, or minimize adverse effects. These procedures are commonly referred to as the Section 106 process. As part of the Section 106 process, agencies are required to consult with SHPO.

The term *historic properties* refer to cultural resources that meet specific criteria for eligibility for listing on the NRHP; historic properties need not be formally listed on the NRHP. Section 106 does not require the preservation of historic properties but ensures that the decisions of federal agencies concerning the treatment of these places result from meaningful considerations of cultural and historic values and of the options available to protect the properties. The Proposed Action is an undertaking as defined by 36 CFR 800.3 and is subject to requirements outlined in Section 106.

Consultation with federally recognized tribes for proposed activities that could significantly affect tribal resources or interests is required by DoD Instruction 4710.02 (14 September 2006), within which the DoD Annotated Policy on American Indians and Alaska Natives (27 October 1999) is a component, and EO 13175, *Consultation and Coordination with Indian Tribal Governments*.

3.3.2 Existing Conditions

3.3.2.1 Regional History

Inhabited by plains tribes and sold to the United States by France as a part of the 1803 Louisiana Purchase, much of what is now Oklahoma was subsequently designated as Indian Territory. As such, it was intended to provide a new home for tribes forced by the federal government to abandon their ancestral lands in the southeastern United States. Many of those forced to relocate in the 1830s were from what were called the Five Civilized Tribes—Cherokee, Choctaw, Chickasaw, Creek, and Seminole—who soon set up independent nations in the new territory. After the Civil War, the pressure of westward expansion brought railroads into the Indian Territory, where the United States government began to declare some land available for settlement (Tinker AFB 2005a).

Prairie land surrounding a Santa Fe Railroad boxcar station was designated as a townsite when Presidential proclamation opened the central portion of the Indian Territory to claim stakers in 1889 (Oklahoma City Convention and Visitors Bureau [OCCVB] 2010). That settlement, now known as Oklahoma City, attained official status in 1890, just a few weeks after the western half of the Indian Territory was redesignated as Oklahoma Territory. Railroad connections to the city helped make it a center for trade, milling, and meat packing (OCCVB 2010).

3.3.2.2 Tinker AFB

Tinker AFB has implemented an Integrated Cultural Resources Management Plan (ICRMP), which is designed to assist the installation in continuing to maintain and operate existing facilities, and in developing new facilities, as needed, in compliance with federal and state legislation protecting cultural resources (Tinker AFB 2005b). Cultural resources are protected under the NHPA of 1966, as amended and protected by the Archaeological Resource Protection Act. Both archaeological and historic architectural resources that have not been evaluated must be considered eligible for the NRHP until appropriately evaluated and SHPO concurrence has been documented (Tinker AFB 2005a).

Area of Potential Affect

The Area of Potential Affect (APE) for this project includes the three service areas identified on Figure 3-2. The haul roads and waste removal sites are not considered part of the APE. Existing commercial landfill sites are proposed for all solid waste generated during implementation of the Proposed Action, and no modifications to existing roads or special temporary roads would be needed.

The entire land area of Tinker AFB has been surveyed for archeological resources, and four archaeological sites have been identified at Tinker AFB (Table 3-4; Tinker AFB 2005a). Three sites have been determined to be eligible for listing in the NRHP, and one site has been determined to be ineligible for listing in the NRHP (SHPO 2001). None of these archaeological sites are within the APE.

Table 3-4. Archaeological Sites at Tinker AFB

Site#	Site Description	Author and Date	NRHP Status
34OK-146	Historic trash scatter	Klinger and Smith 1992	Not Eligible
34OK-157	Historic building complex	Parsons ES 2000	Eligible
34OK-166	Prehistoric open habitation without mounds	Parsons ES 2000	Eligible
34OK-167	Prehistoric open habitation without mounds	Parsons ES 2000	Eligible

Two historic property types have been identified at Tinker AFB: facilities associated with aircraft construction and modification, 1942-1946; and facilities associated with the Cuban Missile Crisis, 1962. Tinker AFB has six buildings individually eligible for listing in the NRHP and one historic district with seven contributing buildings that are eligible for listing in the NRHP (Figure 3-2; Table 3-5) (Tinker AFB 2005a). Buildings, or building complexes, directly in the CSP service areas are shown in bold font in Table 3-5.

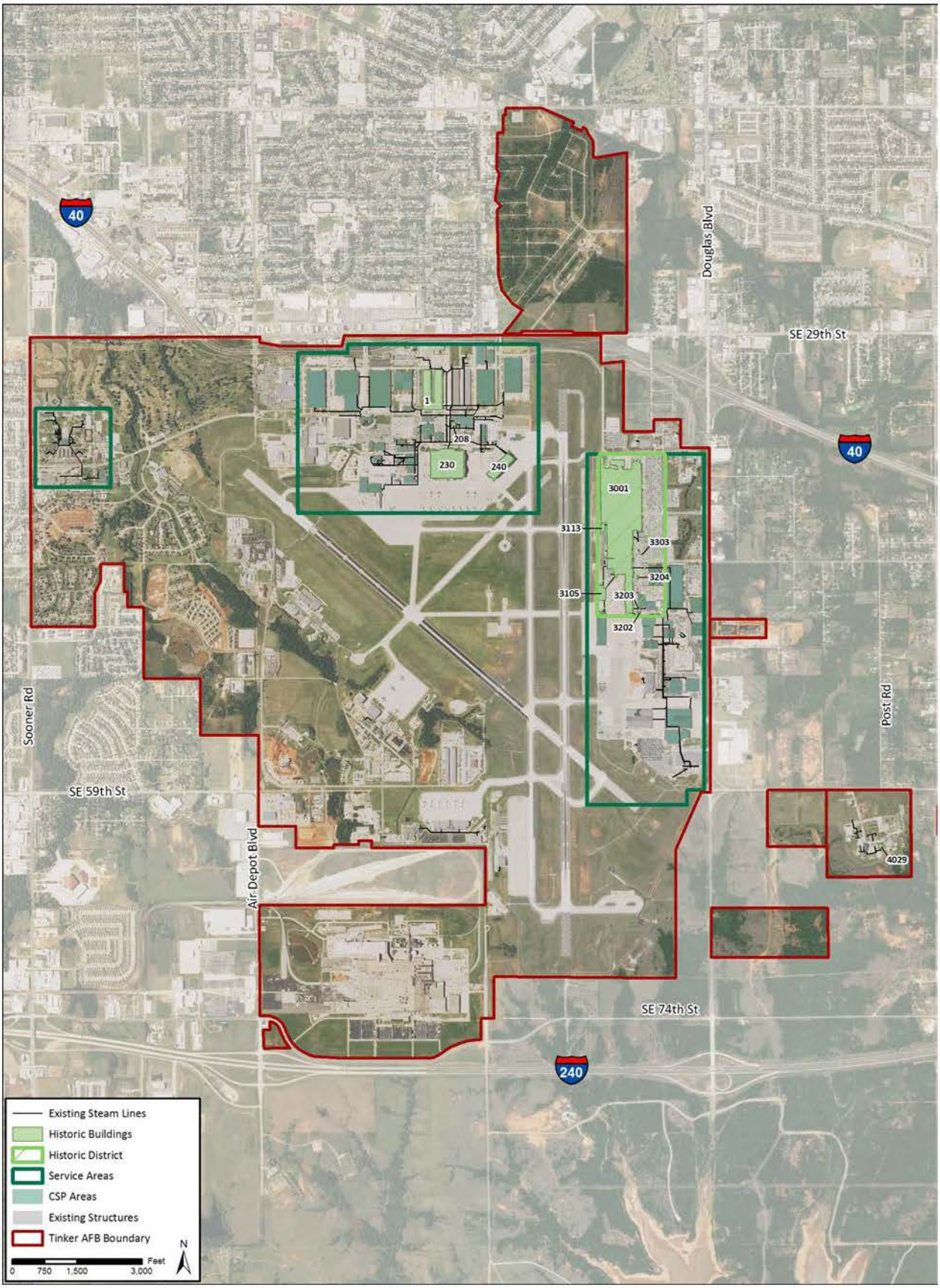


Figure 3-2. NRHP-Eligible Facilities on Tinker AFB

Table 3-5. Tinker AFB Historic Buildings

Building No.	Construction Date	Description	NRHP Eligibility
1	1942	Depot Supply	Individually Eligible
208	**1942**	**Steam Plant**	**Individually Eligible**
230	**1942**	**Airplane Repair Building**	**Individually Eligible**
240	**1942**	**Flight Test Hangar / Base Operations**	**Individually Eligible**
3001	**1943**	**Douglas Assembly Building**	**Individually Eligible; Eligible as Contributing Property***
3105	**1943**	**Paint Building**	**Eligible as Contributing Property***
3113	**1943**	**Woodworking Building**	**Eligible as Contributing Property***
3202	1943	Fire Pump Station	Eligible as Contributing Property*
3203	1943	Fire Protection Water Storage Tank	Eligible as Contributing Property*
3204	1943	Switch Gear House	Eligible as Contributing Property*
3303	1943	Pump House	Eligible as Contributing Property*
4029	1951	Combat Control Center	Individually Eligible

Source: Tinker AFB 2005a
Notes: *Contributing property to the Douglas Cargo Aircraft Manufacturing Historic District
Bold text denotes buildings within the CSP service areas.

Douglas Cargo Aircraft Manufacturing Historic District

The Douglas Cargo Aircraft Manufacturing Historic District contains 7 contributing and 14 noncontributing resources. The primary contributing building in the district is the Douglas Assembly Building (B3001). B3001 is also individually eligible for the NRHP. To the east of B3001 are smaller contributing structures (B3202, B3203, B3204, and B3303), which were originally used to serve the electrical, water, and fire safety needs of B3001. Between the rear west side of B3001 and the north/south runway (Runway 17/35) are two larger contributing buildings, which were part of the original plant operations: the woodworking mill (B3113) and a painting hangar (B3105). The buildings within the historic district share similar features such as concrete copings and, on the larger buildings, exterior bands of contrasting brick that are aligned horizontally. B3001 dominates the district and continues to define the relationships and associations of the smaller accessory structures, despite the presence of the newer, intrusive structures (Tinker AFB 2005a).

The buildings and structures in the Douglas Cargo Aircraft Manufacturing Historic District are historically significant for their role in the Douglas Cargo Aircraft Plant's World War II efforts to produce C-47 transport aircraft for the Army. B3001 also has architectural significance because of its size, which is approximately 3,374 feet long and 926 feet wide, making it the largest

building in Oklahoma. The Douglas Cargo Aircraft Manufacturing Historic District is eligible for listing in the NRHP under Criterion A for its role in history and under Criterion C for its unique architectural features. Under Criterion A, a resource must be associated with important events in history or prehistory; under Criterion C, a resource must meet one or more of the following four components (Tinker AFB 2005a):

- Embody distinctive characteristics of type, period, or method of construction
- Represent the work of a master (i.e., the technical and/or aesthetic achievements of a craftsman must be illustrated)
- Embody high artistic values (i.e., the expression of aesthetic ideals or preferences applied to aesthetic achievement)
- Represent a significant and distinguishable entity whose components may lack individual distinction (typically presented as districts)

The character defining features of buildings eligible for listing on the NRHP, and within the project area are provided in Table 3-6.

Table 3-6. Character-Defining Features for NRHP-Eligible Buildings Included in the Proposed Action

Building No.	Description	Material	Style/Type	Character Defining Features	Year Built
208	Steam Plant	Poured Concrete	Moderne Style	Windows, Main Entrance, Water Table, and Flat Roof	1942
230	Airplane Repair Building	Metal and Concrete	Moderne Style	Hangar Bays, Roof, Stair Towers, Sliding Hangar Doors, Windows, Entrance, and Water Table	1942
240	Flight Test Hangar/ Base Operations	Steel-Framed with Metal Paneling	International Style	Hangar Bays, Hangar Doors, Windows, Projected Concrete Surrounds, Water Table, and Roof	1942
3001*	Douglas Assembly Building	Steel-Framed with Brick Veneer	International Style	Size, Blackout Plan (Windowless), Brick Banding and Common-Bond Pattern, Hangar Doors on North and South Façades, Flat Roof, East Façade Entrance, and Foundation	1943
3105*	Paint Building	Steel-Framed with Brick Veneer	Industrial Type	Exhaust Fan Chimney, Hangar Doors, Brick Banding and Common-Bond Pattern, Concrete Coping, and Flat Roof	1943
3113*	Woodworking Mill	Concrete with Brick Veneer	Industrial Type	Brick Banding and Nine-Course English Bond Pattern, Flat Roof, Foundation, and Raised Loading Docks on Eastern And Northern Façades	1943

Source: Tinker AFB 2005a
Note: *Contributing property to the Douglas Cargo Aircraft Manufacturing Historic District

Tribal Consultation

Tinker AFB has previously consulted with three Native American tribes regarding their potential interest in cultural resources within Tinker AFB: the Seminole Nation, Osage Nation, and Muskogee Nation. These tribes have verbally commented that they have no Native American Graves Protection and Repatriation Act or American Indian Religious Freedom Act concerns about Tinker AFB property. Additionally, they have communicated that Tinker AFB property is not suitable for religious or burial sites (Tinker AFB 2005a). The Proposed Action area contains no known or suspected traditional cultural properties. None of the tribes expressed interest in these or other archeological sites which might potentially be revealed as inadvertent discoveries (Tinker AFB 2005a).

3.4 Hazardous Materials and Wastes

3.4.1 Definition of Resource

Hazardous materials are defined as substances with strong physical properties of ignitability, corrosivity, reactivity, or toxicity that may cause an increase in mortality, a serious irreversible or incapacitating but reversible illness or may pose a substantial threat to human health or the environment. Hazardous wastes are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that pose a substantial present or potential hazard to human health or the environment.

Issues associated with hazardous materials and wastes typically focus on underground storage tanks (USTs); aboveground storage tanks (ASTs); and the storage, transport, and use of pesticides, bulk fuel, petroleum, oils, and lubricants. When such resources are improperly used, they can threaten the health and well-being of wildlife species, botanical habitats, soil systems, water resources, and people.

To protect habitats and people from inadvertent and potentially harmful releases of hazardous substances, the DoD has dictated that all facilities develop and implement Hazardous Waste Management Plans or Spill Prevention and Response Plans. Also, the DoD has developed the Environmental Restoration Program (ERP), intended to facilitate thorough investigation and cleanup of contaminated sites at military installations. These plans and programs, in addition to established legislation (e.g., Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] and RCRA) effectively form the “safety net” intended to protect the ecosystems on which most living organisms depend.

Some building components may contain hazardous building materials such as asbestos (e.g., flooring, insulation wrap, siding) or lead-based paint (e.g., piping). These substances are hazardous to human health. Consequently, demolition or removal of such components may result in the generation of regulated waste. Regulated waste should be transported off site by a licensed contractor for appropriate disposal.

3.4.2 Existing Conditions

3.4.2.1 Hazardous Materials

Tinker AFB

Hazardous materials are utilized to perform the mission of Tinker AFB. The Hazardous Materials Management Program (HMMP) manages the procurement and use of hazardous materials at the base. The HMMP functions through the Hazardous Materials Pharmacy, which consists of a decentralized Hazardous Materials Pharmacy Cell and a hazardous materials electronic tracking system, the Hazardous Materials Management System (HMMS). The HMMS database management system performs the following automated functions:

- Tracks training, exposure, inventory, and personal protective equipment
- Dispenses hazardous materials according to units of use
- Serves as the central issue point for just-in-time control and issue
- Creates online Material Safety Data Sheets
- Maintains hazardous materials control by authorized user, zone, and task

The tracking system provides the data necessary to meet reporting requirements, assess processes for pollution prevention opportunities, and measure success in minimizing hazardous materials usage (Tinker AFB 2009).

Tinker AFB's OC-ALC Plan 19-2, *Spill Prevention and Emergency Response Plan for Hazardous and Extremely Hazardous Material and Spill Prevention Control and Countermeasures Plan* (Tinker AFB 2004), presents specific procedures for preparing for and responding to inadvertent discharges of oil or releases of hazardous substances at the base.

Proposed Action Area

Hazardous building materials may be found in the buildings (e.g., flooring, insulation, piping) and in insulation on existing underground steam lines throughout the project area. The insulation on existing aboveground steam supply and condensate return pipes is not likely to contain asbestos; however, asbestos may be present in insulation on underground steam and condensate pipes. Asbestos testing would be performed before demolition or construction activities occur. Asbestos may be present in flooring, siding, and insulation wrapping material in the buildings. Lead-based paint may be present on painted piping in some of the buildings as well.

The USAF has entered into a leasing agreement at the TACX and intends ultimately to acquire the property. Alignments of the natural gas distribution pipeline traverse the TACX area. There have been no recorded spills or releases of hazardous materials to land in the vicinity of TACX and the BNSF Railway rail line along the proposed natural gas pipeline alignment (EPA 2011b).

3.4.2.2 Hazardous Wastes Generation and Accumulation

Tinker AFB

Tinker AFB is permitted as a large-quantity hazardous waste generator and holds a Part B permit for its hazardous waste storage facility in B810 (Tinker AFB 2009). The permit was issued by the DEQ with an effective date of July 2001 (Tinker AFB 2009). The DEQ serves as the primary oversight agency for RCRA compliance in Oklahoma. Hazardous wastes at the base are managed in accordance with the most recent hazardous waste management instruction guidelines (Tinker AFB Instruction 32-7004). Compliance with the provisions, regulations and mandates put forth in Tinker AFB Instruction 32-7004 is mandatory for actions involving hazardous waste on the installation. The purpose of the guidelines is to ensure safe and effective collection, handling, and disposal of hazardous waste on the installation in a manner that complies with applicable DoD and USAF regulations and federal and state laws (Tinker AFB 2005b). The largest volume of hazardous waste at the base is generated by aircraft and jet engine maintenance and overhaul activities. These activities include the following:

- Preparation of aircraft skins and structural members
- Paint removal and application, degreasing, metal etching, and carbon removal of engines
- Abrasive blasting

Conducting these activities requires the use of large volumes of solvents and the generation of dust and liquid wastes. Other hazardous wastes contributing to this waste stream include petroleum products and waste, hydraulic fluid, antifreeze, and mercury-containing light bulbs and ballasts. Disposal of mercury-containing light bulbs must be conducted in accordance with the Universal Waste Rule (40 CFR 273); this rule specifies procedures for proper disposal and storage of used mercury-containing light bulbs and ballasts. The Hazardous Wastes Management program at Tinker AFB has prepared a plan for the replacement of such light bulbs and ballasts and should be contacted prior renovation or demolition activities to ensure that appropriate measures are implemented to adhere to established guidelines.

Another large hazardous waste stream generated at Tinker AFB results from RCRA corrective actions on past contaminated sites and remediation of a National Priorities List site on the base. These wastes consist of solvent-, hydrocarbon-, and metal-contaminated soil and debris removed during remediation projects. Other hazardous waste at Tinker AFB is generated from remodeling or demolition of older buildings. Due to the age of certain buildings on base, there is a potential for building materials to contain hazardous substances such as asbestos (in structures built prior to 1986) and lead-based paint. Operational activities including vehicle building, grounds maintenance, and wastewater treatment also generate hazardous waste.

According to the Fiscal Year 2009 *Internal Environmental Compliance Assessment and Management Program* [ECAMP] *Final Report for Tinker AFB,* approximately 345 organizations on the base generate hazardous wastes. Hazardous wastes are accumulated at the site of generation in initial accumulation points (IAPs) throughout the base (Tinker AFB 2009). In some

areas, collection points (e.g., hazardous waste storage; see Figure 3-3) are used to accumulate wastes during work shifts; wastes are then transferred to an appropriate IAP at the end of the work shift (Tinker AFB 2009). Waste staging areas are used for some locations where wastes from multiple IAPs are staged for pickup and transfer to one of two accumulation points (APs), located in B809 and B3125 (Tinker AFB 2009). These containers are tracked from the issue of an empty container through disposal of the container using the HMMS. B809 is the largest of the APs and processes the majority of containerized hazardous waste from the IAPs for transfer to the treatment, storage, and disposal facility (TSDF). The TSDF is in B810 and is operated by the Defense Logistics Agency Disposition Services. The role of the TSDF is limited to conforming storage (Tinker AFB 2009). B810 and B811 temporarily house hazardous waste for up to one year (Tinker AFB 2005b). Serialized accumulation containers for nonbulk hazardous waste are issued to waste generators and picked up when full (Tinker AFB 2009). Profiling is completed using either generator knowledge or laboratory analysis to identify and quantify the chemical constituents of the waste for proper treatment and disposal. Containers are then shipped off site for disposal.

There are three areas on Tinker AFB where noncontainerized waste is accumulated in APs. The industrial wastewater treatment plant accumulates dewatered hazardous waste sludge in a roll-off bin that is picked up directly by a contractor and taken to an appropriate TSDF (Tinker AFB 2009). B3125 contains an AP where drums are rinsed and crushed, aerosol cans are punctured and crushed, and blast media wastes are accumulated (Tinker AFB 2009). The chemical cleaning line in B3001 includes hazardous waste tanks, which are only used when there is a malfunction in the process line (Tinker AFB 2009).

Proposed Action Area

Within the Proposed Action project area are a variety of hazardous waste storage sites. Several buildings included in the Proposed Action project area contain IAPs, and B3001 and B3125 include hazardous waste storage sites.

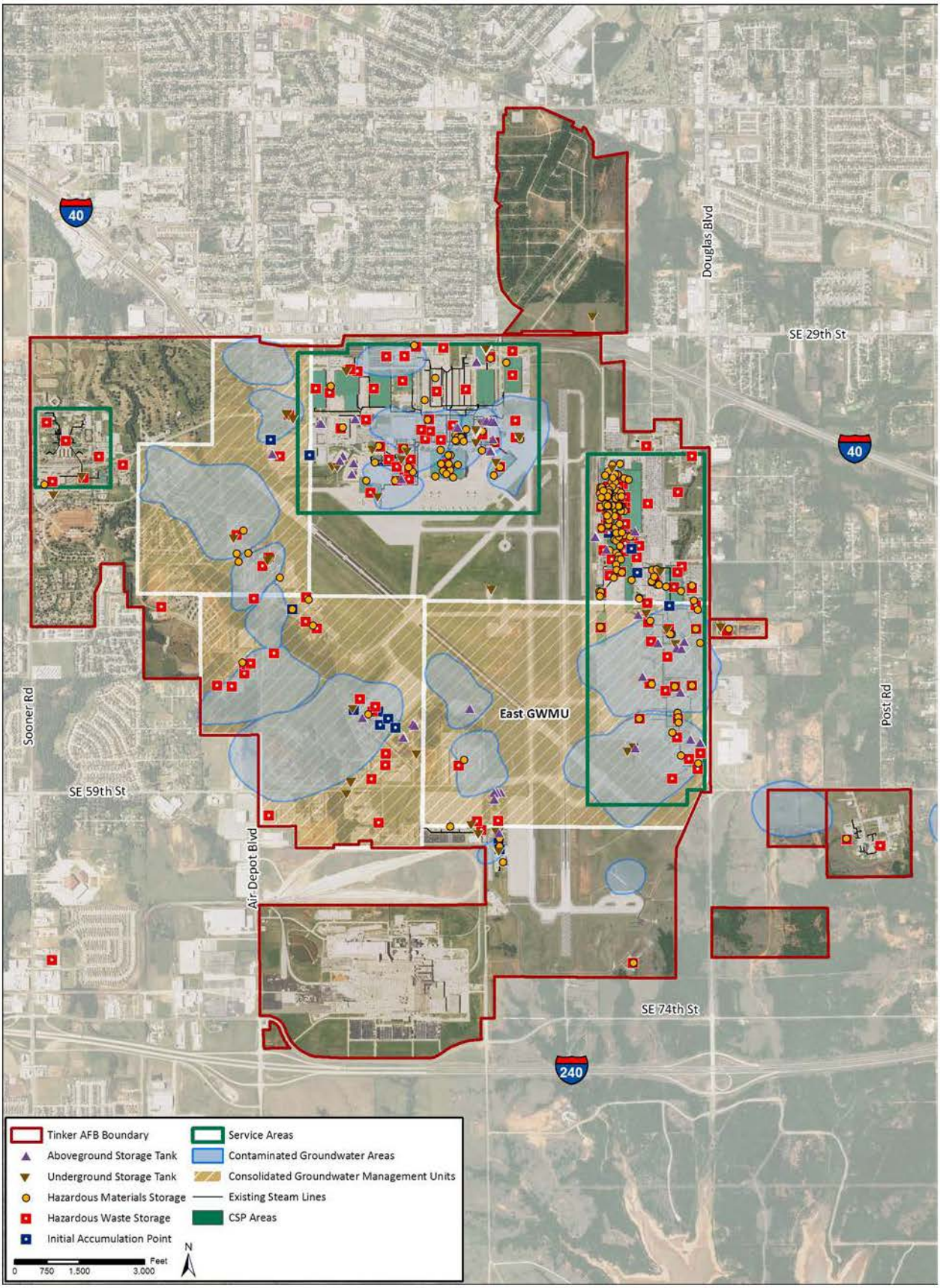


Figure 3-3. Hazardous Wastes on Tinker AFB

3.4.2.3 Fuel Storage

Tinker AFB

The fuels and materials stored and handled in bulk at the base include jet propellant 5 (JP-5), JP 8, and pulverized fuel 1 (PF-1; aviation fuels), JP-10 (missile fuel), motor gasoline (Mogas; automotive gasoline), diesel fuel, biodiesel fuel, No. 2 heating oil, PD-680 (solvent), and deicing fluid. Conoco supplies JP-8 fuel to Tinker AFB through a 6-inch-diameter supply line that enters the northern section of the base and continues to the main tank farm (Tinker AFB 2005b). Tanker trucks are used as a backup to deliver JP-8, which is dispensed to aircraft either from one of the 11 refueler vehicles (R-11s) or directly through hydrants located on the aprons on the western, southern, and eastern sides of the base (Tinker AFB 2009).

Various fuels at the base are also stored in ASTs and USTs. Releases from ASTs and USTs (i.e., spills, overfill, and leaks) can cause fires or explosions that threaten human safety and can contaminate soil and groundwater that threaten human health. The main goal of the base's storage tank program is to protect groundwater and soil from contamination by ensuring that the following:

- All ASTs meet applicable requirements, including requirements for leak testing and preventing, responding to, reporting, and cleaning up spills.
- New USTs (including piping) are designed and constructed to provide corrosion protection, release detection, spill and overfill prevention, proper installation, and secondary containment.
- All existing USTs (any regulated UST installed before 22 December 1988) are upgraded to meet the standards for new USTs (Tinker AFB 2005b).

An aggressive investigation of abandoned and active USTs at Tinker AFB began in September 1985. Eighty-eight active tanks and 38 abandoned tanks were identified and located. Most of those tanks were found in the vicinity of B3001 and in the north-central portion of the base near B201, B210, and the B290 Fuel Farm (Figure 3-3).

In coordination with the Oklahoma Corporation Commission (OCC), Tinker AFB began release investigations at 26 UST sites beginning on 31 July 1999. Tinker AFB has completed most of the investigations and has determined the nature and extent of contamination at each UST site; several of those sites are in active remediation. Currently, 15 of the sites have been closed or deactivated in accordance with OCC regulations that were in effect prior to 1 September 1996. The previous rules categorized UST sites for remediation based on generic contaminant levels in soils and groundwater. On 1 July 1996, the OCC issued new rules that classify sites for remediation based on risk to human health and the environment. The new process is referred to as the Oklahoma Risk-Based Corrective Action Program. Eleven sites are still open and are in remediation or have been recommended for case closure. In addition, two UST removals were performed in 1998, and tank closure reports were submitted to the OCC in December 1998 for each site. According to the Fiscal Year 2009 *Internal ECAMP Final Report*, Tinker AFB currently maintains 36 active USTs and 90 active ASTs (Tinker AFB 2009).

Proposed Action Area

Seven fuel tanks are associated with the existing CSPs, six of which would be removed as part of the Proposed Action. Four 18,000-gallon ASTs are located at B208, one 40,000 gallon UST is located at B2212, one 20,000 gallon UST is located at B3001, and one 12,000 gallon UST is located at B5802 (Figure 3-3). The UST located at B3001 would not be removed as part of the Proposed Action.

3.4.2.4 Groundwater Contamination

Tinker AFB

Tinker AFB has established a basewide groundwater sampling program to obtain depth-to-water and depth-to-product measurements semiannually from approximately 1,300 monitoring wells, pumping wells, and piezometers (a small-diameter observation well used to measure groundwater pressure). The groundwater contamination characterized to date is generally limited to the base boundaries. Groundwater at Tinker AFB is evaluated and monitored in areas where solvents or other hazardous materials may have been disposed of and have impacted groundwater. Three consolidated groundwater management units (GWMU)—identified as the Northwest, East and Southwest GWMUs—are located within the boundaries of Tinker AFB. The purposes of the GWMUs are to define areas to facilitate investigation and monitoring of groundwater for contaminants, principally solvents, metals and fuel that may originate from a variety of localized sources. The sources include several Installation Restoration Program (IRP) sites and non-IRP sites at Tinker AFB. Remediation actions in place include pump-and-treat systems, monitored natural attenuation, and interim controls.

Soil vapor at Tinker AFB results from the evaporation of petroleum products, solvents, or other hazardous materials remaining in the unsaturated soils found below the ground surface (above groundwater level). Vapor intrusion assessments were recently performed to assess the potential for soil vapor intrusion of subsurface contaminants volatilized from soil and/or groundwater into overlying buildings at various areas across Tinker AFB. The assessment preparers determined that the following buildings have a potential for vapor intrusion condition to exist: 200, 220, 240, 255, 267, 296, 2210, 2211, 3001, 3105, 3117, 3123, 3125, 3221, 3225, 3228, 3234, 3307, 3703, 3706, 3707, 3708, and 3761 (Tinker AFB 2011). However, the assessment concluded that vapor intrusion is likely to be a rare occurrence at Tinker AFB because of the clay-rich soils underlying most of the buildings (Tinker AFB 2011).

Proposed Action Area

Buildings in the CSP 208 and CSP 2000/3000 areas are in areas overlying groundwater contamination plumes. The CSP 208 area is in the northwest GWMU; the principal chemicals of concern include chlorinated solvents, including trichloroethene (TCE). According to 2007 groundwater sampling information, TCE concentrations exist in the upper and lower saturated zones under the following buildings in the CSP 208 area: 200, 201, 202, 220, 230, 240, 255, 260, 267, 268, 283, 289, and 296 in the CSP 208 area (Tinker AFB 2010a).

The CSP 2000/3000 Area is in the east GWMU area; the principal chemicals of concern in this area include fuels and chlorinated solvents, including TCE. TCE, tetrachloroethene (PCE), and hexavalent chromium concentrations exist under most or all of the buildings in the CSP 2000/3000 Area (Tinker AFB 2010a).

TCE plumes occur on either side of B510; however, groundwater contamination does not appear to exist under B510 or where the geothermal wells are proposed to be sited (Figure 3-3) (Tinker AFB 2010a).

Portions of the proposed natural gas line would cross the east GWMU and southwest GWMU (Figure 3-3) (Tinker AFB 2010a).

3.4.2.5 Environmental Restoration Program

Tinker AFB

The Secretary of Defense established the Defense ERP in 1981 to investigate and remediate hazardous waste sites at DoD facilities. The USAF subsequently established its ERP to locate and investigate hazardous waste sites on its installations, termed IRP sites. Fully restored and remediated IRP sites present few constraints to future on-base development; however, the implementation of land use controls may be required. Land use controls are physical, legal, or administrative mechanisms that restrict or limit access to contaminated property to promote beneficial land uses and to protect human health and the environment.

A total of 40 IRP sites including National Priorities List sites (operable units), landfills, industrial waste pits, fire-training areas, radioactive waste disposal sites, disposal areas, and groundwater contamination sites have been identified on Tinker AFB (Figure 3-3). Of the 40 sites in the IRP, 24 have reached site closeout with the regulating authority while the remaining 16 sites have a remedy in place (Scott Bowen, personal communication February 2011). Of these 16 remaining sites, 3 sites are within the jurisdiction of EPA Region 6 and are managed under CERCLA, and 13 sites are under the jurisdiction of the DEQ and managed under RCRA. Ten of the closed IRP sites and nine of the active IRP sites are RCRA solid waste management units. Although 24 of the IRP sites have reached site closeout, three of the RCRA sites have only completed case closures for fuel releases from UST releases regulated by the OCC's Petroleum Storage Tank Division (Tinker AFB 2010a).

In addition to the IRP sites, 13 Compliance Restoration Program (CRP) sites are located on Tinker AFB. The CRP sites will require additional site investigations and studies before remedial responses can be proposed and implemented (Tinker AFB 2010a).

Proposed Action Area

In total, 18 IRP sites and 11 CRP sites are in the vicinity of the Preferred Alternative project area (Figure 3-3). The proposed natural gas pipeline included under the Preferred Alternative would occur within the consolidated 039 east GWMU area.

Four IRP sites and four CRP sites are within the CSP 208 Area. The IRP and CRP sites and their status are listed in the Tinker AFB *2010 Community Relations Plan* and are given in Table 3-7 (Tinker AFB 2010a).

Table 3-7. ERP Sites in CSP 208 Area

Site Type	Status
IRP Sites Located Within the Central Steam Plant 208 Area	
Storage Tanks (ST) 008 Four Fuels Site	Remedial Action – in Operation (RA-O)
Radioactive Waste (RW) 026 Radioactive Waste Disposal Site 201S	No Further Response Action Planned (NFRAP)
ST033 Area A Service Station	NFRAP
Consolidated Groundwater (CG) Management Unit 037 Northwest GWMU	RA-O
CRP Sites Located Within the Central Steam Plant 208 Area	
Other (OT) 062 B230	Interim Remedial Action in Place (IRA-O)
OT063 B240	Remedial Investigation (RI) as a RCRA Facility Investigation (RFI)
OT064 B210	RI as an RFI, IRA-O
OT065 B283, B284 and B296	Discovery/Notification

Source: Tinker AFB 2010a

Thirteen IRP sites and four CRP sites are located within the CSP 2000/3000 Area and along the proposed pipeline. The IRP and ERP sites and their status are listed in the Tinker AFB *2010 Community Relations Plan* and are provided in Table 3-8 (Tinker AFB 2010a).

Table 3-8. ERP Sites in CSP 2000/3000 Area

Site Type	Status
IRP Sites Located Within the Central Steam Plant 2000/3000 Area	
OT001 B3001	RA-O with a Focused RI and Feasibility Study (RI/FS)
OT002 Soldier Creek Sediments and Surface Water	NFRAP
ST003 North Tank Area	RA-O
OT004 Wells 18 and 19	NFRAP
OT005 Soldier Creek/Industrial Wastewater Treatment Plant Groundwater	NFRAP
ST006 Southwest Tank Area	NFRAP
IRP Sites Located Within the Central Steam Plant 2000/3000 Area	
Waste Pit (WP) 018 Industrial Waste Pit No. 1	RA-O
WP019 Industrial Waste Pit No. 2	NFRAP
OT020 Multiple Creeks	NFRAP
ST032 3700 Fuel Yard	NFRAP
WP030 Pit Q-51	NFRAP
WP036 Purge Facility Turnaround Soils	NFRAP
CG039 East GWMU	RA-O
CRP Sites Located Within the Central Steam Plant 2000/3000 Area	
OT058 B3703 Groundwater	IRA-O
OT069 SE Quad, B2121 and B2122	Discovery/Notification
Vapor Intrusion (VI) 080 B3105	Discovery/Notification
VI081 B2210	Discovery/Notification

Source: Tinker AFB 2010a

One IRP site is located near the proposed location of the ground source heat pump array at B510. No CRP sites are in the area. The IRP site and its status are listed in the Tinker AFB *2010 Community Relations Plan* and are listed in Table 3-9 (Tinker AFB 2010a).

Table 3-9. ERP Sites Near B510

IRP Sites Located Within the Ground Source Heat Pump Array at B510	Status
CG037 Northwest GWMU	RA-O

Source: Tinker AFB 2010a

No ERP sites have been identified along the proposed natural gas pipeline alignment (Tinker AFB 2010a).

3.5 Safety

3.5.1 Definition of Resource

Human health and safety are defined as the conditions, risks, and preventative measures associated with a facility and its ability to potentially affect the health and safety of facility personnel or the general public. The Occupational Safety and Health Administration, EPA, and National Fire Protection Agency issue standards regarding personnel training, preventative controls, and other occupational health and safety matters. The USAF determines quantity-distance arcs to protect against exposure to blasts, thermal hazards, and shrapnel from explosives.

The primary safety concern with regard to military aircraft activity is the potential for aircraft mishaps (i.e., crashes), which may be caused by midair collisions with other aircraft or objects, weather difficulties, or on-ground collisions between aircraft.

3.5.2 Existing Conditions

3.5.2.1 Asbestos and Lead-Based Paint

Some building components may contain hazardous materials such as asbestos (e.g., flooring, steam and condensate return piping, insulation wrap, siding) or lead-based paint (e.g., piping). These substances are hazardous to human health; consequently, demolition or removal of such components, including belowground steam and condensate return piping, may result in the generation of regulated waste.

Building materials should be sampled by a licensed Asbestos Inspector/Management Planner prior to renovation activities. The building and piping materials should be analyzed for asbestos by a laboratory certified by the National Voluntary Laboratory Accreditation Program. Regulated waste would be transported off site by a licensed contractor for disposal. These materials, their management, and their disposal are further discussed in Section 3.5, *Hazardous Materials and Wastes.*

3.5.2.2 Runway Protection Zones

APZs and CZs are rectangular zones extending outward from the ends of active military airfields that delineate areas recognized as having the greatest risk of aircraft mishaps, most of which occur during takeoff or landing. Three zones are identified for each runway: the CZ, APZ I, and APZ II. Each end of Runways 17/35 and 12/30 at Tinker AFB has a 3,000-foot-by-3,000-foot CZ, a 3,000-foot-by-5,000-foot APZ I, and a 3,000-foot-by-7,000-foot APZ II (Tinker AFB 2006). Portions of the Proposed Action project area fall within the CZ for both Runways 17/35 and 12/30, and a small portion of the Runway 12/30 APZ 1 (Figure 3-5).

Clear Zones

The CZ has the highest accident potential of the three zones, as 27 percent of accidents studied occurred in this area. As stated previously, it is USAF policy to request that Congress authorize and appropriate funds to purchase the real property interests in this area to prevent incompatible land uses. Currently at Tinker AFB, all land use with CZs would be considered compatible (Tinker AFB 2006).

Accident Potential Zones I and II

APZ I is an area that possesses somewhat less accident potential than the CZ, with 10 percent of the accidents studied occurring in this zone. APZ II has less accident potential than APZ I, with 6 percent of the accidents studied occurring in this zone. Although the potential for aircraft accidents in APZs I and II does not warrant land acquisition by the USAF, land use planning and controls are strongly encouraged in these areas for the protection of the public (Tinker AFB 2006).

APZ I is 3,000 feet wide by 5,000 feet long and has land use compatibility guidelines that are sufficiently flexible to allow reasonable economic use of the land, such as industrial/ manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. APZ II is 3,000 feet wide by 7,000 feet long, extending 15,000 feet from the runway threshold. Acceptable uses include those of APZ I, as well as low-density, single-family residential, and those personal and business services and commercial/retail trade uses of low-intensity or low-scale operations. High-density functions such as multistory buildings, places of assembly (e.g., theaters, churches, schools, restaurants), and high-density office uses are not considered appropriate (Tinker AFB 2006).

Incompatible land use is currently established within APZs associated with the airfield at Tinker AFB and is summarized in Table 3-10. APZs I and II, located off Runways 17/35 and 12/30, contain commercial and sensitive receptors (i.e., residences, schools, libraries, etc.).

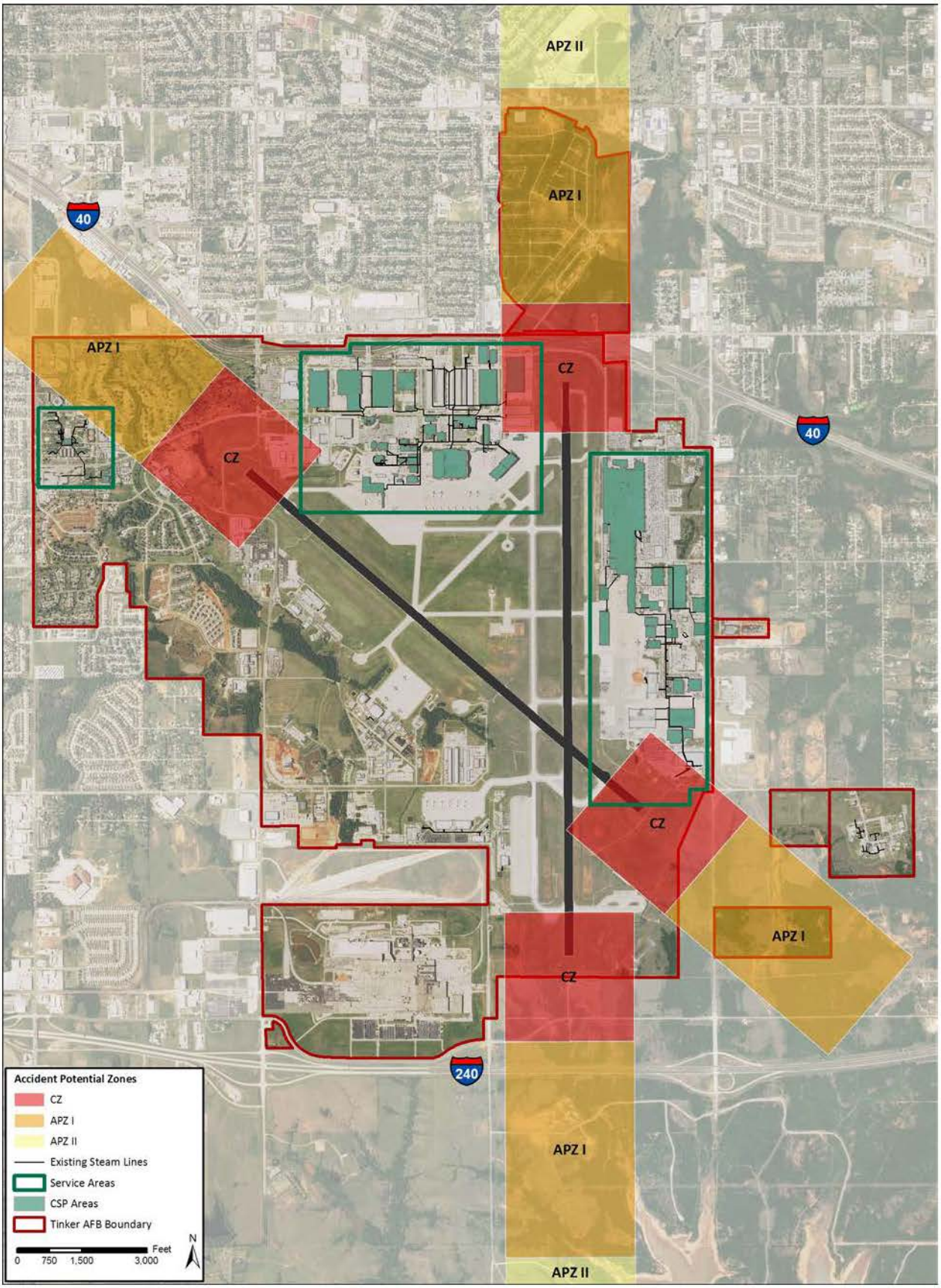


Figure 3-5. Runway Protection Zones on Tinker AFB

Table 3-10. Acres of Incompatible Land Use within Clear Zones, Accident Potential Zones I and II Associated with Runways 12/30 and 17/35

Land Use	Acres of Incompatible Land Use		
	CZ	APZ I	APZ II
Residential	0	4	408
Commercial	0	41	0
Industrial	0	0	0
Public/Quasi-Public	0	4	121
Recreational/Open Space/Agricultural/Low Density	0	0	0
Total	**0**	**49**	**529**

Source: Tinker AFB 2006

3.5.2.3 Quantity-Distance Arcs

Quantity-distance arcs are defined clearance distances around munitions storage areas and other locations subject to explosive mishaps. Quantity-distance arcs are identified to protect personnel, the public, and assets against exposure to blasts, thermal hazards, and shrapnel from explosives. As such, facilities development within quantity-distance arcs is discouraged.

No quantity-distance arcs overlie any of the Proposed Action project sites.

3.6 Socioeconomics

3.6.1 Definition of Resource

Socioeconomics can generally be described as the interrelationship between the basic attributes and resources associated with the human environment, particularly population and economic activity. Human population is affected by regional birth rates, death rates, and overall migration. Economic activity includes factors related to the supply of and demand for goods and services, such as employment, personal income, and commercial and industrial growth. Impacts on these two fundamental socioeconomic indicators can influence other socioeconomic components such as housing availability and the provision of public services. Socioeconomic data in this section are presented for the region to provide a brief summary of the general socioeconomics of the area surrounding the Proposed Action site.

3.6.2 Existing Conditions

3.6.2.1 Regional Setting

Population

The Proposed Action site is in Oklahoma County, in the southeastern portion of Oklahoma City. The adjacent municipalities of Midwest City and Del City respectively lie to the north and northwest of the Tinker AFB boundary and the Proposed Action area. To provide a general idea of the population surrounding Tinker AFB and the Proposed Action area, demographics for these

three adjacent municipalities are provided in Table 3-11 and are compared to county- and state-level data.

Table 3-11. Total Population: 2000-2008

Geographic Area	Census 2000	Estimated 2008	Population Change (2000-2008)
Oklahoma City	506,132	544,157	7.5%
Midwest City	54,088	53,674	-0.8%
Del City	22,128	22,446	1.4%
Oklahoma County	660,448	699,440	5.9%
Oklahoma	3,450,654	3,606,200	4.5%

Source: United States Census Bureau 2000, 2008

Employment

According to the United States Bureau of Labor Statistics (BLS), the total labor force for Midwest City and Del City decreased between 2000 and 2009 (Table 3-12). By comparison, the total labor force for Oklahoma City increased during this same period, as it did for Oklahoma County and the state (BLS 2010; Table 3-12).

Table 3-12. Total Labor Force: 2000-2009

Geographic Area	2000	2009	Change (2000-2009)
Oklahoma City	252,689	258,079	2.1%
Midwest City	25,890	25,245	-2.5%
Del City	10,205	9,503	-6.9%

Table 3-12. Total Labor Force: 2000-2009 (Continued)

Geographic Area	2000	2009	Change (2000-2009)
Oklahoma County	326,774	329,243	0.8%
Oklahoma[1]	1,659,005	1,773,579	6.9%

Source: BLS 2010

Note: [1] Data for the State of Oklahoma were derived from the average total labor force for each month of the year. All data for other geographic areas were obtained using annual values provided by the BLS.

The USAF is a major contributor to the economy of Oklahoma City. The top five employers in the Oklahoma City area include the following (Greater Oklahoma City Chamber of Commerce 2010):

- State of Oklahoma
- Tinker AFB

- Oklahoma University, Norman Campus
- INTEGRIS Health
- Federal Aviation Administration's Mike Monroney Aeronautical Center

Approximately 16 percent of the employed population of Oklahoma County is employed by the government (United States Census Bureau 2008).

Unemployment

BLS data for the Proposed Action area show an increase in the unemployment rate from 2006 to 2010 (BLS 2010). Increases were experienced in Midwest City, Del City, Oklahoma County, and the State of Oklahoma during this same period (Table 3-13).

Table 3-13. Unemployment: September 2009 to September 2010

Geographic Area	Work Force			Unemployment Rate		
	September 2006	September 2008	September 2010[1]	September 2006	September 2008	September 2010[1]
Oklahoma City[2]	259,298	255,525	256,533	4.3	3.5	6.1
Midwest City[2]	26,268	24,814	25,207	4.2	4.0	7.1
Del City[2]	9,812	9,385	9,469	4.9	4.2	7.3
Oklahoma County[2]	331,458	325,685	327,380	4.1	3.7	6.4
Oklahoma[3]	1,731,552	1,754,940	1,756,589	4.2	3.8	6.9

Source: BLS 2010

Notes: [1] Preliminary data
[2] Not seasonally adjusted
[3] Seasonally adjusted

Tinker AFB

Currently, with approximately 27,000 military and civilian employees, Tinker AFB is the largest single-site employer in Oklahoma (Tinker AFB 2010b). The installation has an annual statewide economic impact of $3.4 billion, creating an estimated 30,865 secondary jobs (Tinker AFB 2010b).

3.7 Sustainability

3.7.1 Definition of Resource

EO 13514 was issued on 4 October 2009, to focus the attention of federal agencies on promoting the establishment of an integrated system of development that promotes environmental sustainability by the federal government and emphasizes the reduction of GHG emissions. The principal GHGs that enter the atmosphere due to human activities include CO_2, CH_4, N_2O, and fluorinated gases. Water vapor and ozone are also considered GHGs, but these gases are not included in this discussion. Water vapor, while the most abundant GHG, is excluded from

evaluation because it is generally believed that water vapor produced directly by human activity contributes very little to the atmospheric amount of water vapor (United States Energy Information Administration 2010). Ozone is not monitored as a GHG because at lower elevations in the atmosphere, where it is harmful to human health, it is regulated independently (see Section 3.1, *Air Quality*) (United States Energy Information Administration 2010). The federal government is taking actions to reduce GHGs through means such as streamlining infrastructure to minimize vehicle use and vehicle emissions (i.e., idling), and reducing facility consumption of energy by implementing energy conservation projects.

The U.S. Green Building Council has developed the Leadership in Energy and Environmental Design (LEED) program to provide building owners and operators with a concise framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions (U.S. Green Building Council 2010). The U.S. Green Building Council's LEED is a third-party certification program and the nationally accepted benchmark for the design, construction, and operation of high-performance green buildings (U.S. Green Building Council 2010).

3.7.2 Existing Conditions at Tinker AFB

Many buildings at Tinker AFB included in the Proposed Action were constructed prior to 1970 and do not meet current sustainability goals. As a result, many buildings use resources such as electricity, water, and gas inefficiently. Building code requirements have also changed substantially since many of these structures were designed and constructed. Tinker AFB recently completed a basewide energy audit to achieve compliance with the EISA, as well as EO 13423. The intent of the energy audit was to determine feasible energy conservation opportunities. Results of the survey identified 26 energy and 4 water conservation projects that would result in annual use reduction and cost savings (Department of the Air Force 2010a, 2010b). The Proposed Action would provide a method to achieve and exceed the mandated energy reduction goals at Tinker AFB as defined by EO 13514. The existing CSPs supply steam to 71 buildings through distribution pipelines. Energy is lost due to the aging pipeline infrastructure, and much of the equipment is outdated and inefficient. The Preferred Alternative also includes additional natural gas pipeline distribution infrastructure between selected areas that would increase energy redundancy and security on base (Honeywell 2010).

3.8 Transportation and Circulation

3.8.1 Definition of Resource

Transportation and circulation refer to the movement of vehicles and pedestrians throughout a road and highway network. Under highway functional classification guidance by the Oklahoma Department of Transportation's Planning and Research Division, principal arterials are interstates, other freeways, expressways and other principal arterials that serve major traffic movements, provide continuity for rural arterials, and operate under full, partial or no controlled access. Minor arterial roads provide a lower level of mobility than principal arterials and serve

moderate-length trips. Other roadway facilities are collector street systems and local street systems that provide higher access and lower traffic mobility.

3.8.2 Existing Conditions

3.8.2.1 Regional and Local Circulation

Tinker AFB is within the city limits of Oklahoma City, approximately 9 miles southeast of downtown by surface roads. Oklahoma City is served by a network of interstates and local and regional arterial roads. Four interstates, I-40, I-35, I-240 and I-44, pass through Oklahoma City and provide regional access to the base.

Three arterial roads, including Sooner Road, SE 29th Street, and Douglas Boulevard, and two interstates, I-40 and I-240, provide access to Tinker AFB (Figure 3-6). Sooner Road is a north-south four-lane arterial that forms part of the western border of the base. SE 29th Street is an east-west arterial that, along with I-40, forms the northern boundary of the base. SE 29th Street is recognized as having east-west section-line roads with some of the highest traffic volumes in the southeastern sector of Oklahoma City (City of Oklahoma City 2007). Douglas Boulevard is a four-lane north-south arterial that forms the eastern boundary of the base and provides access to the base through the Lancer Gate. I-40 runs along the northern boundary of the base and provides access to the base via Air Depot Boulevard/Tinker Gate and Eaker Gate. I-240, an east-west arterial located south of the base, provides access to the base from Sooner Road (via Vance Gate), Air Depot Boulevard (Gott Gate), and Douglas Boulevard (Figure 3-6).

3.8.2.2 Circulation at Tinker AFB

A network of arterial, collector, and local roads serves Tinker AFB. A system of local roads supports most of the traffic on the base.

Air Depot Boulevard, East Drive, Arnold Avenue, and Patrol Road are the major collector roads and are supported by a network of minor collector road and local streets. McNarney Avenue, Reserve Road, and Mitchell Avenue are the primary local roads. Arnold Avenue connects Vance Gate on the west with Turnbull Gate on the east. Other collector roads such as Air Depot Boulevard and Patrol Road provide north-south connectivity on the base.

Thirteen gates are located on the perimeter of Tinker AFB. Eaker Gate, Hruskocy Gate, and Truck Gate are open 24 hours per day, seven days per week (Tinker AFB 2010c). Tinker Gate and Lancer Gate are temporarily closed due to construction and other reasons (as of August 2010; see Tinker AFB 2010c). Midwest Boulevard Gate, where improvements are currently being conducted, is under consideration to become the new truck entry gate.

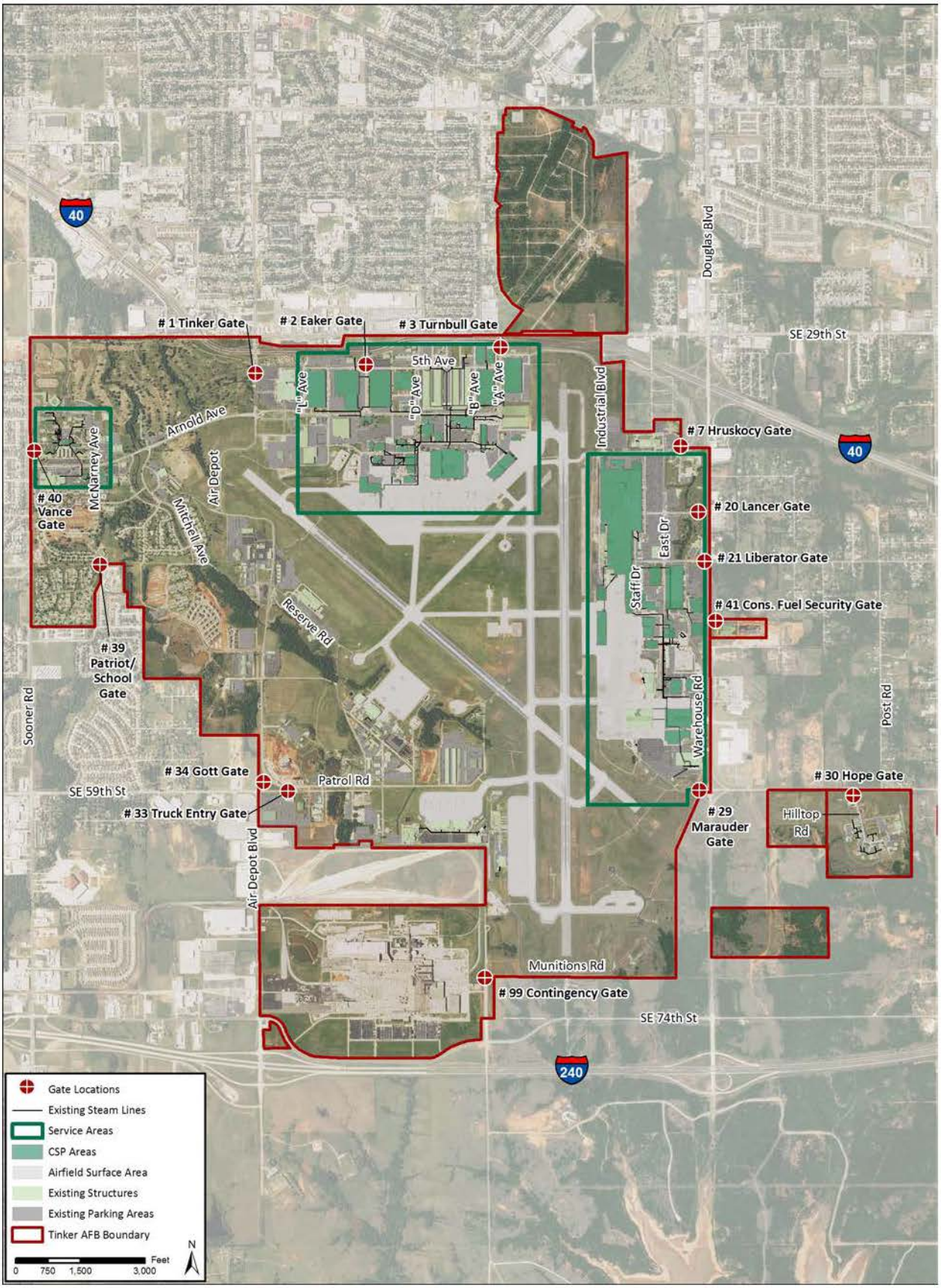


Figure 3-6. Transportation and Circulation on Tinker AFB

3.9 Utilities and Infrastructure

3.9.1 Definition of Resource

Utilities are basic services such as gas, electricity, water, and sewer that are delivered by public and private service providers. Infrastructure is the means of delivery for utilities and may include such systems as gas pipelines, electricity grids, water distribution systems, and sewer collection systems. The infrastructure systems of utilities typically have a finite capacity based upon system reliability and level of use.

3.9.2 Regional Setting – Tinker AFB

3.9.2.1 Communications

The communication distribution system at Tinker is provided through copper cable and fiber-optic cable networks, both located in underground conduits (Tinker AFB 2005b). The data systems at Tinker AFB are divided into the unclassified network and the classified network.

3.9.2.2 Electricity and Natural Gas

Oklahoma Gas and Electric Company supplies electrical power to Tinker AFB through a looped 138-kilovolt transmission line (Tinker AFB 2005b). The electrical distribution system consists of overhead lines with pole-mounted transformers and underground lines with pad-mounted transformers. Tinker AFB also utilizes numerous generators on base to provide backup power to key buildings, as well as an isolated secondary power source provided by an Oklahoma Gas and Electric Company–owned 80-megawatt peaking plant and standby generator (Tinker AFB 2005b).

Tinker AFB purchases natural gas through a government wide supply contract administered by the Defense Energy Supply Center. ONG delivers natural gas to Tinker AFB at three metered delivery points (Tinker AFB 2005b).

3.9.2.3 Potable Water

The primary drinking water supply source for Tinker AFB is a system of wells on Tinker AFB. There are 22 operational wells that obtain water from the Garber-Wellington Aquifer, which is part of the larger Central Oklahoma Aquifer. The wells operate at approximately 75 percent of rated capacity, producing approximately 2.2 million gallons per day (Tinker AFB 2010d). A secondary drinking water source is provided by the Oklahoma City Water Department, via two metered connections, that supplies approximately 30,000 gallons per month.

Tinker AFB's water supply is treated primarily by chlorination and fluoridation, either at the individual well site or through a central chlorination station (B774) on Tinker AFB (Tinker AFB 2005b). B6620 and B800 also add fluoride to water that is supplied to the family housing area.

Water purchased from Oklahoma City is chlorinated and fluoridated prior to delivery to Tinker AFB (Tinker AFB 2005b).

The water distribution system at Tinker AFB utilizes five elevated steel tanks to provide increased capacity to meet seasonal or firefighting demands, as well as maintaining distribution system pressure. Total elevated water storage capacity is 3 million gallons. The water distribution system itself is almost entirely decentralized and includes asbestos cement, cast iron, and polyvinyl chloride (PVC) pipe. Cast iron and asbestos cement water lines were initially installed in 1943; PVC water lines were installed as recently as 2001 (Tinker AFB 2005b).

3.9.2.4 Wastewater

Tinker AFB no longer operates a wastewater treatment plant. The base wastewater collection system is connected to the Oklahoma City wastewater system through a line that runs from the industrial wastewater treatment plant to the western side of the base (Tinker AFB 2005b). The majority of the wastewater collection system was constructed in 1943 and utilizes gravity-fed sewer line system. Forty-six sanitary wastewater lift stations and associated force mains are located throughout the main Tinker AFB area to maintain adequate pressure and flow through the sewer lines.

Tinker AFB operates an industrial wastewater system to collect wastewater from industrial facilities and activities and treatment prior to discharge into Oklahoma City's sanitary sewer system. Industrial waste includes oil, grease, and other contaminants that collect into aqueous streams (e.g., contents from chemical cleaning line processes). The industrial wastewater treatment plant receives and treats approximately 600,000 gallons per day of wastewater before releasing it into the Oklahoma City municipal wastewater treatment plant (Tinker AFB 2010d). Currently, the residual oily sludge from the industrial wastewater treatment processes is not filtered and is disposed of as hazardous waste.

3.9.2.5 Storm Water

Tinker AFB uses a combination of natural and constructed features (e.g., gutters, culverts, pipes) to convey storm water through the storm water drainage system. Tinker AFB's OC-ALC Plan 19-2, *Spill Prevention and Emergency Response Plan for Hazardous and Extremely Hazardous Material and Spill Prevention Control and Countermeasures Plan* (Tinker AFB 2004), presents specific procedures for preparing for and responding to inadvertent discharges of oil or releases of hazardous substances at the base.

In 2002, Tinker AFB developed a Storm Water Pollution Prevention Plan (SWPPP) to comply with the conditions of the Multi-Section General Permit for Storm Water Discharges Associated with Industrial Activities (Permit Number GP-00-01) (Tinker AFB 2002b). The SWPPP is noted as a supporting plan in OC-ALC Plan 19-2. The SWPPP provides basewide and facility-specific best management practices (BMPs) to reduce pollutants in storm water discharges from the base. BMPs for Tinker AFB include the following:

- Source controls
- Management practices
- Preventive maintenance
- Spill prevention and response
- Erosion and sediment controls
- Identification of storm water pollution prevention personnel

3.10 Solid Waste

3.10.1 Definition of Resource

Solid wastes generally refer to discarded (i.e., abandoned or considered waste-like) materials resulting from industrial, commercial, mining and agricultural operations, and from community activities. Solid wastes that contain hazardous materials or are regulated by law (e.g., dissolved materials in domestic sewage) are excluded. Solid waste disposal facilities are discussed in this resource presentation.

Construction and demolition (C&D) waste is generally separated from other solid waste to facilitate disposal; C&D waste includes solid wastes resulting from the construction, demolition or razing of buildings, roads, and other structures. C&D recovery operations are regulated as processing facilities (where C&D waste is processed for disposal) or recycling facilities (where clean waste components [e.g., textiles, clean wood, glass, rubber, and pavement] are recycled or sold).

3.10.2 Existing Conditions

Tinker AFB currently has an Integrated Solid Waste Management Plan that details the procedures for managing solid waste on Tinker AFB. Solid waste generated on Tinker AFB is handled basewide by a private contractor; the contractor is responsible for pickup and disposal of conventional solid waste generated by routine activities on base. Solid waste is disposed of at an off-base landfill; the nearest landfill to Tinker AFB is the SE Oklahoma City landfill, located approximately 8 miles west of Tinker AFB along I-240. The SE Oklahoma City landfill accepted approximately 530,318 tons of solid waste in 2009 and has adequate capacity for several years or more of operation. Solid waste at Tinker AFB contributes negligibly to the total amount of waste accepted by the SE Oklahoma City landfill; approximately 7,055 tons of municipal solid waste was generated at Tinker AFB in 2009. C&D debris at Tinker AFB is not included in the pickup but rather is processed separately from other solid waste generated at the base. The SE Oklahoma City landfill is permitted to accept C&D waste. Yard waste at Tinker AFB is kept separate at its origin/collection point and is hauled to a site on the southern side of the base for composting.

Tinker AFB also operates a Defense Reutilization and Marketing Office to accept materials for reuse, transfer, donation, or sale, as well as accepting recyclable materials such as scrap metal

and automotive and aircraft tires (Tinker AFB 2005b). A separate recycling program for office and household wastes on Tinker AFB further reduces the solid waste stream generated on base.

3.11 Water Resources

3.11.1 Definition of Resource

Water resources analyzed in this EA include surface and groundwater resources, including the quality and availability of surface and groundwater, wetlands, and the potential for flooding. Surface water resources comprise lakes, rivers, and streams and are important for a variety of reasons including economic, ecological, recreational, and human health. Groundwater comprises the subsurface hydrologic resources of the physical environment and is an essential resource in many areas; groundwater is commonly used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition.

Wetlands are defined by the USACE and the EPA in 33 CFR 328.3(b) as follows:

> [t]hose areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. As defined in 1984, wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands provide a variety of functions, including groundwater recharge and discharge, flood flow attenuation, sediment stabilization, sediment and toxicant retention, nutrient removal and transformation, aquatic and terrestrial diversity and abundance, and uniqueness. Three criteria are necessary to define wetlands: vegetation (hydrophytes), soils (hydric), and hydrology (frequency of flooding or soil saturation). Hydrophytic vegetation is classified by the estimated probability of occurrence in wetland versus upland (nonwetland) areas throughout its distribution. Hydric soils are those that are saturated, flooded, or ponded for sufficient periods during the growing season and that develop anaerobic conditions in their upper horizons (i.e., layers). Wetland hydrology is determined by the frequency and duration of inundation and soil saturation; permanent or periodic water inundation or soil saturation is considered a significant force in wetland establishment and proliferation. Jurisdictional wetlands are those subject to regulatory authority under Section 404 of the Clean Water Act; EO 11990, *Protection of Wetlands*, requires analyses of potential wetland impacts if they are related to proposed federal actions.

Other issues relevant to water resources include watershed areas affected by existing and potential runoff and hazards associated with 100-year floodplains. Floodplains are belts of low, level ground present on one or both sides of a stream channel and are subject to either periodic or infrequent inundation by floodwater. Inundation dangers associated with floodplains have prompted federal, state, and local legislation that limits development in these areas largely to recreation and preservation activities. EO 11988, *Floodplain Management*, requires actions to

minimize flood risks and impacts. Under this order, development alternatives must be considered and building requirements must be in accordance with specific federal, state, and local floodplain regulations. The DoD has implemented storm water requirements under Section 438 (42 USC §17094) of the EISA to maintain the hydrologic functions of a site and mitigate the adverse impacts of storm water runoff from DoD construction projects. Section 438 requires federal facility projects of more than 5,000 square feet to "maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow" (DoD 2010).

3.11.2 Existing Conditions

3.11.2.1 Regional Setting

Surface Water

Oklahoma County's landforms drain into the North Canadian River, which runs west to east through the county. The northern portion of the county drains into the Crutcho Creek drainage basin and into the North Canadian River, and the southern portion drains into the Elm Creek and Hog Creek drainage basins and into the South Canadian River; both rivers are headwaters for the Arkansas River. The entire county is part of the Arkansas River Basin.

Several drainage corridors traverse Oklahoma County close to Tinker AFB, including Brock Creek, East Elm Creek, Crutcho Creek, West Hog Creek, the East Fork and West Fork of Wildhorse Creek, Bluff Creek, Walnut Creek, and Soldier Creek. Surface waters on Tinker occur in three primary drainage basins, one of which drains to the north (Crutcho Creek with Kuhlman and Soldier Creek tributaries) and two to the south (East Elm Creek and West Hog Creek) (Tinker AFB 2007).

Surface drainage at Tinker AFB occurs in three primary drainage basins: the Crutcho Creek drainage basin, Elm Creek drainage basin, and Hog Creek drainage basin. Most of the land associated with Tinker AFB is drained by the Crutcho Creek drainage basin, which flows to the north into the North Canadian River (Figure 3-7). The Elm Creek and Hog Creek drainage basins flow to the south of the base into the Little River, which forms a confluence with the South Canadian River (Tinker AFB 2007).

On-base, open-flowing waters total approximately 8 linear miles. Most base creek flows are the result of storm water runoff, though portions of the creeks are recharged from groundwater. Storm water runoff is collected by various diversion structures and discharged into surface streams (Tinker AFB 2007).

No significant point-source industrial discharges currently are made into any waterway on Tinker AFB. In 1996, the base's industrial wastewater treatment plant and sanitary treatment plant discharges were rerouted to Oklahoma City's publicly owned treatment works. This eliminated flows of 1.3 million gallons per day to the on-base portion of Soldier Creek (i.e., East Soldier Creek) (Tinker AFB 2002b).

In 2002, Tinker AFB developed a SWPPP to comply with the conditions of the Multi-Section General Permit for Storm Water Discharges Associated with Industrial Activities (Permit Number GP-00-01) (Tinker AFB 2002b). The SWPPP is noted as a supporting plan in OC-ALC Plan 19-2. The SWPPP provides basewide and facility-specific BMPs to reduce pollutants in storm water discharges from the base. BMPs for Tinker AFB include the following:

- Source controls
- Management practices
- Preventive maintenance
- Spill prevention and response
- Erosion and sediment controls
- Identification of storm water pollution prevention personnel

In addition, the DoD has implemented storm water requirements under Section 438 (42 USC §17094) of the Energy Independence and Security Act (EISA) to maintain the hydrologic functions of a site and mitigate any adverse impacts of storm water runoff generated by DoD construction projects at such a site. Section 438 requires federal facility projects exceeding 5,000 sf to "maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow" (DoD 2010).

Groundwater

The aquifers that underlie Oklahoma County include both ephemeral (short-lived) and perennial (year-round) aquifers. The most important source of potable groundwater in the Oklahoma City metropolitan area is the Central Oklahoma Aquifer system. This aquifer extends under much of central Oklahoma and includes water in the Garber sandstone and Wellington Formation, the overlying alluvium and terrace deposits, and the underlying Chase, Council Grove, and Admire groups. The Garber sandstone and the Wellington Formation portions of the Central Oklahoma Aquifer system are referred to commonly as the *Garber-Wellington Aquifer;* this is considered to be a single aquifer because these units were deposited under similar conditions. Many of the best-producing water wells in the county are in this zone. On a regional scale, the aquifer is confined above by the less permeable Hennessey Group and below by the Late Pennsylvanian Vanoss Group. The regional dip of these formations is generally to the west (Parkhurst et al. 1993). Across the county, water can sometimes be found in shallow, thin, discontinuous perched zones located above the aquifer. Most water from the Garber-Wellington Aquifer is of sufficient quality to be used for most industrial, agricultural, and domestic purposes.

Industrial operations, individual homes, farm irrigation, and small communities not served by a municipal distribution system with a surface water source depend on the Garber-Wellington Aquifer. Communities presently depending on surface supplies, such as Oklahoma City, Midwest City and Del City, maintain wells tapping the Garber-Wellington Aquifer as a backup water supply in the event of drought.

The primary subsurface water zones identified at Tinker AFB include the Hennessey water-bearing zone, the upper saturated zone (formerly the "perched" zone), the lower saturated zone (formerly the "top of regional" and "regional" aquifers), and the producing zone. Tinker AFB is located in a recharge area for these water-bearing zones; groundwater is derived primarily from precipitation and from infiltration of surface streams.

Tinker AFB lies within the recharge area of the Garber-Wellington Aquifer. Regional groundwater flow under Tinker AFB ranges in direction from west/northwest to southwest, depending on location, and has a gradient between 10 to 30 feet per mile (Tinker AFB 2007). The Hennessey water-bearing zone overlies this aquifer in the southwestern portion of the base, but it is not part of the Garber-Wellington Aquifer. Groundwater at Tinker AFB is found under either water table or confined conditions. The depth to water ranges from a few feet to about 70 feet depending on the local topography. Across Tinker AFB, water can sometimes be found in shallow, thin, discontinuous perched zones above the aquifer. However, on Tinker AFB some contaminated groundwater plumes do exist, typically at a depth of 175 feet or shallower. These plumes do not pose health concerns at this time since the producing zone at Tinker AFB (i.e., depth at which water from supply wells is obtained) is 200 feet or deeper. Also, there appears to be an aquitard, or hydraulically confining lithologic layer, at approximately 200 feet, which hydraulically separates the producing zone from shallower groundwater in the aquifer at Tinker (Tinker AFB 2007). More than 200 monitoring wells, production wells, and peizometers have been installed within a 1-mile radius of the Proposed Action as part of Tinker AFB's ERP monitoring; see Section 3.5, *Hazardous Materials and Wastes,* for a description of the ERP program.

Wetlands

Wetlands represent about 950,000 acres (approximately 2 percent) of the land area in Oklahoma (Tinker AFB 2007). Several wetlands are located in Oklahoma County; the National Wetland Inventory (NWI) maps for the area indicate that these wetlands are primarily freshwater emergent, freshwater forested/shrub, freshwater pond, and riverine (USFWS 2011a).

In 1995, approximately 65 acres of wetlands were identified on Tinker AFB by USFWS using NWI criteria; these wetlands included creeks, ponds, drainage swales, and other wet areas (Tinker AFB 2007). Of the 65 acres, 7.9 acres were later classified by the USACE as jurisdictional wetlands under the Clean Water Act. In 2002, the 65 acres of wetlands (73 wetland areas) were reassessed to track their status and trend (Tinker AFB 2007). Based on the survey, only two wetlands (i.e., the Urban Greenway and Prairie Pond) were classified as high-quality wetlands. Thirty-four were classified as being of intermediate quality, and six were classified as low quality. This study also determined that 31 of the original 73 NWI wetland areas no longer existed or were actually drainage ditches or wet-weather conveyances that did not function as wetlands or aquatic habitat and therefore were not included in the survey. These nonwetland areas covered approximately 27 acres and most were within the airfield or other highly

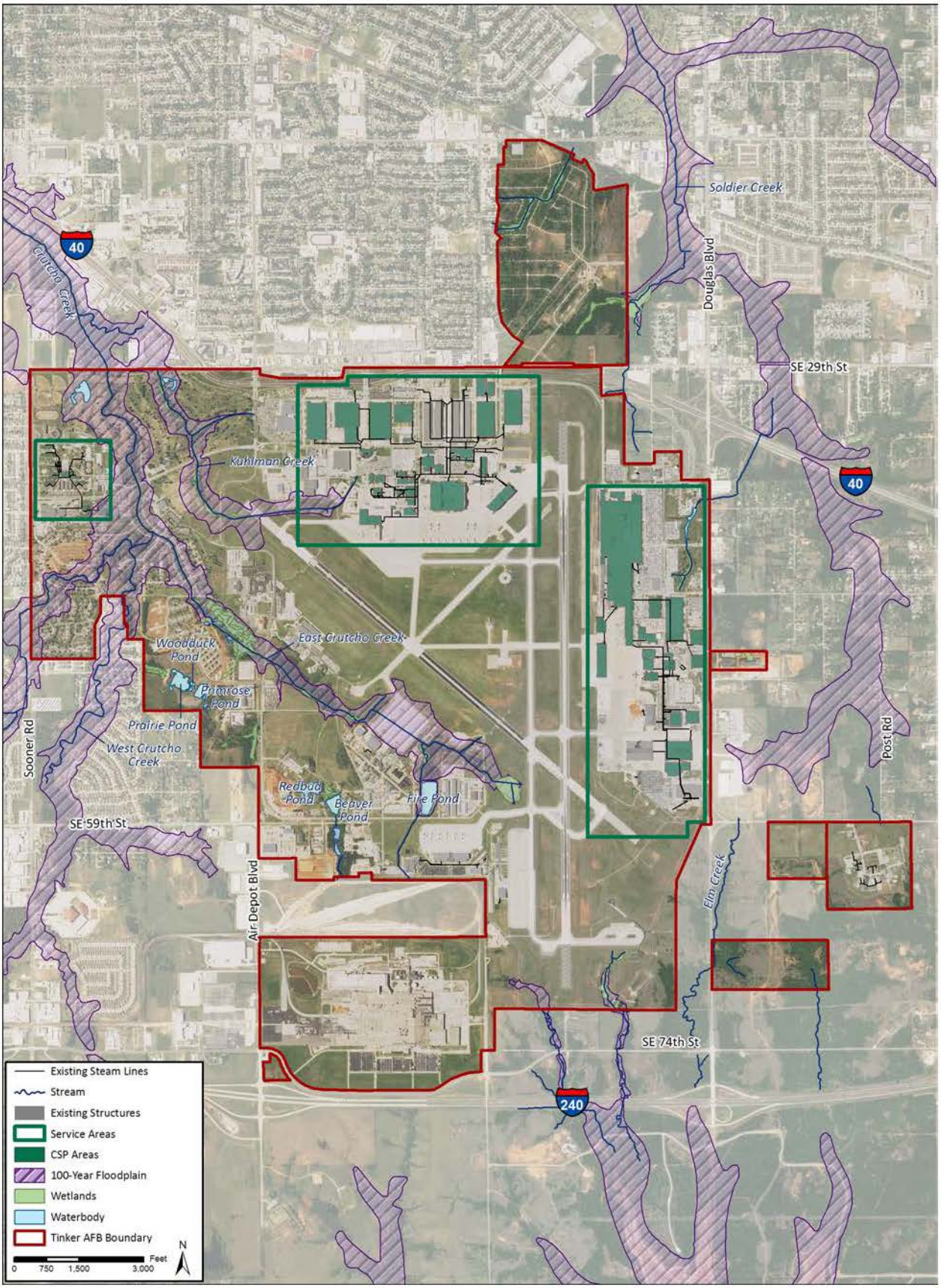


Figure 3-7. Water Resources on Tinker AFB

industrialized areas of the base. Therefore, the current total NWI acreage on Tinker AFB is estimated at 38 acres (Figure 3-7). As of 2007, these had not been officially "delisted" as wetlands by the USFWS, which conducted the original study (Tinker AFB 2007).

Floodplains

The flood hazard areas of Oklahoma County are subject to periodic inundation that results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect public health, safety, and general welfare. The bulk of 100-year and 500-year floodplains designated by the Federal Emergency Management Agency for Oklahoma County are along the North Canadian River and its major tributaries.

The Floodplain Board of Oklahoma County appoints a County Floodplain Manager who administers and implements regulations and other appropriate sections of 44 CFR 9 (National Flood Insurance Program regulations) pertaining to floodplain management. The duties and responsibilities of the floodplain board are to adopt, administer, and enforce floodplain management regulations that (a) delineate floodplains and floodways, including 100-year flood elevations, within all unincorporated areas of the county (these delineations are submitted to the Oklahoma Water Resources Board [OWRB]); (b) preserve the capacity of the floodplain to carry and discharge regional floods; (c) minimize flood hazards; and (d) regulate the use of land in the floodplain (OWRB 2011). Within incorporated areas of Oklahoma County, the city government is responsible for floodplain management. Floodplain management issues at Tinker AFB are within the jurisdiction of the city of Oklahoma City.

In October 2002, USACE, Southwestern Division-Tulsa District, completed a study for USAF to update the 100-year and 500-year floodplains at Tinker AFB. The 100-year and 500-year floodplains were reassessed for the Middle Branch, Upper Crutcho Creek (the Eastern Branch), and Upper Crutcho Creek (Western Branch) (USACE 2002). Crutcho Creek, its tributaries, and Kuhlman Creek are bounded by 100-year and 500-year floodplains. These floodplains affect approximately 121 acres of base area. The bulk of these floodplains are located along Crutcho Creek (Figure 3-7).

In general, Tinker AFB's 100-year floodplain function is poor. However, conversion of some floodplains in improved and semi-improved grounds to natural areas in recent years has helped to develop the functions of these areas. Although no specific monitoring of floodplain functions has been accomplished in the past, projects are scheduled to provide the foundational data for measuring progress towards development of healthy floodplains on Tinker AFB (Tinker AFB 2007).

3.11.2.2 Proposed Action Area

Surface Water

Areas included in the Proposed Action lie within the watershed boundary of Kuhlman Creek, East Crutcho Creek, East Soldier Creek, and Elm Creek (Figure 3-7). Installation of the proposed

natural gas pipeline (Preferred Alternative) would be in the vicinity of, but outside, Beaver Pond, north of the TACX (Figure 3-7).

Groundwater

The approximate direction of groundwater flow in the Garber-Wellington Aquifer is south and southwest across the southern half of the base and west to northwest across the northern half. Shallow groundwater may discharge into surface streams or be recharged by streams; both situations occur at Tinker AFB along Crutcho Creek and Soldier Creek. In contrast, water in the Hennessey water-bearing zone generally flows to the northeast toward Upper Crutcho Creek from higher topographic areas along the southern boundary of the base (Tinker AFB 2007). However, some water from the Hennessey water-bearing zone flows northwesterly into the main branch of Crutcho Creek. Additionally, much of the water in this zone enters Tinker AFB from the west under Sooner Road (off the Oklahoma City Anticline) and flows eastward to Crutcho Creek. On Tinker, several other stream segments are also recharged by this groundwater and flow is generally semiradial.

Wetlands

Based on data from the *Integrated Natural Resources Management Plan* (Tinker AFB 2007) and geospatial data provided by Tinker AFB, the nearest wetlands to the Proposed Action on Tinker AFB are wetlands identified by the NWI that are adjacent to the south side of Alert Road south of Runway 17/35 (Figure 3-7). According to the INRMP, these wetlands are not jurisdictional (Tinker AFB 2007). The actions included in the Preferred Alternative would occur near this wetland area. In areas near wetlands, activities associated with the Preferred Alternative would be confined to previously disturbed areas, such as existing roadway rights-of-way.

Floodplains

The proposed natural gas pipeline alignment included in the Preferred Alternative lies within the mapped floodplain of Elm Creek on the southeastern portion of the base, south of the airfield (Figure 3-7) (Tinker AFB 2007). No other portions of the Proposed Action area are within floodplains. In areas near the floodplain, activities associated with the Preferred Alternative would be confined to previously disturbed areas, such as existing roadway rights-of-way.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 4.0
ENVIRONMENTAL IMPACTS

This section evaluates the potential environmental consequences resulting from implementation of the Proposed Action and alternatives. Analyses are presented by resource area, as presented in Section 3, *Affected Environment*.

4.1 Air Quality

4.1.1 Approach to Analysis

The 1990 CAA requires that federal agency activities conform to the SIP with respect to achieving and maintaining attainment of NAAQS and addressing air quality impacts. The EPA's General Conformity Rule requires that a conformity analysis be performed that demonstrates that a Proposed Action does not (1) cause or contribute to any new violation of any NAAQS in the area, (2) interfere with provisions in the SIP for maintenance or attainment of any NAAQS, (3) increase the frequency or severity of any existing violation of NAAQS, or (4) delay timely attainment of any NAAQS, any interim emission reduction, goals, or other milestones included in the SIP for air quality. A conformity review must be performed when a federal action generates air pollutants in a region that has been designated a *nonattainment* or *maintenance* area for one or more NAAQS. *Nonattainment* areas are geographic regions where the air quality fails to meet the NAAQS. *Maintenance* areas are regions where NAAQS were exceeded in the past, and are subject to restrictions specified in a SIP-approved maintenance plan to preserve and maintain the newly regained attainment status. Provisions in the General Conformity Rule allow for exemptions from performing a conformity determination if the total net increase in emissions of individual nonattainment or maintenance area pollutants resulting from implementation of the Proposed Action fall below the significance (*de minimis*) threshold values established in 40 CFR 93.153 (b) (1) and (2).

As of 19 January 2011, the state of Oklahoma does not have any nonattainment areas for NAAQS pollutants (EPA 2011a). Additionally, the state of Oklahoma does not currently have a SIP in place for the Oklahoma City area. Therefore, a conformity analysis would not be required for this proposed action.

The air quality analysis presented below evaluates impacts based on current regulations. If regulations change prior to implementation of the Preferred Alternative, air quality impacts should be reevaluated against any new standards.

4.1.2 Impacts

4.1.2.1 Preferred Alternative

Pollutant emissions associated with implementation of the Preferred Alternative at Tinker AFB would include the following:

- Construction emissions (i.e., fugitive dust emissions) generated during ground disturbance related to the installation of new natural gas pipelines and site preparation activities related to the demolition of B2212 and B5802

- Combustion emissions from construction-related vehicles and heavy equipment used during the installation of new natural gas pipelines and site preparation activities related to the demolition of B2212 and B5802

- Operational emissions associated with the combustion byproducts resulting from the decentralization of the CSPs and installation of individual natural-gas-based heating equipment in the buildings identified under this action

Construction-related emissions would be temporary and would not last beyond completion of the Proposed Action. It is anticipated that emissions resulting from construction activities would have little to no impact on ambient air quality.

Detailed calculations used to determine construction-related and operations-related emissions are presented in Appendix C.

Construction Emissions

Dust Emissions

Under implementation of the Preferred Alternative, construction dust emissions (i.e., PM_{10}, a criteria pollutant) would be generated during construction activities. Construction activities would occur over a period of 30 months. Demolition and construction activities to install the proposed equipment and upgraded components as well as trenching of new natural gas pipeline would entail the use of various construction vehicles (e.g., bulldozers, trenchers, backhoes). Construction equipment and vehicles would be kept on site at temporary staging areas that would be relocated as construction activities advance around the base. Staging areas would generally be sited in previously disturbed or developed sites to minimize construction impacts.

Construction dust emissions can vary substantially daily depending on levels of activity, specific operations, and prevailing meteorological conditions. Based on the California Air Resources Board's Urbemis2007 emission-estimating software and assuming that slightly less than 6.0 acres of surface area (trenching and demolition of buildings) would be disturbed at any one time, the total estimated unmitigated PM_{10} emissions would be less than 0.1 pound per day. Assuming construction would take place five days per week for one year, the total estimated emissions would be 26 pounds, or conservatively 0.01 ton. The total estimated unmitigated PM_{10} emissions that potentially would be emitted during the 30-month project is approximately 0.05 ton. The 6.0-acre estimate is based on the square footage of the total disturbed area related to trenching activities associated with the installation of new natural gas pipelines and the demolition of B2212 and B5802 under the Preferred Alternative as presented in Section 2.0. It is anticipated that the construction activities under the Preferred Alternative would not involve all 6.0 acres at one time; therefore, the 0.05 ton of dust generated would occur over the term of the project.

Increased PM_{10} emissions resulting from the proposed construction activities would be negligible and any impacts would be brief. Potential impacts could be addressed proactively through standard dust minimization practices, such as watering exposed soils, stockpiling soil, and stabilizing soil. By implementing dust minimization practices, the estimated 0.05 tpy of dust generated during the term of construction activities would be further reduced, lessening impacts on local air quality. Therefore, implementation of the Preferred Alternative would result in short-term negligible impacts on local air quality.

Combustion Emissions

Combustion emissions associated with construction-related vehicles and equipment would be minimal because most vehicles would be driven to and kept at the affected site for the duration of construction activities. The Urbemis2007 emission estimating software provides default numbers and types of construction-related vehicles based on the estimated acreage disturbed during a project. Results of the analysis indicated that combustion emissions for this project would be 2.89 tpy, within *de minimis* levels. Further, as is the case with PM_{10} emissions associated with site preparation activities, emissions generated by construction equipment would be temporary. Therefore, combustion emissions would be temporary with negligible impacts on air quality under the Preferred Alternative.

It is anticipated that GHG emissions would increase during construction activities due to increased use of construction-related vehicles and equipment. GHG emissions associated with construction-related vehicles and equipment are estimated to increase by 885 tons over the duration of construction activities. The GHG emissions were estimated using the Urbemis2007 emissions-estimating software, which provides default numbers and types of construction-related vehicles based on the estimated acreage disturbed during a project. The increase in GHG emissions is directly related to the construction activities associated with the Preferred Alternative and would be temporary. Therefore, GHG emissions that result from construction-related activities would be temporary and would result in negligible impacts.

Operational Emissions

Implementation of the Preferred Alternative would result in a decrease in NAAQS criteria pollutants and GHG emissions. The majority of the long-term operational emissions associated with the Preferred Alternative would result from the following:

- Combustion of natural gas associated with the individual, decentralized boilers and other heating equipment
- Optimization of the steam boilers in B3001
- Installation of an emergency generator at B3001

Estimated PTE calculations have been completed to compare the impacts from the existing emissions at the CSPs in B208, B2212, B3001, and B5802, with the impacts for the Proposed Action. The results of this comparison are summarized in Table 4-1, and supporting documents are provided in Appendix C. The boiler information used in the PTE calculations for the current CSP steam boilers was provided by Tinker AFB representatives, and the information used to

perform the project PTE calculations was based on information received from Honeywell and provided in Section 2.0 of this document (Honeywell 2010).

Table 4-1. Estimated Reductions in Air Pollutant Emissions at Tinker AFB*

Pollutant	Current PTE Emissions of Boilers at Central Steam Plants (tpy)	Estimated PTE Emissions due to Preferred Alternative (tpy)	Estimated Net Reduction of Emissions (tpy)
PM_{10}	31.5	26.9	(4.6)
$PM_{2.5}$	31.5	26.9	(4.6)
VOC	22.8	19.6	(3.2)
NOx	1,054.3	539.4	(514.9)
SO_2	2.5	2.1	(0.4)
CO	348.7	295.1	(53.6)
HAPs**	9.3	6.6	(2.7)
CO_2	498,145.9	424,169.9	(73,976.0)

Notes: * This table is based on information provided from Tinker AFB representatives regarding the current/actual steam boiler emissions and the air quality analysis performed by AMEC Earth & Environmental, Inc. (see Appendix C).

** The HAPs reported by Tinker AFB to the DEQ are formaldehyde and hexane. Formaldehyde and hexane are being presented in this table for comparison purposes.

The estimated emissions presented in Table 4-1 indicate that the Preferred Alternative would result in a decrease in air pollutant emissions and GHGs. The data presented represent a *worst-case scenario* of PTE emissions based on the proposed equipment's maximum potential to emit pollutants into the atmosphere. It is expected that the current actual emissions would be reduced by the same percentage as the estimated PTE emissions. The following are assumptions that were used to calculate the PTE emissions:

- Each piece of natural-gas-fired heating equipment's maximum heating rating is in mBtu per hour.
- The annual operating hours of the equipment is based on year-round use (8,760 hours).

The estimated pollutant emissions under implementation of the Preferred Alternative are less than the current air pollutant emissions associated with the existing CSPs at Tinker AFB. An impact analysis was not performed because the estimated emissions result in a net reduction of air pollutant emissions across all pollutants evaluated, and emissions are not expected to exceed PSD permitting thresholds. Further, since implementation of the Preferred Alternative would reduce air emissions conformity analysis is not expected to be required even if Oklahoma County is classified as non-attainment under new regulations. Therefore, implementation of the Preferred Alternative would result in long-term beneficial operational impacts on air quality through a net reduction of air pollutant emissions.

4.1.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Air quality conditions would remain as described in Section 3.1, *Air Quality*, and Tinker AFB would continue to operate the existing inefficient, outdated, resource-intensive central steam distribution system. Reductions in air pollutant and GHG emissions that would result from the implementation of the Preferred Alternative (refer to Table 4-1) would not be achieved. Therefore, implementation of the No-Action Alternative would result in a negative impact on air quality.

4.1.2.3 Proposed Mitigation Measures and Best Management Practices (BMPs)

4.1.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse air quality impacts to below significant levels.

4.1.2.3.2 BMPs

The following BMPs, although not required to reduce impacts to less than significant levels, would be implemented in order to reduce adverse air quality impacts as a result of the Preferred Alternative. Dust control measures to be implemented during earthmoving and excavation may include the following:

- Maintain all construction equipment in good operating condition to minimize exhaust emissions.
- Ensure vehicular traffic associated with construction and operation of the readiness center remains on paved areas to the maximum extent practicable.
- Limit speed on unpaved surfaces.
- Water all excavated, graded, or unpaved areas to prevent excess dust generation.
- Minimize area of disturbance to the extent practicable.
- Revegetate as soon as possible after disturbing the soil.

4.2 Biological Resources

4.2.1 Approach to Analysis

The determination of the significance of potential impacts on biological resources is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to proposed activities, and (4) the duration of ecological ramifications. Impacts on biological resources are significant if species or habitats of foremost

concern are adversely affected over relatively large areas or disturbances cause reductions in population size or distribution of a species of high concern.

USFWS data, ODWC data, and the Tinker AFB INRMP were reviewed to determine the presence or potential occurrence of sensitive species and habitats in the study area (ODWC 2011; Tinker AFB 2007; USFWS 2011b). Potential physical impacts such as habitat loss, noise, and impacts on surface water were evaluated to assess potential impacts on biological resources resulting from implementation of the Proposed Action.

4.2.2 Impacts

No federal or state listed threatened or endangered species have been documented on Tinker AFB (USACE 1995; Tinker AFB 2007); therefore, federal or state listed threatened or endangered species for Oklahoma County have not been evaluated for potential impacts. However, several species designated as state species of special concern by the ODWC or ONHI do occur on the base and are evaluated for potential impacts in the following sections. Table 4-2 presents information on sensitive species documented at Tinker AFB and the potential of occurrence at the Proposed Action project areas.

Table 4-2. Special Status Species Potentially Occurring in the Proposed Action Area

Scientific name **(Common Name)**	**Status**	**Habitat Requirements**	**Habitat Suitability**	**Likelihood of Presence – CSP Areas and Existing Steam Lines**	**Likelihood of Presence – Proposed Natural Gas Pipeline**
Athene cunicularia (Burrowing Owl)	SS2	Grasslands, Prairie Dog Colonies	U	UN	PO
Buteo swainsoni (Swainson's Hawk)	SS2	Plains, Range, Open Hills, Sparse Trees	U	UN	PO
Lanius ludovicianus migrans[1] (Migrant Loggerhead Shrike)	SS2	Open Country with Scattered Trees, Scrub, Deserts, Roadsides	U	UN	PO
Pelecanus erythrorhynchos (American White Pelican)	S3N	Nests in Lakes and Rivers; Feeds in Shallow Lakes, Rivers, Washes; Winters in Coastal Marine Habitats; Migratory Range includes Tinker AFB	U	UN	UN
Phrynosoma cornutum (Texas Horned Lizard)	CS SS2	Semiarid Open Country with Sparse Plant Growth	U	UN	V
Tyto alba (Barn Owl)	SS2	Feeds in Grasslands; Nests in Caves, Trees, And Buildings	U	UN	UN
Penstemon oklahomensis (Oklahoma Penstemon)	S3	Prairies, Oak Savannas, Abandoned Fields, and along Roadsides	U	UN	V (Habitat Areas)

Sources: ODWC 2011; ONHI 2003, 2010; Tinker AFB 2007

Key:

Status Codes

CS Statewide closed season
SS2 State special concern category II
S3 Rare and local in Oklahoma (may be locally abundant)

Habitat Codes

U Unsuitable
N Not documented on Tinker AFB

Presence Codes

UN Unlikely
PO Possible
V Verified (in the immediate vicinity of the Proposed Action)

Notes:

State sensitive species include those species that have been documented on Tinker AFB according to INRMP (Tinker AFB 2007).
[1]Loggerhead shrikes have been documented on Tinker AFB. It is unknown whether the migrant race occurs there (Tinker AFB 2007).

4.2.2.1 Preferred Alternative

CSP Areas

Impacts on biological resources in the vicinity of the CSP areas are expected to be negligible in the short term. The CSP areas proposed for implementation of the Preferred Alternative are currently developed and paved with little to no vegetation. Vegetation that does occur in the area is highly maintained landscaping or turf grass. Wildlife habitat surrounding the CSP areas is of relatively low quality.

Implementation of the Preferred Alternative would negligibly affect wildlife species that may transit the CSP areas. These species are common and mobile; therefore, these wildlife species could easily avoid direct impacts from construction activities and forage in nearby unimproved areas. Also, activities proposed under the Preferred Alternative in the CSP areas would occur in areas already disturbed by noise and heavy activity associated with industrial, flight, and airfield operations. Wildlife inhabiting underground spaces may occur in the area; such wildlife species are likely accustomed to the existing level of noise and vibration from airfield activity.

Following construction activities, operation of the new heating distribution system would occur within buildings and would be supplied by the new underground natural gas distribution system. There would be no long-term or regular ongoing impacts on vegetation or wildlife. Therefore, no long-term impacts on wildlife associated with the portion of the steam decentralization project at the CSP areas would be anticipated under the Preferred Alternative.

Proposed Natural Gas Pipeline

Impacts on biological resources in the vicinity of the proposed natural gas pipeline are also expected to be negligible. Vegetation along most of the proposed natural gas pipeline corridor is highly maintained turf grass and is not considered to be high-value habitat for wildlife species (Tinker AFB 2007). Further, toward the southern end of the base, the proposed natural gas pipeline alignment is routed along the shoulder of Alert Road, and infrastructure development restricted to within the shoulder would limit ground-disturbing activities to previously disturbed or developed areas that are either paved, unpaved but maintained, or have typically been planted and maintained with turf grass (Figure 4-1). As such, vegetation along the proposed alignment has been previously disturbed and any wildlife that may be displaced by construction activities would be expected to easily find similar or more desirable habitat nearby.

Portions of the Alert Road right-of-way (and road shoulder) within which the proposed natural gas pipeline would be developed traverse a portion of the mapped Elm Creek floodplain and are adjacent to habitat areas identified for Texas horned lizard and Oklahoma penstemon (Figure 4-1). The roadway and shoulder do not provide suitable habitat for the Oklahoma penstemon. The portion of the project area south of the SE 59th Street alignment has been known to contain Texas horned lizard, which is a state species of concern. Installing pipeline within the road right-of-way could have an impact on Texas horned lizard or its habitat; therefore, BMPs addressing installation methods to minimize surface disturbance and on-site containment of soils and runoff would be implemented to eliminate impacts.

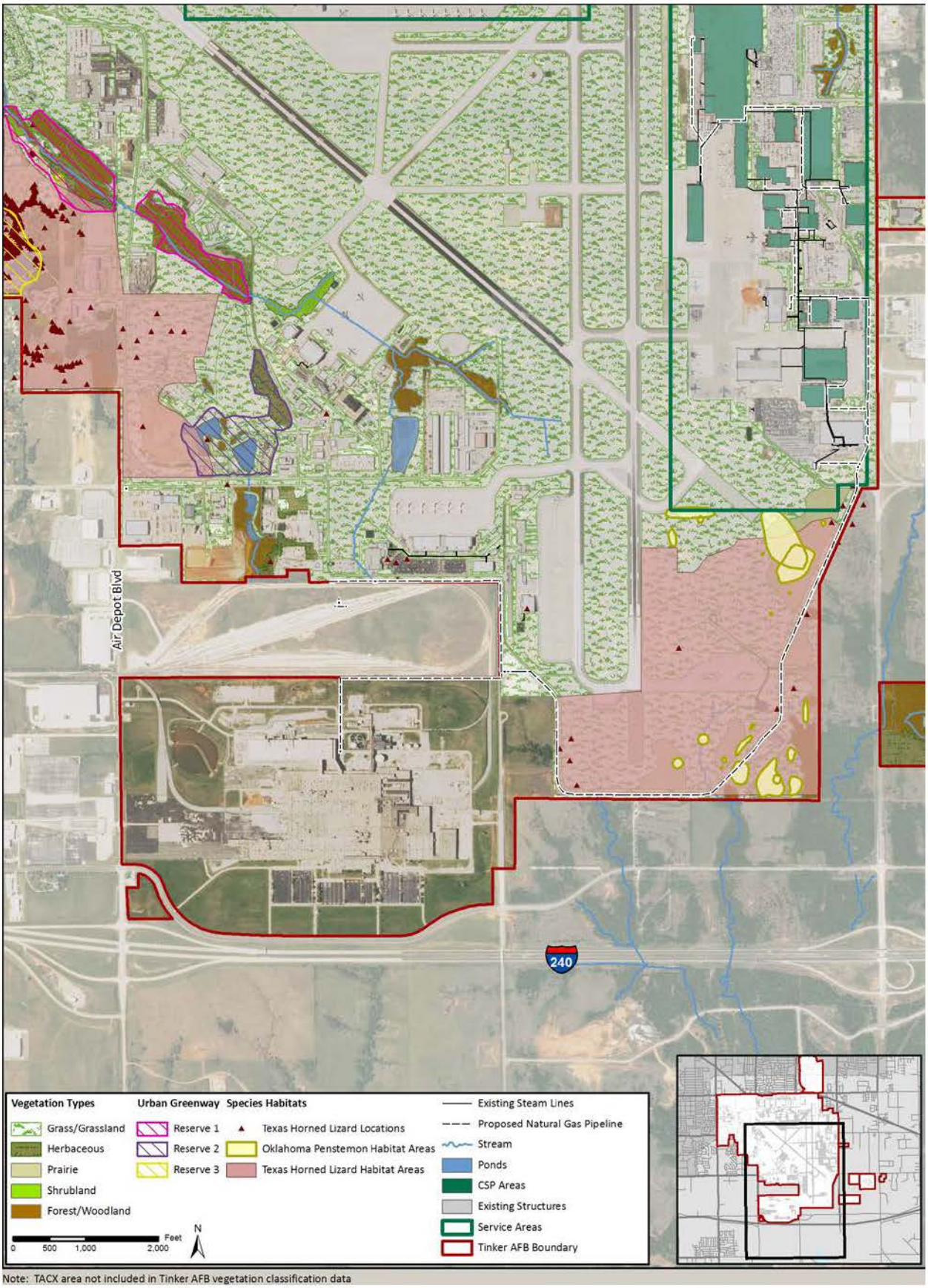


Figure 4-1. Impacts on Biological Resources

Therefore, there would be negligible impacts on vegetation and wildlife species along the proposed natural gas pipeline alignment.

Implementation of the Preferred Alternative would temporarily but negligibly affect wildlife species that may transit the area of the proposed natural gas pipeline. These species are common and mobile; therefore, these wildlife species could easily avoid direct impacts from the construction activities and forage in nearby unimproved areas. Further, the proposed natural gas pipeline would be installed in an area already disturbed by noise and heavy activity associated with industrial, flight, vehicular, and airfield operations. Wildlife inhabiting underground spaces may occur in the area; such wildlife species are likely accustomed to the existing level of noise and vibration from airfield and road activity.

Following construction activities, the natural gas pipeline would be buried near other belowground utility infrastructure and there would be no long-term or ongoing impacts on vegetation or wildlife. Operation of the new heating distribution system would be limited to mechanical rooms within individual buildings; no regular activities would occur along the natural gas pipeline. Therefore, no long-term impacts on wildlife associated with steam decentralization project along the proposed natural gas pipeline would be anticipated under the Preferred Alternative.

4.2.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Therefore, negative impacts on biological resources resulting from steam and water leakages would continue as described in Section 3.2, *Biological Resources*.

4.2.2.3 Proposed Mitigation Measures and BMPs

4.3.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce adverse cultural resources impacts to below significant levels.

4.3.2.3.2 BMPs

BMPs, although not required to reduce adverse impacts to less-than-significant levels, would be implemented in order to reduce adverse impacts on biological resources as a result of the Preferred Alternative.

- Prior to any ground-disturbing activities south of the SE 59th Street alignment, the contractor would perform a search for Texas horned lizard. In the event of a sighting, the contractor shall contact Natural Resources personnel immediately at (405) 739-7065.
- The contractor would fill holes and trenches as soon as possible to prevent potential trapping of Texas horned lizard.
- The contractor would regularly inspect holes and trenches, would avoid leaving trenches left opern overnight, and would cover holes and trenches when not in use.

- The contractor would minimize the total amount of ground disturbance and preserve vegetative covers to the amount practicable.

4.3 Cultural Resources

4.3.1 Approach to Analysis

Cultural resources are subject to review under both federal and state laws and regulations. Section 106 of the NHPA of 1966 empowers the Advisory Council on Historic Preservation to comment on federally initiated, licensed, or permitted projects affecting cultural sites listed or eligible for inclusion on the NRHP.

Once cultural resources have been identified, significance evaluation is the process by which resources are assessed relative to significance criteria for scientific or historic research, for the general public, and for traditional cultural groups. Only cultural resources determined to be significant (i.e., eligible for the NRHP) are protected under the NHPA.

A project that may alter characteristics that qualify a specific property for inclusion in the NRHP in a manner that would diminish the integrity of the property would be considered to have an adverse effect. Integrity is the ability of a property to convey its significance, based on its location, design, setting, materials, workmanship, feeling, and association. Per 36 CFR 800.5(a)(1), an adverse effects can include the following: physical destruction, damage, or alterations; relocation of the property; change in the character of the property's use or setting; introduction of incompatible visual, atmospheric, or audible elements; neglect and deterioration; transfer, lease, or sale of a historic property out of federal control without adequate preservation restrictions. These activities and the facilities' subsequent use can disturb or destroy cultural resources. Formal coordination with respect to Section 106 consultation was performed with Oklahoma SHPO and concurrence of no adverse effect was received in formal correspondence dated 7 July 2011. A copy of the SHPO correspondence is provided in Appendix D.

4.3.2 Impacts

4.3.2.1 Preferred Alternative

CSP Areas

The Preferred Alternative includes activities at and in the vicinity of several historic properties that have been determined eligible for the NRHP for their association with aircraft construction (1942 through 1946) and architectural style (Figure 4-2). The proposed activities under the Preferred Alternative would involve impacts on these buildings as presented in Table 4-3 (Honeywell 2010a; Tinker AFB 2005a).

1 **Table 4-3. Impacts on Tinker AFB Historic Buildings**

Building No.	Description	Activity
208	Steam Plant	• Demolish the inside equipment, underground fuel oil tanks, and exterior steam and condensate return piping
230	Airplane Repair Building	• Remove and cap mechanical room steam and condensate service • Remove and replace boilers and water heating systems • Install tube-type infrared natural gas heating systems • Provide a gas service entrance, including regulator, meters, piping, and accessories • Route combustion air and flue through the roof and walls
240	Flight Test Hangar/Base Operations	• Remove air handling, fan coil, and direct units and replace them with VRF systems • Install two dedicated outside air units • Replace the packaged gas split system with a condensing furnace • Install two dedicated outside air units with electric heat, direct cooling, and heat recovery • Remove steam unit heater on the southern side of the hangar • Install a new gas service entrance • Provide infrared luminous natural gas heating in the hangar • Provide gas-fired unit heaters for storage areas
3001*	Douglas Assembly Building	• Demolish existing steam turbine drives and convert to electric motors with variable frequency drives • Remove existing steam and condensate piping and cap pipes at building walls • Install new condensing economizers • Install a new boiler blowdown heat recovery system • Install a 750-kilowatt emergency generator outside the building in the cooling tower compound and install the electrical connection • Install boiler fans for the variable-frequency-drive electric motors
3105*	Paint Building	• Demolish existing steam and condensate piping and cap pipes where they enter the building • Demolish AHU-2, AHU-6, AHU-9, and AHU-11 steam-heated makeup air units and replace with direct-fired gas-makeup air units with variable frequency drives of equal size and capacity • Demolish existing AHU-12 split system and replace with a new packaged unit of equal size with direct cooling and gas heat • Replace PKG-4 cooling only with a new remote terminal unit • Install a new gas service entrance • Install infrared luminous heating in the hangar area
3113*	Woodworking Building	• Demolish existing steam, condensate, steam humidifiers, and piping, and cap pipes where they enter the building • Demolish existing AHU-1 steam coils and replace them with hot water heating coils of equal capacity • Replace AHU-4 unit with hot water and chilled water unit and install three variable air volume reheat boxes for spaces • Install a new gas service entrance • Install a new heating water system • Install two new gas-fired humidifiers to replace the existing humidifiers • Install two hot water unit heaters

2 Source: Honeywell 2010a
3 Note: *A contributing property to the Douglas Cargo Aircraft Manufacturing Historic District
4
5

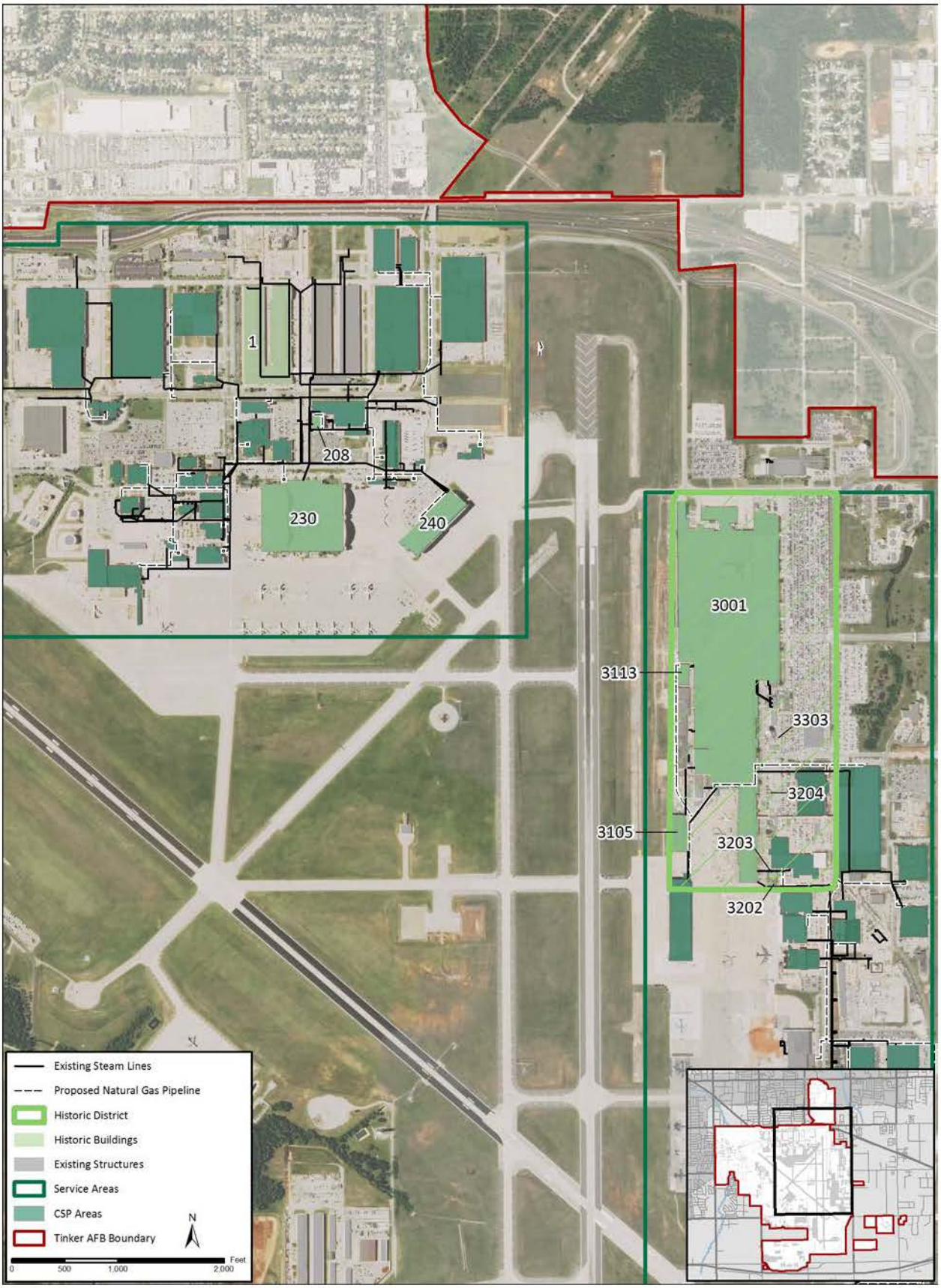


Figure 4-2. Impacts on Cultural Resources

The Preferred Alternative would result in the decentralization and decommissioning of CSP 208. At this time, the future use of this building has not been identified. Per the Secretary of the Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*, the historic property would be mothballed in accordance with *Preservation Brief 31: Mothballing Historic Buildings*. Tinker AFB has determined that the Preferred Alternative would have no adverse effect on B208, and concurrence from the SHPO was received in letter dated 28 March 2011.

In accordance with the ICRMP (Tinker AFB 2005a), modification of HVAC, plumbing, or electrical systems would have no adverse effect provided that such work would not affect the exteriors or significant interior features of NRHP-eligible buildings. Also, projects that would not impact character-defining features of NRHP-eligible buildings are considered to have no adverse effect (Tinker AFB 2005a). None of the proposed activities would either (1) affect the exteriors or (2) affect significant interior features of NRHP-eligible buildings or impact character-defining features of NRHP-eligible buildings.

Therefore implementation of the Preferred Alternative would have no adverse effect on B230, B240, B3001, B3105, and B3113, and concurrence from the SHPO of no adverse effect was received in formal correspondence dated 7 July 2011 (Appendix D).

Proposed Natural Gas Pipeline

Implementation of the Preferred Alternative would require extensive ground-disturbing activities to install the proposed additions to the natural gas pipeline distribution system. Such ground-disturbing activities would have no adverse effect on the Douglas Cargo Aircraft Manufacturing Historic District. The areas proposed for natural gas pipeline installation would occur within base property and would largely follow existing utility corridors or would be aligned in previously disturbed or developed areas. At the southern end of the base, the pipeline is proposed to follow the existing Alert Road alignment to restrict ground disturbance in previously disturbed areas (e.g., the roadway) to the extent practicable. As described above, the project would not adversely affect the historic buildings within the district. Indirect noise and visual impacts would occur during proposed construction and installation activities; however, these impacts would be localized and brief. The types of construction activities associated with the proposed project would be similar to maintenance activities routinely performed by Tinker AFB and would not be considered to have an adverse effect on the district.

The proposed project would have no adverse affect on historic properties or the cultural landscape within the district. Therefore, the Preferred Alternative would have no adverse effect on cultural resources. Concurrence from the SHPO was received in formal correspondence dated 7 July 2011 (Appendix D).

Although the likelihood of discovering significant cultural resources such as archeological deposits would be low during implementation of the Proposed Action since nearly all areas proposed for ground-disturbing activities have been previously disturbed for facilities and infrastructure development, any such inadvertent discoveries would be processed under the

Tinker AFB ICRMP, Section E.7.3, *Inadvertent Discoveries*, and the provisions of applicable law(s) such as NHPA Section 106 (36 CFR 800.13).

4.3.2.2 No-Action Alternative

Implementation of the No-Action Alternative would have no impact on cultural resources. Cultural resources in the Proposed Action area would remain as described in Section 3.3, *Cultural Resources*.

4.3.2.3 Proposed Mitigation Measures and BMPs

4.3.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce adverse cultural resources impacts to below significant levels.

4.3.2.3.2 BMPs

Although the likelihood of discovering significant cultural resources such as archeological deposits would be low during implementation of the Preferred Alternative since nearly all areas proposed for ground-disturbing activities have been previously disturbed for facilities and infrastructure development, any such inadvertent discoveries would be processed under the Tinker AFB ICRMP, Section E.7.3, *Inadvertent Discoveries*, and the provisions of applicable law(s) such as NHPA Section 106 (36 CFR 800.13).

4.4 Hazardous Materials and Wastes

4.4.1 Approach to Analysis

Numerous local, state, and federal laws regulate the storage, handling, disposal, and transportation of hazardous materials and wastes; the primary purpose of these laws is to protect public health and the environment. The significance of potential impacts associated with hazardous substances is based on their toxicity, ignitability, reactivity, and corrosivity. Impacts associated with hazardous materials and wastes would be significant if the storage, use, transportation, disposal of, or interaction with hazardous substances substantially increases the human health risk or environmental exposure.

4.4.2 Impacts

4.4.2.1 Preferred Alternative

Construction-Related Impacts

CSP Areas

Implementation of the Preferred Alternative would involve demolition and construction activities. Asbestos-containing materials and lead-based paint may be present within the

mechanical rooms and in insulation on the steam distribution pipeline. The majority of aboveground steam pipes are not likely to contain asbestos; however, asbestos may be present in insulation on underground steam supply and condensate return lines.

OSHA prohibits occupation of a work area without respiratory protection if either of the following occurs:

- The 8-hour average asbestos fiber concentration exceeds 0.1 fiber per cubic centimeter.
- A 30-minute asbestos fiber concentration exceeds 1.0 fiber per cubic centimeter.

Asbestos testing and reporting would be performed before demolition or construction activities occur; if identified, appropriate asbestos management and/or abatement plans would be prepared and followed by construction contractors during project implementation. Asbestos testing would only be required where the cutting of materials is proposed, or if an area of insulation suspected of containing asbestos is damaged or disturbed by construction activities. Regulated waste would be contained and disposed of according to all applicable standards by a licensed contractor; given the advance testing, management planning, and plan implementation, only negligible impacts related to the exposure to hazardous materials from demolition activities are anticipated.

The Preferred Alternative includes the removal and disposal of six fuel tanks and would include disposal of fuel oil contained within the tanks and identification and remediation of any contaminated soil prior to tank removal; these tanks are listed in Table 4-4. All tank removal should be performed in accordance with OCC tank removal policies and regulations, by OCC-licensed personnel, and removed and closed in accordance with OAC 165:25, OAC 165:26 and Tinker AFB Standards 0700, 0710, and 0720. Oils and refrigerants in existing chillers would be recovered and properly disposed or recycled. New chillers and VRF heat pumps would use R410A, an environmentally friendly refrigerant. Mercury-containing light bulbs, ballasts, and mercury-containing thermostats would be disposed properly and recycled in accordance with the Tinker AFB Hazardous Wastes Management program. Therefore, only negligible impacts related to the removal and disposal of hazardous materials and wastes from demolition activities are anticipated.

Table 4-4. Fuel Tank Removal

Building	No. of Tanks	Tank Type	Tank Size (gallons)
208	4	AST	18,000
2212	1	UST	40,000
5802	1	UST	12,000

Note: The oil tank at CSP 3001 would not be removed as part of the Proposed Action.

Ground disturbance within an area covered by a GWMU area would not result in exposure to contamination as long as there are no contamination plumes present. TCE plumes are present in the vicinity of B510; however, the plumes are located approximately 30 feet below ground surface, and the proposed activities would not reach the depths of the plumes. The proposed geothermal wells at B510 would form a closed-loop system and should not come into contact with TCE plumes on either side of B510 during installation or operation of the system.

Therefore, there would be no impacts on or from hazardous materials or wastes resulting from installation or operation of the ground source heat pump system.

Proposed Natural Gas Pipeline

All work is proposed to occur on base property; however, trenching for installation of the natural gas pipeline is proposed to occur next to the BNSF Railway rail line. Contaminated soils along the railway may exist; however, no soil sampling has occurred along the Tinker AFB/BNSF Railway property boundary. Conditions are currently unknown, but there have been no recorded spills or releases in this area (EPA 2011b). Due to potential contamination within the project area, the contractor shall collect four to five samples along the proposed pipeline alignment and at the proposed pipeline depth in advance of construction activities.

No natural gas storage is included as part of the proposed project and no other hazardous materials or wastes storage is included under the Preferred Alternative; therefore, there would be no impacts on or from hazardous materials or wastes along the remaining portion of the natural gas pipeline away from the Tinker AFB/BNSF Railway property boundary.

Operations-Related Impacts

Operations associated with the Preferred Alternative would not result in the generation or disposal of hazardous materials or wastes in either the CSP areas or along the proposed natural gas pipeline. Following removal of asbestos containing materials, lead-based paint, and fuel oil tanks described in the construction-related impacts would result in operations-related benefits because these removed materials would no longer be associated with operation of the system. TCE plumes are present in the vicinity of B510; however, the plumes are located approximately 30 feet below ground surface, and the proposed activities would not reach the depths of the plumes. The proposed ground source heat pump system would form a closed-loop system, and no impacts from any potential groundwater contamination are anticipated during operation of the system. Therefore, there would be no adverse impacts on or from hazardous materials or wastes during operation associated with the Preferred Alternative.

4.4.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Therefore, no impacts with regard to hazardous materials would occur and conditions would remain as described in Section 3.5, *Hazardous Materials and Wastes*.

4.4.2.3 Proposed Mitigation Measures and BMPs

4.4.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse hazardous substances/waste impacts to below significant levels.

4.4.2.3.2 BMPs

BMPs, although not required to reduce impacts to less than significant levels, would be implemented in order to reduce impacts on hazardous substances/waste as a result of the Preferred Alternative. Hazardous materials and waste control measures that would be implemented during construction activities and operation of the facility include the following:

- The contractor would collect four to five soil samples along the Tinker AFB/BNSF Railway property boundary and test for contaminants. Samples would be taken at regular intervals along the proposed pipeline alignment and at the depth of the proposed pipeline.
- All tank removal would be performed in accordance with OCC tank removal policies and regulations, by OCC-licensed personnel, and removed and closed in accordance with OAC 165:25, OAC 165:26 and Tinker AFB 0700, 0710, and 0720.
- The contractor would develop and implement a Spill Prevention, Control, and Countermeasure Plan prior to construction activities.
- The contractor would develop a plan outlining procedures for the proper handling, storage, use, disposal and cleanup of hazardous wastes and/or toxic materials.
- Potential accumulation of hazardous materials and generation of hazardous wastes during project construction would follow all applicable storage, transfer, and disposal regulations.

4.5 Safety

4.5.1 Approach to Analysis

Human health and safety are defined as the conditions, risks, and preventative measures associated with a facility and its ability to potentially affect the health and safety of facility personnel or the general public. If implementation of the Proposed Action would substantially increase the risks associated with aircraft mishap potential or flight safety relevant to the public or the environment, it would represent a significant impact. For example, if an action involved an increase in aircraft operations such that mishap potential would increase significantly, air safety would be compromised; conversely, beneficial impacts would be those reducing the potential for aircraft mishaps.

In addition, if implementation of the Proposed Action would substantially increase the risks to occupational safety, it would represent a significant impact. Beneficial impacts would include those reducing the risk of occupational safety hazards.

Further, if implementation of the Proposed Action would result in incompatible land use with regard to safety criteria such as CZs or APZs, impacts would be significant. Beneficial impacts would include those reducing incompatible land uses within CZs or APZs. Siting facilities within

established quantity-distance arcs would be considered adverse due to the risk of exposure to explosives including those resulting from blasts, fragments, or thermal hazards.

4.5.2 Impacts

4.5.2.1 Preferred Alternative

Asbestos and Lead-Based Paint

CSP Areas

Implementation of the Preferred Alternative would involve hazardous building materials. Lead-based paint may be present on surfaces, and asbestos-containing materials may be present in structures built prior to 1986 and in insulation on the steam distribution system.. Asbestos testing and reporting would be performed before demolition or construction activities occur; if identified, appropriate asbestos management and/or abatement plans would be prepared and followed by construction contractors during project implementation. Asbestos testing would focus on areas where cutting of materials is proposed. Waste would be contained, managed, and disposed according to all applicable standards by a licensed contractor; given the advance testing, management planning, and plan implementation, only negligible impacts related to the exposure to hazardous materials from demolition activities are anticipated.

Proposed Natural Gas Pipeline

Implementation of the Preferred Alternative would include installation of a natural gas pipeline. No asbestos-containing materials or lead-based paint are likely to be encountered during trenching and installation activities. Therefore, no adverse impacts resulting from exposure to hazardous materials are anticipated to result from implementation of the Preferred Alternative along the proposed natural gas pipeline.

Accident Potential Zones

CSP Areas

None of the CSP areas fall within either airfield CZs or APZs. All proposed construction activities identified in the Preferred Alternative have been designed and sited to comply with all airfield safety criteria and are consistent with guidelines established in the base's *General Plan* (Tinker AFB 2005b). No actions are proposed within airfield CZs or APZs; further, implementation of the Preferred Alternative would not result in a change in shape or shift in location of established CZs or APZs. Therefore, no adverse impacts on airfield safety would result from implementation of the Preferred Alternative in the CSP areas.

Proposed Natural Gas Pipeline

Similar to the CSP areas, all proposed pipeline activities under the Preferred Alternative have been designed and sited to comply with all airfield safety criteria and are consistent with established guidelines. The proposed pipeline is sited to cross the CZs of both runways and a portion of the APZ I for Runway 12/30. Therefore, all construction personnel involved with the

site preparation and installation of the natural gas pipeline would be required to follow the same established safety procedures currently in use for any vehicles or activities occurring within the CZ. Implementation of the Preferred Alternative would not result in a change in shape or shift in location of established CZs or APZs. Current land use incompatibilities exist within APZs I and II off Runways 17/35 and 12/30, respectively; however, no new incompatible land use would be introduced as a result of implementation of the Preferred Alternative. Activity associated with the Preferred Alternative includes trenching and installation of the natural gas pipeline, which would entail short-term construction; once installed, the pipeline would be covered and buried at existing grades and would result in no change in topography or introduction of new obstructions with either a CZ or APZ. The heights of valves and markings above ground surface associated with the pipeline would comply with airfield height restrictions. Therefore, no adverse impacts on airfield safety would result from installation of a natural gas pipeline under the Preferred Alternative.

Portions of the proposed natural gas pipeline would fall within the defined CZs. An airfield waiver is required prior to any digging or boring activities (e.g., those associated with the natural gas pipeline, steam pipeline) on the airfield. During this process, safety measures by which contractors must abide would be detailed to ensure the safety of all personnel on site. The contractor shall submit the request for an airfield waiver at least 90 days prior to the start of construction activities.

4.5.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Conditions would remain as described in Section 3.7, *Safety.*

4.5.2.3 Proposed Mitigation Measures and BMPs

4.5.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse safety impacts to below significant levels.

4.5.2.3.2 BMPs

BMPs, although not required to reduce impacts to less than significant levels, would be implemented in order to reduce impacts on safety as a result of the Preferred Alternative; these BMPs would include:

- All construction personnel involved with the implementing the Preferred Alternative would adhere to all OSHA regulations.
- An airfield waiver request would be submitted 90 days prior to any digging or boring activities.

- All construction personnel involved with the implementing the Proposed Action would adhere to airfield safety procedures currently in use for any vehicles or activities occurring within the CZ.

4.6 Socioeconomics

4.6.1 Approach to Analysis

The determination of the significance of impacts on socioeconomic conditions is based on the overall impacts on population, economic activity, and other socioeconomic attributes in the vicinity of the project site and the surrounding region (for this project, the workforce population at Tinker AFB was identified as the surrounding region). For example, potentially beneficial impacts on socioeconomic conditions could result from an action that increases short-term or long-range employment; adverse impacts would result from an action that displaces a large number of people or reduces work productivity with regard to the various units at Tinker AFB. The following sections discuss potential socioeconomic consequences of the evaluated alternatives.

4.6.2 Impacts

4.6.2.1 Preferred Alternative

Implementation of the Preferred Alternative would involve construction activities on Tinker AFB during a 30-month period. Construction phasing and traffic management planning would be developed and implemented to minimize disruption to daily base activities. Following implementation of the Preferred Alternative, the number of contract personnel required for operations and maintenance of the new system would be reduced by 30 personnel and expiring contracts would not be renewed; therefore, there would be a net decrease in contract staff due to implementation of the Preferred Alternative.

Proposed construction activities would result in a temporary increase in local employment through construction jobs and local spending for construction materials. No long-term change in spending would occur once the project is complete. Given the size of the Oklahoma City area economy as discussed in Section 3.8, *Socioeconomics*, the beneficial impacts from temporary construction employment and spending would be minor in comparison with the regional economy.

4.6.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Therefore, conditions would remain as described in Section 3.8, *Socioeconomics*.

4.6.2.3 Proposed Mitigation Measures and BMPs

4.6.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse socioeconomic impacts to below significant levels.

4.6.2.3.2 BMPs

No BMPs are recommended for socioeconomics.

4.7 Sustainability

4.7.1 Approach to Analysis

To comply with EO 13514, the project has been evaluated for its impact on the federal government's goal to reduce GHG emissions by reducing energy consumption through strategic sustainable development, energy-efficient building design, and environmentally friendly building material selection. The project alternatives have been evaluated for their adherence to the EO and the *Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding* referenced within the EO, as it pertains to identifying energy-reduction opportunities and siting considerations.

This project has also been evaluated based on the level of proposed design elements and daily operations engaged to strengthen the management of environmental, energy, and human resources. The determination of significance is based on the proposed design of the facility's construction components, including building materials, mechanical and electrical systems, and overall energy use. Impacts on sustainability and greening would occur if proposed operations did not incorporate facility design and operational measures intended to conform to EO 13514, or if they did not incorporate LEED recommendations. The following sections discuss the potential environmental consequences of the evaluated alternatives.

4.7.2 Impacts

4.7.2.1 Preferred Alternative

The Preferred Alternative provides a means for Tinker AFB to implement renewable energy alternatives to contribute towards meeting the renewable energy goals as stated in the Energy Policy Act of 2005, EO 13423, and EO 13514, as well as in 10 USC § 2911, *DoD Energy Performance Plan*.

The Preferred Alternative would include the replacement of the currently utilized centralized steam heating system. This existing system is aging and inefficient; portions of the system leak steam and condensate to the environment. The Preferred Alternative also includes the installation of a ground source heat pump system, a renewable energy resource. Therefore, implementation of the Preferred Alternative would result in long-term beneficial impacts through the

decentralization of the central steam distribution system and improvements to the efficiency and operations and maintenance of most of the heating system equipment on Tinker AFB. As such, implementation of the Preferred Alternative would contribute towards meeting mandated energy reduction goals for the USAF, reduce utility costs, and provide service in a maintenance-friendly manner.

The simple payback of the project is estimated at 13.24 years based on the utilities savings that would be generated by the project; the total term of the project payback, including finance charges, is 21 years (Honeywell 2010). Energy savings associated with the Preferred Alternative include a reduction in water consumption by 17,846,000 gallons, a reduction in electricity consumption by 6,557,523 kilowatt-hours, and a reduction in natural gas consumption by 520,662 mBtu. Therefore, implementation of the Preferred Alternative would result in long-term beneficial impacts on sustainability at Tinker AFB and the region through decreased energy and utility consumption.

4.7.2.2 No-Action Alternative

If the No-Action Alternative were selected, Tinker AFB would not implement the Proposed Action. Therefore, conditions would remain as described in Section 3.9, *Sustainability*, and Tinker AFB would continue to operate the existing inefficient, outdated, resource-intensive central steam distribution system.

4.7.2.3 Proposed Mitigation Measures and BMPs

4.7.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse sustainability impacts to below significant levels.

4.7.2.3.2 BMPs

No BMPs are recommended for sustainability.

4.8 Transportation and Circulation

4.8.1 Approach to Analysis

Potential impacts on transportation and circulation are assessed with respect to anticipated disruption or improvement of current transportation patterns and systems, deterioration or improvement of existing levels of service, and changes in existing levels of transportation safety. Beneficial or adverse impacts may arise from the physical changes to circulation (e.g., closing, rerouting, or creating roads), construction activity, introduction of construction-related traffic on local roads, or changes in daily or peak-hour traffic volumes created by the installation workforce or population changes. Adverse impacts on roadway and/ or parking capacities would be significant if roads with no history of exceeding capacity were forced to operate at or above their full design capacity.

4.8.2 Impacts

4.8.2.1 Preferred Alternative

Temporary impacts on transportation and circulation would be expected during the construction activities associated with implementation of the Preferred Alternative. Construction activities are expected to occur during a 30-month period and would include construction-related traffic, equipment staging, and vehicle staging. Staging would occur in previously developed or disturbed areas and may include parking lots. Impacts to parking at construction locations would be temporary at each location and would not last beyond completion of the construction activities.

Steam and gas pipeline construction/removal would also occur within or across existing road alignments; however, impacts would be minimized by standard traffic management planning. In the event that rerouting of traffic is required as a result of the Proposed Action, the contractor would consult with Tinker Support Services traffic engineering management (Randon Rieger [405] 734-2868) to address circulation and traffic flow. Further, based on the temporary nature of pipeline installation along existing road alignments, such impacts would be temporary at each location and would not last beyond completion of the construction activities. Impacts from construction activities are not anticipated to have a significant increase in traffic volume onto and off Tinker AFB, and they would have a negligible impact on area circulation.

No long-term traffic or additional parking needs would be required during operation and maintenance of the decentralized steam distribution system once operational; hence, no long-term impacts to transportation and circulation would occur.

4.8.2.2 No-Action Alternative

If the No-Action Alternative were selected, no construction or renovation activities would occur. Furthermore, there would be no changes in transportation, parking, or circulation; therefore, conditions would remain as described in Section 3.10, *Transportation and Circulation,* and no impacts would occur.

4.8.2.3 Proposed Mitigation Measures and BMPs

4.8.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse transportation and circulation impacts to below significant levels.

4.8.2.3.2 BMPs

BMPs, although not required to reduce adverse impacts to less than significant levels, would be implemented in order to reduce adverse impacts on transportation and circulation as a result of implementation of the Preferred Alternative. In the event that rerouting of traffic is required as a result of the Proposed Action, the contractor would consult with Tinker Support Services traffic

engineering management (Randon Rieger [405] 734-2868) to address circulation and traffic flow.

4.9 Utilities and Infrastructure

4.9.1 Approach to Analysis

A project adversely impacts local or regional infrastructure if its implementation increases utility demand beyond the carrying capacity of existing systems. Infrastructure is significantly impacted if the project results in an increase in demand on public utilities that exceeds available supply and requires the construction of additional or substantial expansion to existing utility systems. Potential impacts on utilities are assessed with respect to anticipated disruption, deterioration, or improvement of services. Beneficial or adverse impacts may arise from physical changes to utility systems or changes in daily or peak-hour use. Adverse impacts on utilities are significant if a proposed action creates a demand for utility services at or above their design service capacity.

4.9.2 Impacts

4.9.2.1 Preferred Alternative

The Preferred Alternative would include the decommissioning of the existing centralized steam heating system within the CSP 208 and 5802 areas, and decentralizing and optimization of the CSP 2000/3000 and buildings served by this CSP. The removal of CSPs would result in the loss of backup fuel capability that currently exists with the CSP system as well as the backup fuel tanks. However, the Preferred Alternative would include the installation of additional natural gas pipeline to complete a closed gas pipeline loop to provide energy-source redundancy on Tinker AFB; therefore, base energy security would be improved under this alternative.

Additionally, the Preferred Alternative would replace the existing centralized steam heating system, which has approached the end of its useful life cycle. Boilers would be connected to the existing water supply and would have backflow prevention installed. The proposed system is an efficient system that would result in decreased net water consumption at Tinker AFB as compared to the existing system. Belowground steam and condensate return piping would be drained under the Preferred Alternative; significant quantities of residual liquid are not expected to occur. Further, such residual liquid is not considered hazardous; nevertheless, it would be processed via the industrial wastewater treatment plant on base. The Preferred Alternative would have no impact on the wastewater, or potable water services currently available at Tinker AFB.

Electrical service would be temporarily disrupted during implementation of the Preferred Alternative during scheduled electrical shutdowns to connect new equipment to the existing electrical services. Per Tinker AFB's Standard 0700, the contractor would schedule and coordinate a shutdown of electrical services through written notice at least 21 days prior to installation to minimize the impact of the electrical shutdown. To minimize the inconvenience to

building occupants, the contractor would install boilers during summer months and chillers during winter months as the schedule permits.

No natural gas storage is included as part of the proposed project, and the proposed additional gas pipeline would form a closed gas pipeline loop, which allows sections of the line to be shut down for maintenance and other services without shutting down the entire pipeline distribution system. Engineering design and siting of proposed alignments of the natural gas pipeline system have been performed to ensure that installation of the system would not affect existing underground or surface infrastructure at the base. Operation of the system would not create a demand for utility services at or above the facility's design service capacity; therefore, the Preferred Alternative would result in a beneficial impact on current utility demands.

4.9.2.2 No-Action Alternative

If the No-Action Alternative were selected, the Proposed Action would not be implemented and no changes to utilities and infrastructure would occur. Therefore, conditions would continue as described in Sections 3.11, *Utilities and Infrastructure,* and Tinker AFB would continue to operate the existing inefficient, outdated, resource-intensive central steam distribution system.

4.9.2.3 Proposed Mitigation Measures and BMPs

4.9.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse utilities and infrastructure impacts to below significant levels.

4.9.2.3.2 BMPs

No BMPs are recommended for utilities and infrastructure.

4.10 Solid Waste

4.10.1 Approach to Analysis

A project may adversely impact solid waste management and infrastructure if its implementation increases demand for solid waste collection, conveyance, and disposal systems or solid waste processing facilities beyond the carrying capacity of existing systems. Infrastructure is significantly impacted if the project results in an increase in demand on solid waste facilities that exceeds available capacity and requires the development of additional or substantial expansion to existing solid waste facilities. Potential impacts on or resulting from solid waste are assessed with respect to anticipated disruption, deterioration, or improvement of solid waste generation and services. Beneficial or adverse impacts may arise from physical changes to solid waste systems or changes in temporal use. Adverse impacts on or resulting from solid waste facilities are significant if a proposed action creates a demand for solid waste facilities or generates solid waste at or above the designed service capacity.

4.10.2 Impacts

4.10.2.1 Preferred Alternative

The Preferred Alternative would include decommissioning of the existing centralized steam heating system within the CSP 208 and 5802 areas, and decentralizing and optimization of the CSP 2000/3000 and buildings served by this CSP. The decommissioning and decentralization of CSPs and associated equipment would generate solid waste, C&D waste, and recyclable materials; such materials would be processed in accordance with the Tinker AFB Integrated Solid Waste Management Plan. The removal of CSP equipment (e.g., boilers and associated steam heating equipment) would generate large amounts of recyclable metal waste at the base over the duration of the project; such recyclable metal waste would be processed by the Defense Reutilization and Marketing Office. A large portion of the waste generated by the Proposed Action would comprise C&D debris, and may include asbestos-containing materials that may be encountered (asbestos-containing materials are discussed further in Section 4.5, *Hazardous Materials and Wastes*). Equipment determined or suspected of containing asbestos materials would have the materials abated prior to disposition for recycling or re-use. Coordination with offices and programs on Tinker AFB that manage waste recycling and C&D debris would occur prior to construction to ensure that all wastes generated during the Proposed Action are managed appropriately and in accordance with defined procedures. Collection, conveyance, and disposal of solid waste generated by implementation of the Preferred Alternative would be conducted in a manner similar to currently exists; routes traveled by trucks hauling waste to landfills would be accustomed to such traffic and no significant increase in traffic would be anticipated as a result. Given that Tinker AFB currently has an Integrated Solid Waste Management Plan that includes processing, disposal, or recycling of materials as appropriate, is not facing a shortage of space to dispose of C&D debris, and nearby landfills have adequate landfill space for continued long-term operations, implementation of the Preferred Alternative would result in no impact to solid waste management at Tinker AFB. Further, the amount of waste generated by the Proposed Action would comprise a small portion of the total solid waste generated at Tinker AFB, and would only be generated during the 30-month project duration, following which no additional solid waste beyond the amount currently generated would result as part of operations and maintenance of the new heating system.

4.10.2.2 No-Action Alternative

If the No-Action Alternative were selected, the Proposed Action would not be implemented and no changes to the existing generation and processing of solid waste or C&D debris would occur. Therefore, conditions would continue as described in Section 3.12, *Solid Waste*.

4.10.2.3 Proposed Mitigation Measures and BMPs

4.10.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse solid waste impacts to below significant levels.

4.10.2.3.2 BMPs

No BMPs are recommended for solid waste.

4.11 Water Resources

4.11.1 Approach to Analysis

Significance criteria for water resources impacts are based on water availability, quality, and use; existence of floodplains; and associated regulations. An impact on water resources would be significant if it would (1) reduce water availability to or interfere with the supply of existing users, (2) create or contribute to overdraft of groundwater basins or exceed safe annual yield of water supply sources, (3) adversely affect water quality or endanger public health by creating or worsening adverse health hazard conditions, (4) threaten or damage unique hydrologic characteristics, or (5) violate established laws or regulations that have been adopted to protect or manage water resources of an area including wetlands. Impacts of flood hazards on preferred alternatives are significant if such actions are proposed in areas with high probabilities of flooding.

4.11.2 Impacts

4.11.2.1 Preferred Alternative

Surface Water

CSP Areas

Implementation of the Preferred Alternative would involve ground-disturbing activities, including site grading. This would increase the potential for soil erosion during construction; however, due to the distance from the proposed project sites to East Crutcho Creek, East Soldier Creek, and Kuhlman Creek, it is unlikely that adverse impacts on surface water quality (e.g., silt-laden runoff discharge into the creek) would result from implementation of the Preferred Alternative (Figure 4-3). Potential impacts would be minimized throughout the proposed project area through implementation of existing nonpoint pollution requirements and spill prevention and response procedures. A Storm Water General Permit for Construction Activities (Permit No. OKR10), issued by DEQ, would be required. In addition, implementation of BMPs—such as silt fencing and vegetation-based erosion control measures—would minimize construction impacts. Long-term operations of the system would not affect surface water; therefore, under

implementation of the Preferred Alternative, no long-term adverse impacts on surface water resources are anticipated in the CSP areas.

Proposed Natural Gas Pipeline

Installation of a natural gas pipeline is proposed along Alert Road through a floodplain of a tributary to Elm Creek (Figure 4-3). Installation of the natural gas pipeline would occur in a previously developed area along Alert Road and an existing utility corridor. Similar to that described for the CSP areas, potential construction impacts on surface waters would be minimized throughout the proposed natural gas pipeline installation area through implementation of existing nonpoint pollution requirements, spill prevention and response procedures, and BMPs. Long-term operation of the system would not affect surface water; therefore, under implementation of the Preferred Alternative, no long-term adverse impacts on surface water resources are anticipated along the proposed natural gas pipeline.

Groundwater

CSP Areas

It is unlikely that groundwater quality would be adversely affected by the Preferred Alternative, assuming required controls for the handling of hazardous materials and spill prevention and cleanup are implemented properly.

Implementation of the Preferred Alternative would result in a negligible increase in impermeable surfaces from the installation of new concrete equipment pads. Further, the Preferred Alternative would not be a major water user or wastewater generator. A ground source heat pump and geothermal well field, consisting of ten 300-foot-deep wells with a separation distance of 20 feet, are proposed for installation in the vicinity of B510. The project site does not overlie an identified groundwater recharge zone of special significance, and the footprint of facility development is negligible with regard to groundwater area below the region. Groundwater monitoring wells would not be affected. Therefore, implementation of the Preferred Alternative would result in negligible impacts on groundwater resources in the CSP areas.

Proposed Natural Gas Pipeline

The increase in impermeable surfaces that would result from implementation of the Preferred Alternative would be negligible given that only a minor segment of new gas pipeline is being proposed; further, these new pipeline alignments would be buried and resurfaced/covered with materials that are the same as existing surface cover (e.g., asphalt, turf grass). The resultant negligible change in impermeable surfaces associated with the Preferred Alternative is not expected to result in a reduction of groundwater aquifer recharge capacity. Therefore, implementation of the Preferred Alternative would result in negligible impacts on groundwater resources along the proposed natural gas pipeline.

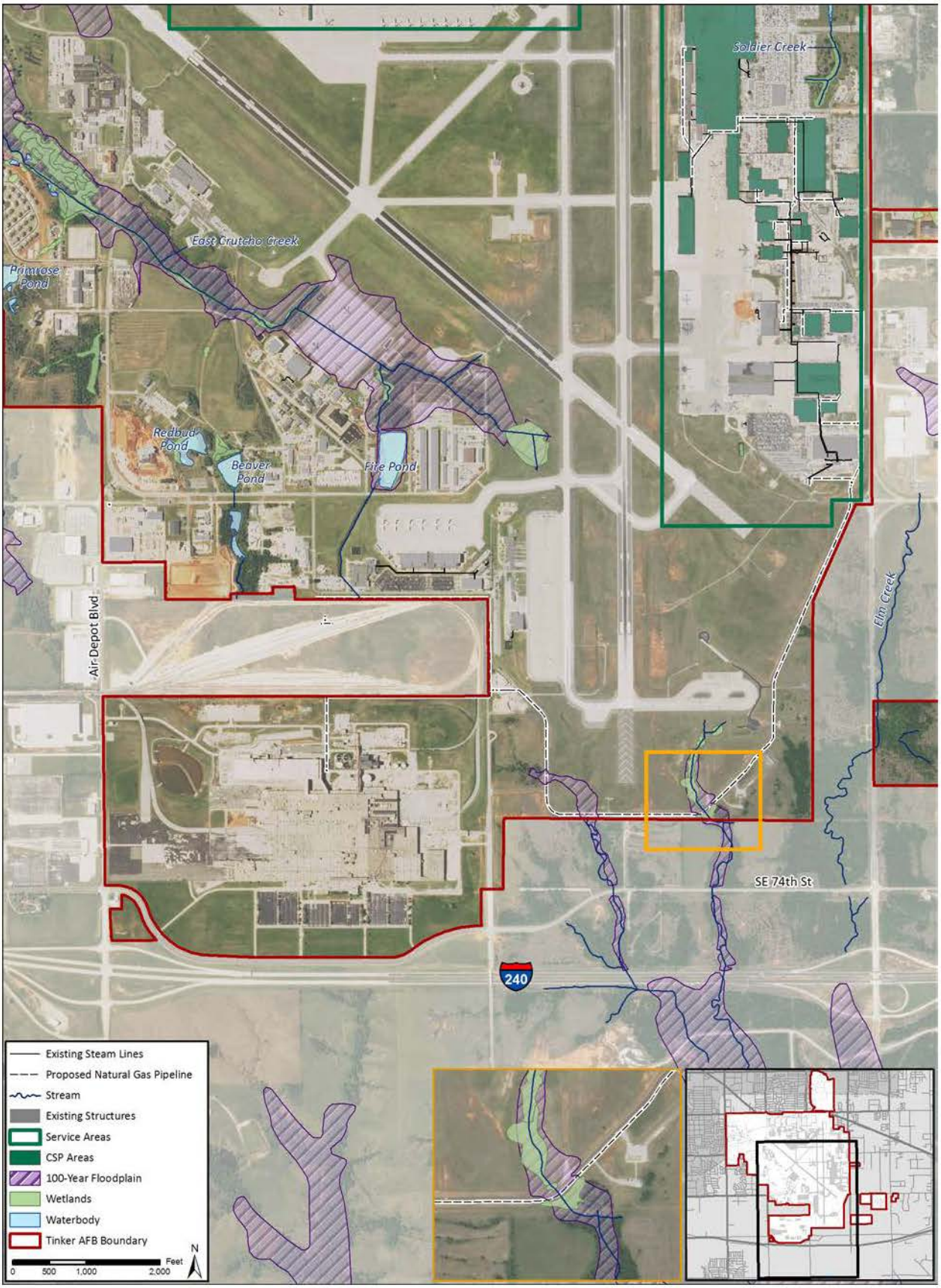


Figure 4-3. Impacts on Water Resources

Wetlands

CSP Areas

No wetlands exist at or adjacent to the location of the Preferred Alternative's CSP areas (Figure 4-3) (Tinker AFB 2007). Due to the distance from the proposed project site to wetlands along East Soldier Creek, Kuhlman Creek, and East Crutcho Creek, it is unlikely that adverse impacts on wetlands (e.g., silt-laden runoff discharge into wetland areas) would result from implementation of the Preferred Alternative. Therefore, implementation of the Preferred Alternative would have no effect on wetland resources in the CSP areas.

Proposed Natural Gas Pipeline

No jurisdictional wetlands exist at or adjacent to the location of the proposed natural gas pipeline installation under the Preferred Alternative (Figure 4-3) (Tinker AFB 2007). However, a fringe wetland along a tributary of Elm Creek has been located by the NWI; installation of the natural gas pipeline is proposed along Alert Road adjacent to this fringe wetland (Figure 4-3). This fringe wetland is not considered to be jurisdictional (Tinker AFB 2007). Installation of the natural gas pipeline would occur along the existing Alert Road in a previously developed area along an existing utility corridor and would utilize BMPs to minimize potential impacts on surface water and wetlands. Installation activities would be temporary; following installation, the alignment would be buried and covered with materials similar to those currently existing. Potential impacts would be minimized through implementation of existing nonpoint pollution requirements and spill prevention and response procedures. Therefore, construction of the Preferred Alternative would have a temporary negligible effect on wetland resources; no permanent impacts on wetlands would occur (Figure 4-3).

Floodplains

CSP Areas

No floodplains exist at or adjacent to the location of the Preferred Alternative's CSP areas (Figure 4-3) (Tinker AFB 2007). Due to the distance from the proposed project sites to East Crutcho Creek, East Soldier Creek, and Kuhlman Creek and the minimal ground-disturbing activities proposed, no floodplains of these creeks would be impacted by construction activities. Therefore, implementation of the Preferred Alternative would have no impact on floodplains in the CSP areas.

Natural Gas Pipeline

A portion of the mapped Elm Creek floodplain exists within the southern limits of the proposed natural gas pipeline alignment under the Preferred Alternative (Figure 4-3). The proposed installation of the natural gas pipeline would result in temporary construction impacts during the trenching of soils, placement of pipeline, and replacement of displaced soil and turf. As proposed, the project should not result in any change in the elevation, function, or capacity of the existing floodplain, since activities would only involve short-term installation of an underground natural gas pipe; following installation, the pipe would be buried and the ground surface would be returned to its current conditions (e.g., elevation, topography, ground cover). Therefore,

implementation of the Preferred Alternative would have temporary negligible impacts on the Elm Creek floodplain along the proposed natural gas pipeline route; no permanent impacts would occur.

4.11.2.2 No-Action Alternative

If the No-Action Alternative were selected, proposed construction activities would not be implemented and water resources conditions would remain unchanged from their current status, as described in Section 3.13, *Water Resources*. Selection of the No-Action Alternative would result in the continuation of leaking steam and condensate return pipe and the resultant negative impacts on surface water resources on Tinker AFB.

4.11.2.3 Mitigation Measures and BMPs

4.11.2.3.1 Mitigation Measures

No mitigation measures would be necessary to reduce any adverse water resources impacts to below significant levels.

4.11.2.3.2 BMPs

BMPs, although not required to reduce adverse impacts to less-than-significant levels, would be implemented in order to reduce adverse impacts on water resources as a result of the Preferred Alternative. The SWPPP provides base-wide and facility-specific BMPs to reduce pollutants in storm water discharges from the base. The contractor would control storm water and wastewater during construction activities by implementing the following measures:

- Obtain Storm Water General Permit for Construction Activities – Permit No. OKR10 issued by DEQ.
- Provide temporary collection and containment systems for domestic and industrial wastewater during the construction phase of the project in the form of portable toilets, designated concrete washout containment facilities, and similar practices as needed.
- Prepare and implement a SWPPP in compliance with the EPA's NPDES CGP for the duration of the soil-disturbing activities during the construction phase of the Preferred Alternative.
- Minimize the total amount of ground disturbance and preserve vegetative cover to the amount practicable.
- Install silt fence, compost berms, or filter socks or other similar measures for managing storm water runoff.
- Limit construction staging areas to areas of disturbance.
- Service and refuel equipment away from streams, and ensure all chemicals and petroleum products are stored and contained away from water sources.

SECTION 5.0
CUMULATIVE IMPACTS

Cumulative impacts on environmental resources result from incremental impacts of the Proposed Action when combined with other past, present, and reasonably foreseeable future projects in an affected area. Cumulative impacts can result from minor but collectively substantial actions undertaken over a period of time by various agencies (federal, state, or local) or persons. In accordance with NEPA, the cumulative impacts resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the near future are discussed below.

Projects occurring on Tinker AFB and in the vicinity of Tinker AFB are included in Table 5-1.

Table 5-1. Projects Occurring at or near Tinker AFB

Project	Project Description
Henry Twaddle Facility Acquisition	The U.S. Army Reserve's 95th Division (Institutional Training) would move to Fort Sill, Oklahoma. The division is currently based at the Major General Harry Twaddle U.S. Armed Forces Reserve Center in Oklahoma City. The 152,000 sf reserve center would be acquired by Tinker AFB.
Demolition of B3108	B3108 is scheduled for demolition in plans currently under development. The demolition would take place over the course of a 5- to 10-year period.
Construct Depot Maintenance, Reengineering, and Transformation of a Three-Bay Multi-Aircraft Hangar	This project involves the construction of a three-bay, multi-aircraft fuel-capable hangar sized for KC-135, E-3, B-1, B-52 and KC-X (next generation) tanker aircraft. The facility is proposed for construction west of B2280, which is located on the industrial eastern side of the base. The new facility is required as part of the programmed depot maintenance for KC-135. Workload and repairs for this aircraft take place in three separate facilities that are inadequate in size. The new hangar is required to adequately address these issues and also to consolidate workload and function, improving efficiency.
Construct Air Traffic Control Tower	Construction of this new 11-story air traffic control tower is to include reinforced concrete piers; a control tower cab with tinted, double-glazed windows; an elevator; a flight command and administrative area; and a supervision and simulation training area, as well as fire protection, utilities, backup power, lighting protection, access road, and any other necessary support for a complete and useable facility. The project is to include minimum DoD antiterrorism/force protection requirements and demolition of the existing control tower and access road.
Construct Medical Clinic	This project involves construction of a new medical clinic, covering approximately 172,000 sf, in the open land area northeast of Gott Gate. The new facility would replace the existing clinic and would result in the demolition of the central plant, which contains both the chillers and boilers that service the clinic. Demolition of the boiler would also result in the decommissioning of an underground diesel storage tank. This proposed project would also include a medical squadron building as well as a war readiness materials warehouse. The new clinic would house doctors' offices, exam and treatment rooms, laboratories, radiology, pharmacy, dental clinic, conference and training rooms, and storage areas. The

1 **Table 5-1. Projects Occurring at or near Tinker AFB (Continued)**

Project	Project Description
Construct Medical Clinic (Continued)	energy sources to operate the new boilers would include a combination of diesel fuel, stored in ASTs, and natural gas. The existing medical clinic (approximately 184,000 sf) and TRICARE facility (B5803) would be demolished upon completion of the new facilities.
507th Base Realignment and Closure Action	As recommended by Base Realignment and Closure Act, the following actions would take place: • The relocation of operations and maintenance personnel associated with the 137th Air Wing (AW) of the Air National Guard from Will Rogers Air Guard Station to Tinker AFB, where the 137th AW would become an associative wing, operating with the 507th Air Refueling Wing of the Air Force Reserve Command. Although the 137th AW currently operates eight C-130 cargo aircraft, those aircraft would not follow the 137th AW to Tinker AFB but rather would be relocated to Pope AFB in Fayetteville, North Carolina. • The transfer of four KC-135R aircraft from the 939th Air Reserve Wing from Portland International Airport Air Guard Station to Tinker AFB. • The demolition and construction of facilities to support the additional personnel and aircraft. To implement the Base Realignment and Closure Act, Tinker AFB has proposed the following: • Construction of Air Force Reserve Command and Air National Guard squadron operations, operations support squadron, life support storage, and life support work area • Construction of a new hangar with hangar access and associated demolition of B1037 and B1041, which would also correct a current deficiency at Tinker AFB • Renovation of B1048
Construct Physical Fitness Center	This project involves construction of a 90,900 sf facility in the vicinity of Vance Gate along the western side of the base. Construction of the facility would consist of a physical fitness center that would include a health and wellness center, a cardiovascular room, an equipment and free weight room, exercise rooms, racquetball rooms, an indoor track, an Olympic-sized pool, a children's play area, two full basketball courts, and locker rooms as well as men and women's restrooms. This project would also include demolition of B5922, B5937, B5927, B5916, B5915, B5924, B5920, B6004, and B216.
Child Development Center	This project would comprise a new 32,877 sf child development center in the southwestern portion of the base, north of SE 59th Street and northwest of Gott Gate in the South Forty Area. The Preferred Alternative would be located approximately 375 feet west of Air Depot Road and approximately 100 feet north of the base fence line. Approximately 130 feet of the Urban Greenway Multiuse Trail would be removed and rerouted as a result. The new child development center would provide for the care and training of dependent children of both military and civilian personnel assigned to the base. The building would contain areas for child activities, staff support, facility support, core administration, and maintenance. A total of 2.1 acres of land would be required surrounding the facility.

2

3

1 **Table 5-1. Projects Occurring at or near Tinker AFB (Continued)**

Project	Project Description
Consolidated Security Forces, South Forty Development	This project is to construct a new 64,000 sf facility on the southern side of the base to relocate and consolidate key Security Police operations at a single facility. Having one centralized facility would reduce the response time for various situations.
Military Family Housing Privatization	This project entails USAF implementation of the privatization initiative, which involves leasing of all housing areas to a private developer for 50 years. The USAF would also convey all 694 existing military units to the developer and, depending on the alternative selected, the developer would build 660 housing units using a combination of demolition, renovation, and/or construction. Once privatization is implemented, the developer would own, operate, and manager all housing units on the installation while leasing the land underlying the housing communities (approximately 224 acres) for 50 years. Depending on the developer, there would be a combination of demolition, renovation, and new construction distributed throughout the military family housing areas. Included would be alternatives to desired community features such as a sound protection buffer along Sooner Road, lighted tennis and basketball courts, and an outdoor fitness area.
Realignment of Air Depot Boulevard and Tinker Gate	Relocation of Air Depot Road/Tinker Gate is occurring on the western side of the base. This relocation is required to provide an adequate and secure base entry, as the existing roadway alignment poses a safety issue and does not meet security requirements Relocation would alleviate current hazardous traffic congestion and would maintain the base perimeter security.
Vance Gate Relocation	The relocation, reconfiguration, and upgraded improvements proposed for the Vance Gate would provide an adequate and secure base entry control facility compliant with antiterrorism/force protection requirements. Proposed relocation would alleviate on- and off-base traffic congestion and related traffic safety issues along Sooner Road and improve both perimeter and internal security of Tinker AFB.
B230 Repair and Renovation	The repair and renovation of the Airborne Warning and Control System Maintenance Group Complex (B230) would provide an improved maintenance facility that would enable the facilities in B230 to accommodate existing and future workload in an efficient, safe, maintenance-friendly, and energy-efficient manner.
Maintenance, Repair, and Overhaul Technology Center	The acquisition of the Maintenance, Repair, and Overhaul Technology Center would secure workload capacity for the 76th Aircraft Maintenance Group's aircraft maintenance and modification. The center is located east of Tinker AFB and is bordered by Douglas Boulevard on the west and SE 59th Street on the south.
Large Engine Test Cell Construction	The USAF proposes to construct a large engine test cell to accommodate anticipated increased engine-testing operations as well as to accommodate large engines. Construction of a new large engine test cell is proposed in the vicinity of B9001 in the TACX.
Renovate Chemical Cleaning Line in B3001	Renovations are proposed for the chemical cleaning line in B3001 to replace the existing aging cleaning line with an improved, energy-efficient, cleaning line system capable of accommodating larger engine parts in addition to current workload. Proposed renovations would also result in a cleaning line that is safer to

2

3

Table 5-1. Projects Occurring at or near Tinker AFB (Continued)

Project	Project Description
Renovate Chemical Cleaning Line in B3001 (Continued)	operate, produces less chemical waste, and generates less water to be treated by the industrial wastewater treatment plant on base. The proposed improvements are anticipated to yield an annual savings of $2.76 million in utility costs.
Construct T9 Test Cell at Tinker Aerospace Complex (TACX)	Construction of a new T9 noise suppression system (test cell) is required to be constructed at the TACX. This project would include a T-9 style engine testing facility, jet engine fuel storage and delivery system, utilities, building, and access driveways and parking. These facilities would allow continuous support of military jet engine repair performed at TACX, as well as enabling the 76th Maintenance Wing and 76th Propulsion Maintenance Group to meet their mission requirements of delivering engines on time and on cost. The T9 test cell would also provide temporary backup in case of failure of other engine-testing facilities on Tinker AFB.
Retrofit Boilers and Install Landfill Gas Generation Serving TACX Facility	A landfill gas project is proposed for the TACX, where a landfill gas pipeline is currently in place. The project would retrofit boilers and install landfill gas generation serving TACX. The project would allow landfill gas to be used in addition to natural gas at the TACX to provide for the heating requirements of TACX facilities. Boilers at TACX would be retrofitted to use landfill gas as well as natural gas to generate heat for the facility.

The projects listed in Table 5-1 are planned for construction roughly when the Proposed Action would be implemented. Consequently, the potential exists for cumulative environmental impacts to occur with regard to air quality, traffic, solid waste, and water quality.

Implementation of the Preferred Alternative would result in a decrease in air quality emissions, and would not contribute to the cumulative air quality impacts when compared to projects identified above. Cumulative air quality effects are expected to result from the projects identified above, as projects such as the Large Engine Test Cell and Landfill Gas Generation would result in an increase in air emissions. Cumulative air quality impacts would be controlled through the implementation of BMPs to reduce air emissions below significance thresholds and modifications to the existing Title V permit.

With regard to traffic and circulation, if projects occur concurrently, short-term impacts on traffic caused by additional construction equipment and construction workers traveling along surrounding roadways could potentially cause a short-term, adverse cumulative impact during peak traffic hours. Traffic impacts associated with the Vance Gate relocation would occur during the same time; however, these projects would be located in separate areas on the base and would not impact the same roadways. Construction would be temporary, so cumulative impacts on transportation and circulation are expected to be less than significant.

C&D debris could potentially cause short-term, adverse cumulative solid waste impacts to during construction activities, if projects occur concurrently. Construction activities would be temporary, and all C&D debris would be managed in accordance with the Tinker AFB Integrated Solid Waste Management Plan. Coordination with offices and programs on Tinker AFB that

manage waste recycling and C&D debris would occur prior to construction to ensure that all wastes generated during the projects listed above are managed appropriately and in accordance with defined procedures. There is no shortage of space at Tinker AFB to dispose of C&D debris, and nearby landfills have adequate landfill space for continued long-term operations. Therefore, cumulative solid waste impacts on are expected to be less than significant.

Construction activities associated with the projects listed above could potentially cause adverse cumulative impacts to water quality. Ground-disturbing activities would increase the potential for soil erosion and silt-laden runoff discharge into East Crutcho Creek, East Soldier Creek, or Kuhlman Creek. Potential cumulative impacts would be minimized through implementation of existing nonpoint pollution requirements and spill prevention and response procedures. A Storm Water General Permit for Construction Activities (Permit No. OKR10), issued by DEQ, would be required for all construction projects. In addition, implementation of BMPs—such as silt fencing and vegetation-based erosion control measures—would minimize construction impacts. Long-term impacts of the projects identified above would not affect water quality. Therefore, cumulative impacts on water quality are expected to be less than significant.

No significant cumulative impacts from implementation of the Preferred Alternative, when evaluated in conjunction with the projects identified above, are anticipated to occur.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 6.0
REFERENCES

Association of Central Oklahoma Governments (ACOG). 2008. *Central Oklahoma 8-Hour Ozone Flex Program for 2008-2012*. 4 April.

City of Oklahoma City. 2007. *Southeast Sector Plan: An Amendment to the OKC Plan, 2000-2020.* As adopted 22 February 2007.

City of Oklahoma City. 2008. *OKC Plan, 2000-2020.* Adopted by the Planning Commission on 28 September 2000, with amendments through 10 December 2009.

Council on Environmental Quality (CEQ). 1978. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act.* Title 40, Code of Federal Regulations Parts 1500 through 1508. Washington, DC: U.S. Government Printing Office.

Department of the Air Force. 2010a. *First 50% of Buildings Audited Investment Grade Base Wide Energy Audit for Tinker AFB, Oklahoma*. Prepared for AETC CONS/LGCT CO AFCESA/CEBC by AMEC Earth & Environmental, Inc. AFCESA Project No. TINK-10-K-3032. Contract FA8903-08-D-8766. August.

_____. 2010b. *Second 50% of Buildings Audited Investment Grade Base Wide Energy Audit for Tinker AFB, Oklahoma*. Prepared for AETC CONS/LGCT CO AFCESA/CEBC by AMEC Earth & Environmental, Inc. AFCESA Project No. TINK-10-K-3032. Contract FA8903-08-D-8766. October.

Department of Defense (DoD). 2010. Memorandum for Acting Assistant Secretary of the Army/Navy/Air Force, RE: DoD Implementation of Storm Water Requirements under Section 458 of the Energy Independence and Security Act (EISA). 19 January.

Executive Order (EO) 13514. *Federal Leadership in Environmental, Energy, and Economic Performance.*

EO 13423. *Strengthening Federal Environmental, Energy, and Transportation Management.* Effective Date: 24 January 2007.

EO 12989, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. Effective Date: 13 February 1996.

EO 13045. *Protection of Children from Environmental Health and Safety Risks*. Effective Date: 23 April 1997.

EO 11990. *Protection of Wetlands*. Effective Date: 24 May 1977.

EO 11988. *Floodplains Management*. Effective Date: 24 May 1977.

Greater Oklahoma City Chamber of Commerce. 2010. Oklahoma City Area Major Employers. Accessed at http://www.greateroklahomacity.com/index.php?submenu=majoremployers&src=directory&view=employers on 11 October 2010.

Greater Oklahoma City Partnership. 2011. Oklahoma County – Quality of Living. Accessed at http://greateroklahomacity.com/index.php?submenu=oklahomacounty&src=directory&view=counties&srctype=detail&refno=328&category=Counties on 25 January 2011.

Hoagland, Bruce. 1999. The Vegetation of Oklahoma: A Classification for Landscape Mapping and Conservation Planning. *Southwestern Naturalist* 45(4): 385-420.

Honeywell International (Honeywell). 2010. *Department of Energy: Energy Savings Performance Contract Final Proposal for Tinker Air Force Base – Task Order #2.* October.

International Ground Source Heat Pump Association. 2011. What Is a Ground Source Heat Pump? Accessed at http://www.igshpa.okstate.edu/geothermal/geothermal.htm on 22 January 2011.

Johnson, F.L., M.D. Proctor, T.L. Browning, G.E. Brown, and G.D. Schnell. 1995. *Native Tallgrass Prairie Assessment/Management Plan, Tinker Air Force Base, Oklahoma.* Final report to Woodward-Clyde Federal Services, Del City, Oklahoma.

Midwest City, Oklahoma. 2008. *Comprehensive Plan 2008.* Accessed at http://www.midwestcityok.org/comprehensive-plan on 2 April 2010.

Oberholser, H.C. 1974. *The Bird Life of Texas.* Vol. 1. Edited by E.B. Kincaid, Jr. Austin, Texas, and London: University of Texas Press.

Oklahoma City Convention and Visitors Bureau (OCCVB). 2010. Oklahoma City History. Accessed at http://www.okccvb.org/index.php?submenu=about_history&src=gendocs&ref=History&category=History on 15 October 2010.

Oklahoma Department of Wildlife Conservation (ODWC). 2011. Oklahoma's Endangered and Threatened Species and Species of Special Concern. Accessed at http://www.wildlifedepartment.com/endanger.htm on 17 January 2011.

Oklahoma Department of Environmental Quality (DEQ), Air Quality Division. 2010. Tinker AFB Facilitywide Operating Permit. Title V Permit No. 2009-394-TVR. September. Accessed at ftp://ftp.deq.state.ok.us/DEQ%20Public/AQD/Issued_Permits/2009XXX/2009394-vr.doc on 3 May 2011.

Oklahoma Natural Heritage Inventory (ONHI). 2003. Federal and State Endangered, Threatened, and Candidate Species in Oklahoma by County, OK. Accessed at http://www.biosurvey.ou.edu/download/heritage/countypr0503.pdf on 15 February 2011.

_____. 2010. Plant Tracking List. Accessed at http://www.biosurvey.ou.edu/download/publications/NEWtrackinglist7192010.pdf on 15 February 2011. Last updated on 19 July 2010.

Oklahoma Water Resources Board (OWRB). 2011. *Operations Manual for Oklahoma Local Floodplain Boards.* Accessed at http://www.owrb.ok.gov/hazard/fp/pdf_fp/FloodplainManual.pdf on 24 January 2011.

Parkhurst, D.L., S. Christenson and G.N. Breit. 1993. *Ground-Water-Quality Assessment of the Central Oklahoma Aquifer, Oklahoma: Geochemical and Geohydrologic Investigations.* U.S. Geological Survey Open-File Report 92-642.

Sherbrooke, Wade C. 2003. *Introduction to Horned Lizards of North America.* Berkeley and Los Angeles: University of California Press. pp. 94.

Texas Parks and Wildlife. 2000. Wildlife Fact Sheets – Texas Horned Lizard. Accessed at http://www.tpwd.state.tx.us/nature/wild/reptiles/thlizard.htm on 23 July 2002.

Tinker Air Force Base (AFB). 2002a. Environmental Assessment for Demolition of Facilities, Tinker AFB. 5 April 2002.

_____. 2002b. *Storm Water Pollution Prevention Plan*. October.

_____. 2004. *OC-ALC Plan 19-2, Spill Prevention and Emergency Response Plan for Hazardous and Extremely Hazardous Material and Spill Prevention Control and Countermeasures Plan*. Oklahoma: Tinker Air Force Base. October.

_____. 2005a. *Integrated Cultural Resources Plan for Tinker Air Force Base,* Oklahoma City, Oklahoma. December.

_____. 2005b. *Tinker Air Force Base General Plan*. Oklahoma: Tinker AFB.

_____. 2006. *Air Installation Compatible Use Zone Study*. Oklahoma: Tinker AFB. December.

_____. 2007. *Integrated Natural Resources Management Plan 2007-2011.*

_____. 2009. *Environmental Compliance Assessment and Management Program (ECAMP), FY09 Final Report.* Oklahoma: Tinker AFB. 15 September.

_____. 2010a. *2010 Community Relations Plan- Installation Restoration Program and Resource Conservation and Recovery Act*. Oklahoma: Tinker AFB. November.

_____.2010b. Tinker Air Force Base Fact Sheet. March. Accessed at http://www.tinker.af.mil/library/factsheets/factsheet.asp?fsID=9404&page=3 on 16 April 2010.

_____. 2010c. Tinker AFB Gate Schedule. Email communication with Cynthia Garrett, 12 August 2010. Email included gate schedule and gate map in PDF format.

_____. 2010d. Tinker AFB Fiscal Year 2010 Annual Utility Review. November.

_____. 2011. *RCRA Facility Assessment Vapor Intrusion in Areas A and B on Tinker Air Force Base, Oklahoma*. January.

University of Oklahoma. 2006. Oklahoma's Past, Oklahoma County. Oklahoma Archeological Society. Accessed at http://www.ou.edu/cas/archsur/counties/oklahoma.htm on 9 November 2010.

U.S. Air Force (USAF). 1991. *Natural Resources Management Plan, Tinker Air Force Base, Oklahoma.* Prepared by John R. Krupovage, Natural Resources Manager. July.

U.S. Army Corps of Engineers (USACE). 1995. *Protected Species Surveys, Tinker Air Force Base Oklahoma.* U.S. Army Corps of Engineers, Tulsa District.

_____. 2002. *Tinker Air Force Base Special Study, Oklahoma County, Oklahoma.* U.S. Army Corps of Engineers, Southwestern Division, Tulsa District. October.

U.S. Bureau of Labor Statistics (BLS). 2010. Local Area Unemployment Statistics (2000-2009). Accessed at http://data.bls.gov:8080/PDQ/outside.jsp?survey=la on 19 November 2010.

U.S. Census Bureau. 2000. American FactFinder – 2000 Census Demographic Profile Highlights. Accessed at http://factfinder.census.gov on 19 November 2010.

_____. 2008. American FactFinder – 2006-2008 American Community Survey 3-Year Estimates. Accessed at http://factfinder.census.gov on 19 November 2010.

U.S. Department of Agriculture (USDA). 2003. *Soil Survey of Oklahoma County, Oklahoma.* Prepared by Natural Resources Conservation Service in cooperation with the Oklahoma Agricultural Experiment Station and the Oklahoma Conservation Commission.

U.S. Energy Information Administration. 2010. Frequently Asked Questions about Environment and Emissions – Greenhouse Gases. Accessed at http://www.eia.doe.gov/ask/environment_faqs.asp#greenhouse_gases_definition on 15 December 2010.

U.S. Environmental Protection Agency (EPA). 2010a. Air: EPA to Hold Public Hearings on Air Quality Standards for Smog (EPA news release). 29 January. Accessed at http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/0a593109d2265c87852576ba005e5056!OpenDocument on 31 March 2010.

_____. 2010b. Ground Level Ozone Maps for Proposed O_3 Levels. Accessed at http://www.epa.gov/glo/pdfs/20100104maps.pdf on 31 March 2010.

_____. 2010c. National Emission Inventory (NEI) Database for Criteria and Hazardous Air Pollutants. Accessed at http://www.epa.gov/air/data/reports.html on 31 March 2010.

_____ 2010d. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule. Title 40, Code of Federal Regulations Parts 51, 52, 70, and 71. *Federal Register* 2010-06-03, Volume 75, No. 106. EPA-HQ-OAR-2009-0517, FRL-9152-8. 3 June 2010. Accessed at http://www.epa.gov/NSR/actions.html on 2 February 2011.

_____. 2011a. *Criteria Pollutant Area Summary Report*. Accessed at http://epa.gov/airquality/greenbk/ancl2.html on 19 January 2011. Website last updated on 17 December 2010.

_____. 2011b. EnviroMapper for Envirofacts. Accessed at http://www.epa.gov/emefdata/em4ef.html?ve=12,35.42198,-97.389425&pText=Tinker%20Air%20Force%20Base,%20OK on 19 February 2011.

_____. 2011a. National Wetland Inventory. Accessed at http://www.fws.gov/wetlands/Data/Mapper.html on 24 January 2011.

U.S. Fish and Wildlife Service (USFWS). 2011b. Oklahoma County Endangered Species List. Accessed at http://www.fws.gov/southwest/es/EndangeredSpecies/lists on January 17, 2011.

U.S. Green Building Council. 2010. Intro—What LEED Is. Accessed at http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988 on 4 October 2010.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 7.0
LIST OF PREPARERS

This report was prepared by AMEC Earth & Environmental, Inc. Members of the professional staff are listed below:

Project Management

Aaron Goldschmidt, Program Manager

M.A. Geography

Andrew Smits, Project Manager

M.S. Geology

Technical Analysts

Marcie Martin, Senior Environmental Planner

M.S. Environmental Management and Industrial Hygiene

Theresa Price, Environmental Planner

M.S. Applied Biological Sciences (Botany & GIS)

David Larsen, RPA, Environmental Planner

M.A. Archaeology and Heritage

Joe Pisano, Air Quality & Compliance Specialist

B.S. Environmental Science

Steve Ochs, Chemical and Air Quality Engineer

M.S. Chemical Engineering

Tim Ostapuk, Environmental Management and Industrial Hygiene Specialist

M.S. Environmental Management

Production

Shawn Gravatt, Senior GIS Analyst

M.S. Environmental Studies

David Cooper, GIS Analyst

B.A. Geography

Krystal Kliger, GIS Analyst

M.S. Natural Resources Management & Engineering

Maggie Fulton, Technical Editor

B.A. English

Katie Murphy, Document Specialist

B.F.A. Drawing

Kristen Knutson, Document Specialist

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A – PUBLIC NOTICE

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B – SCOPE DESCRIPTIONS

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C – AIR QUALITY ANALYSIS SUPPORTING DOCUMENTATION

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D – AGENCY CONSULTATION

THIS PAGE INTENTIONALLY LEFT BLANK