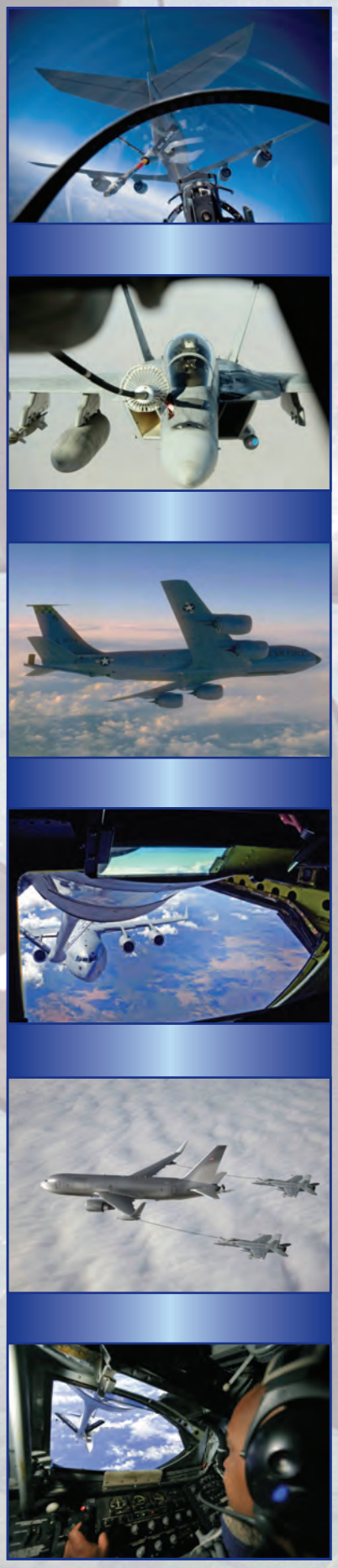

Final

Environmental Impact Statement Second Main Operating Base KC-46A Beddown at Alternative Air National Guard Installations

June 2014

Cover Sheet

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE SECOND MAIN OPERATING BASE (MOB 2) KC-46A BEDDOWN AT ALTERNATIVE AIR NATIONAL GUARD INSTALLATIONS

a. *Responsible and Cooperating Agencies:* United States Air Force, National Guard Bureau (Responsible Agencies); there are no Cooperating Agencies.

b. *Title of Action:* Second Main Operating Base KC-46A Beddown at Alternative Air National Guard Installations Environmental Impact Statement

c. *Comments and Inquiries:* Anne Rowe, NGB/A7AM, 3501 Fetchet Avenue, Joint Base Andrews MD 20762-5157, (240) 612-8859.

d. *Designation:* Final Environmental Impact Statement (EIS)

e. *Abstract:* This Final EIS has been prepared in accordance with the National Environmental Policy Act (NEPA). The public and agency scoping process resulted in the analysis of the following environmental resources: noise, air quality, safety, soils and water, biological resources, cultural resources, land use, infrastructure and transportation, hazardous materials and wastes, socioeconomics, and environmental justice and the protection of children. The Secretary of the Air Force proposes to beddown KC-46A aircraft for MOB 2 at one of five alternative locations. The goal of KC-46A basing and fielding is to continue to provide optimum Combatant Commander support and to efficiently meet regional and global receiver demands while replacing the KC-135 fleet. This action would involve the beddown of one KC-46A squadron consisting of 12 Primary Aerospace Vehicles Authorized (PAA), and establishing a KC-46A Main Operating Base (MOB). Concurrent with the beddown of the 12 KC-46A, 12 existing KC-135 aircraft would be retired out of the Air National Guard (ANG) fleet. The existing KC-135 aircraft at the selected installation would either be relocated to another installation and/or retired out of the United States Air Force (USAF) inventory, depending on the age and maintenance status of each aircraft. Separate documentation would be prepared if the KC-135 aircraft are relocated to another installation. The beddown of the MOB 2 KC-46A would follow the Total Force Integration (TFI) concept that was enacted into law through the passage of the 2008 Defense Authorization Act, pairing two USAF component units (host and associate) together to operate as one. In support of TFI, an active duty associate unit would be integrated with ANG personnel and equipment under any of the action alternatives, enabling joint training and execution of missions using ANG-assigned aircraft. The ANG host unit would be assigned principal responsibility of the physical resources for mission accomplishment (aircraft, equipment, facilities) and the active duty associate unit would share those resources. Five alternative ANG locations were selected for this beddown:

- Forbes Air National Guard Station (ANGS), Kansas;
- Joint Base McGuire-Dix-Lakehurst (JB MDL), New Jersey;
- Pease ANGS, New Hampshire;
- Pittsburgh ANGS, Pennsylvania; and,
- Rickenbacker ANGS, Ohio.

The USAF has identified Pease ANGS as the preferred alternative.

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ACRONYMS AND ABBREVIATIONS

ºC	degree Celsius
ºF	degree Fahrenheit
µg/m^3	micrograms per cubic meter
64 ARS	64th Air Refueling Squadron
108 WG	108th Wing
121 ARW	121st Air Refueling Wing
157 ARW	157th Air Refueling Wing
171 ARW	171st Air Refueling Wing
190 ARW	190th Air Refueling Wing
AAD	Average Annual Day
AAQS	Ambient Air Quality Standards
ACAA	Allegheny County Airport Authority
ACM	asbestos-containing material
ACS	American Community Survey
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
AFSEC	Air Force Safety Center
AGE	Aerospace Ground Equipment
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
AMC	Air Mobility Command
ANG	Air National Guard
ANGS	Air National Guard Station
AOC	Area of Concern
APZ	Accident Potential Zone
ARFF	Aircraft Rescue and Fire Fighting
ARO	Air Refueling Operator
ASD	Average Sortie Duration
ASN	Aviation Safety Network
AST	aboveground storage tank
AT/FP	Anti-Terrorism/Force Protection
ATADS	Air Traffic Activity Data System
ATCAA	Air Traffic Control Assigned Airspace
BAI	Backup Aerospace Vehicle Inventory
BASH	Bird/Wildlife Aircraft Strike Hazard
BOMARC	Boeing Michigan Aerospace Research Center
C2	Command and Control
C4	Command, Control, Communications, and Computers
CAA	Clean Air Act
CAP	Central Accumulation Point
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CONUS	continental United States
CRAA	Columbus Regional Airport Authority
CWA	Clean Water Act
CY	Calendar Year
CZ	Clear Zone
dB	decibel
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EO	Executive Order
ERP	Environmental Restoration Program
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FICUN	Federal Interagency Committee on Urban Noise
FL	Flight Level
FPPA	Farmland Protection Policy Act
FY	fiscal year
FTU	Formal Training Unit
GHG	greenhouse gas
GMV	Government Motor Vehicle
GWP	global warming potential
HAP	Hazardous Air Pollutant
I-	Interstate
IAP	International Airport
IFR	Instrument Flight Rule
INM	Integrated Noise Model
JB MDL	Joint Base McGuire-Dix-Lakehurst
KIAS	knots indicated airspeed
KS ANG	Kansas Air National Guard
LBP	lead-based paint
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Development
MBTA	Migratory Bird Treaty Act
MILCON	Military Construction
MOA	Military Operations Area
MOB	Main Operating Base
MOB 1	First Main Operating Base
MOB 2	Second Main Operating Base
MSL	mean sea level
MTAA	Metropolitan Topeka Air Authority
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NGB/A7AN	National Guard Bureau, Asset Management Division, Natural Infrastructure Management Branch
NH ANG	New Hampshire Air National Guard
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NIPTS	Noise-Induced Permanent Threshold Shift
NJ ANG	New Jersey Air National Guard
nm	nautical mile
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NVIS	Night Vision Imaging System
O_3	ozone
OH ANG	Ohio Air National Guard
OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
PA ANG	Pennsylvania Air National Guard
PAA	Primary Aerospace Vehicles Authorized
PADEP	Pennsylvania Department of Environmental Protection
Pb	lead
PCB	polychlorinated biphenyl
PDA	Pease Development Authority
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter less than or equal to 10 microns in diameter
POL	petroleum, oil, and lubricant
POV	privately owned vehicle
ppm	parts per million
PSD	Prevention of Significant Deterioration
PUD	Planned Unit Development
QD	quantity-distance
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROI	Region of Influence
RPZ	Runway Protection Zone
SAP	satellite accumulation point
SEL	Sound Exposure Level
SF	square foot/feet
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SO_2	sulfur dioxide
SR	State Route
SUA	Special Use Airspace
SWPPP	Stormwater Pollution Prevention Plan
TFI	Total Force Integration
tpy	tons per year
TSCA	Toxic Substances Control Act
U.S.	United States
UFC	Unified Facilities Criteria
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
UTBNI	Up to But Not Including
VFR	Visual Flight Rule
VOC	volatile organic compound

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EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) analyzes the potential environmental impacts associated with the beddown the KC-46A at the Second Main Operating Base (MOB 2), which will be led by an Air National Guard (ANG) unit. The Secretary of the Air Force proposes to replace existing KC-135s with the KC-46A aircraft for MOB 2 at one of five alternative locations. The five alternative ANG locations (Figure ES-1) selected for this beddown include:

- Forbes Air National Guard Station (ANGS), Kansas;
- Joint Base McGuire-Dix-Lakehurst (JB MDL), New Jersey;
- Pease ANGS, New Hampshire;
- Pittsburgh ANGS, Pennsylvania; and,
- Rickenbacker ANGS, Ohio.

The official public scoping period for this proposal was initiated when the Notice of Intent (NOI) to prepare the EIS was published in the *Federal Register* on May 17, 2013 and ended on July 5, 2013. The Notice of Availability (NOA) for the Draft EIS was published in the *Federal Register* on February 7, which initiated a 45-day public comment period on the Draft EIS that ended on March 24, 2014. All comments received on the Draft EIS have been fully considered and addressed in the Final EIS, as appropriate. Comments received are reflected in Appendix B, Section 6, pages B6-223 to B6-387. Only substantive comments were responded to in the Government Responses to Comments, Appendix B, Section 6, pages B6-202 to B6-222.

PURPOSE AND NEED

Air refueling is the backbone of the United States' (U.S.) ability to project global reach and combat power. Air refueling aircraft, also known as "tankers," are a joint asset, serving our sister services and U.S. allies who rely on the range and flexibility of tankers to strengthen their contribution to the coalition fight. Without a robust air refueling capability, U.S. forces would be limited in their ability to provide global reach. The original mission of the current United States Air Force (USAF) air refueling aircraft, the KC-135 Stratotanker, was primarily to refuel strategic bomber aircraft while in flight, which enhances the ability of aircraft to provide sustained mission capability without landing to refuel. Through the course of the KC-135's service life, structural and functional modifications have added capabilities to select aircraft. The result is a fleet of aircraft with multiple configurations and crews that may not be trained to accomplish every mission for which the aircraft is capable. This lack of standardized equipment and training throughout the fleet limits the ability for KC-135s to support, on a large scale, multi-role missions or exploit new tactics and procedures. The following are examples of capabilities that the current KC-135 fleet lacks:

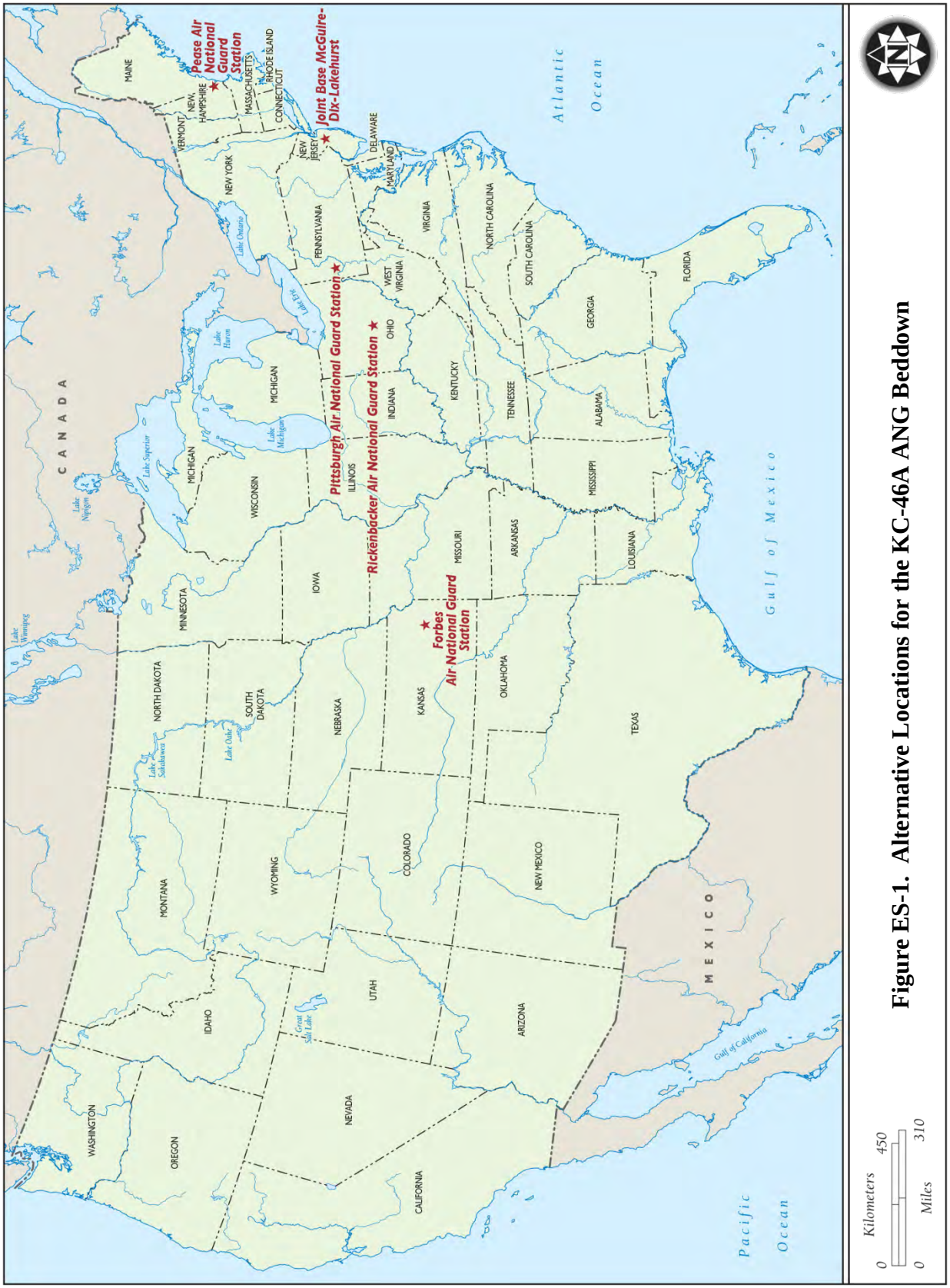

Figure ES-1. Alternative Locations for the KC-46A ANG Beddown

- Multi-Point Refueling. Simultaneous refueling of two probe-equipped receiver aircraft from the same tanker is limited to 20 sets of wing-mounted refueling pods installed on the aircraft for the fleet of tankers.
- Boom/Probe and Drogue Refueling. With the exception of the refueling pod equipped aircraft, the KC-135 fleet does not have capability to perform boom and probe/drogue refueling on the same sortie[1].
- Receiver capabilities. Only eight KC-135s have air refueling receptacles, which means that only eight of the KC-135 aircraft in the fleet can receive fuel in flight. This restricts force extension and limits persistence over the battlefield. It also results in inefficient use of valuable, but limited air refueling assets and limits flexibility within the maintenance schedule.
- Night Vision Imaging System (NVIS). The KC-135 fleet currently lacks a standard NVIS for tanker cockpits and boom operator positions. Additionally, exterior lighting is not currently NVIS-compatible, which prohibits air refueling in tactical NVIS (low vision) conditions. This limits the ability to perform covert air refueling operations at night, and degrades effectiveness of special operations support.
- Command, Control, Communications, and Computers (C4). KC-135s lack robust connectivity to command and control agencies. No secure tactical datalink exists and these aircraft have limited C4 connectivity to other combat, combat support, and mobility aircraft.
- Defensive Protection. KC-135s currently do not have any aircraft defensive systems.

The purpose of this action is to ensure that the National Guard Bureau (NGB) will have air refueling support for both conventional global strike and nuclear deterrence operations into the future. The purpose of the KC-46A is to support air superiority through air refueling of fighter, bomber, attack, special operations, Command and Control, Intelligence, Surveillance and Reconnaissance, and transport aircraft; and to support employment of combat units deploying to areas of operations. Finally, the KC-46A will also support the Command and Control core function as a communications "gateway" when equipped with a roll-on gateway system to provide connectivity between tactical network partners in theater.

The NGB requires a refueling aircraft that will be equipped with major technological improvements designed to enhance operations and increase mission effectiveness. The KC-46A is the USAF's newest air refueling aircraft that meets this need. NGB requires a location to beddown the KC-46A aircraft in support of MOB 2. The base would support the beddown and

[1] Probe and drogue refueling employs a flexible hose that trails from the tanker aircraft. The drogue is a fitting resembling a windsock, and is attached with a valve to a flexible hose.

training of crewmembers and personnel in the operation and maintenance of the KC-46A aircraft in an appropriate geographic location that can provide sufficient airfield, facilities, infrastructure, and airspace to support the KC-46A training and operations.

NARROWING PROCESS FOR ALTERNATIVE BASES

As previously described, the NGB is programmed to beddown one squadron of 12 Primary Aerospace Vehicles Authorized (PAA) KC-46A aircraft at one of five alternative locations. Identification and analysis of alternatives is one of the core elements of the environmental process under the National Environmental Policy Act (NEPA) and the USAF's implementing regulations. The NGB may expressly eliminate alternatives from detailed analysis based on reasonable selection standards (32 Code of Federal Regulations [CFR] 989.8(c)). Based on extensive analysis by the USAF operations community, a siting study was conducted to determine the specific requirements for beddown of the KC-46A aircraft and to identify potential military installations where this beddown could occur. Following this study, the Secretary of the Air Force and the Chief of Staff of the Air Force approved selection criteria for the KC-46A beddown.

The approved criteria were used to screen the enterprise of 83 candidate installations to identify those installations' capacity to successfully support the MOB 2 mission. The objective criteria included mission, capacity, environmental considerations, and cost.

The Secretary of the Air Force considered the objective screening results as well as qualitative operational factors in determining the alternative installations for the KC-46A MOB 2 mission. These military judgment factors included:

- Plans and Guidance
- Global and Regional Coverage
- Combatant Commander Support
- Total Force
- Beddown Timing
- Force Structure
- Training Requirements and Efficiencies
- Logistic Supportability
- Resources/Budgeting

The Strategic Basing Process described above resulted in the identification of five alternative bases for consideration.

- Forbes ANGS, Kansas
- JB MDL, New Jersey
- Pease ANGS, New Hampshire
- Pittsburgh ANGS, Pennsylvania
- Rickenbacker ANGS, Ohio

PROPOSED ACTION AND ALTERNATIVES

Overview of the Proposed Action

The USAF has a requirement to provide refueling aircraft that will be equipped with major technological improvements designed to enhance operations and increase mission effectiveness. The NGB proposes to beddown one squadron of 12 KC-46A aircraft at one of five alternative locations: Forbes ANGS, Kansas; JB MDL, New Jersey; Pease ANGS, New Hampshire; Pittsburgh ANGS, Pennsylvania; or Rickenbacker ANGS, Ohio. Additionally, one active duty associate unit would be integrated with ANG personnel and equipment, enabling joint training and execution of missions using ANG-assigned aircraft. Furthermore, the NGB would implement construction projects associated with the aircraft beddown at the selected installation. Concurrent with the beddown of the KC-46A, the existing KC-135 aircraft at the selected installation would either be relocated to another installation and/or retired out of the USAF inventory.

As a result of the Proposed Action, there would be a change to the type of aircraft based at the selected installation; a change to the mix of aircraft using the associated airspace; changes to staffing and manpower at the selected location; changes to the number of airfield operations; as well as minor required construction, building renovation, and facility demolition. There would be no new or modified airspace required to support this action. The proposed beddown is estimated to begin in Fiscal Year (FY) 2018 for the NGB, and construction is estimated to begin FY 2015. Although proposed construction is necessary for the long-term viability of the beddown, aircraft operations with the KC-46A could begin prior to implementation of the construction. Table ES-1 summarizes the major components of each alternative.

Table ES-1. Summary of Alternatives (Current/Proposed)

	Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Refueler Aircraft Type	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-135
Number of Refueler Aircraft (PAA)	12 / 12	8 / 12	8 / 12	16 /12	18 / 12	Same as current
ARW Refueler Flying Hours	4,868 / 8,040	3,687 / 8,040	6,219 / 8,040	6,016 / 8,040	7,215 / 8,040	Same as current
Annual Sorties	1,478 / 2,010	1,112 / 2,010	1,382 / 2,010	1,569 / 2,010	2,014 / 2,010	Same as current
% Home-Station Operations	64% / 64%	75% / 75%	44% / 44%	59% / 59%	64% / 64%	Same as current
Home-Station Sorties	946 / 1,286	834 / 1,508	614 / 884	926 / 1,186	1,289 / 1,286	Same as current
Annual Airfield Operations Home-Station -- ANG	10,452 / 14,562	8,340 / 17,608	6,140 / 8,840	6,943 / 9,226	6,445 / 6,857	Same as current
Total Actual Airfield Operations (including ANG) based on 2012 FAA/Tower reports	24,630 / 28,740	62,686 / 71,875	37,410 / 40,110	139,217 / 141,500	39,436 / 39,848	Same as current
Total FAR Part 150 (Baseline 2006/2007) Approved Operations (including ANG)	N/A	N/A	N/A	321,436[1] / 317,602	67,160[2] / 60,877	Same as current
Construction -- new	Hangar modifications; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; new simulator building; ramp/taxiway modifications	Hangar modifications; building additions; new fuel hydrants; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; ramp/ taxiway modifications	None
Construction -- renovations	Internal building renovations	Internal hangar renovations	Internal building renovations	Internal hangar renovations	Internal hangar renovations	None
Proposed Personnel Change (ANG and active duty)	+194	+287	+171	+59	+197	0

Notes: 1. 2006 Part 150 Study data
2. 2007 Part 150 Study data
ANGS = Air National Guard Station; JB MDL = Joint Base McGuire-Dix-Lakehurst; PAA = Primary Aerospace Vehicles Authorized; ARW = Air Refueling Wing; ANG = Air National Guard; FAR = Federal Aviation Regulations

Requirements of the Proposed Action

Aircraft Beddown/Transition

The KC-46A is planned to eventually replace existing USAF KC-135s. The NGB proposes to begin this process by replacing the aircraft at the selected location with 12 KC-46A operational aircraft (regardless of how many aircraft are currently at the alternative location). It is estimated that the 12 KC-46A aircraft would be beddown at the selected location beginning in FY 2018. The existing KC-135 aircraft at the selected location would either be relocated to another installation and/or would be retired out of the USAF inventory. The relocation/retirement actions would be evaluated under NEPA, as appropriate.

Facility and Infrastructure Requirements

While basing the KC-46A would require certain facilities and infrastructure to support necessary training and operational requirements, utilizing existing infrastructure to the maximum extent feasible comprises a fundamental basis of the Proposed Action. Where existing facilities and infrastructure cannot meet the needs of the Proposed Action, the NGB would implement construction of necessary new and/or renovated infrastructure and facilities at the selected alternative installation. The type of construction needed would vary by installation (Table ES-1).

Personnel Changes

The KC-46A would provide substantial expanded capabilities with only minor overall changes in military personnel; however, the mission would require basing sufficient and appropriate personnel to operate and maintain the Wing and to provide necessary support services. In addition, there would be an active duty associate unit based with the selected MOB 2 alternative installation. The change in number of personnel would vary by installation (Table ES-1).

KC-46A Operations

Under the Proposed Action, the 12 PAA KC-46A aircraft would fly 670 hours per aircraft, per year, for a total of 8,040 hours annually. Because this is a new aircraft flying with a combination of ANG and associate active duty personnel, a uniform distribution of flying hours was assumed for each alternative. This is considered a conservative estimate and any deviation from this would likely be fewer hours flown. Thus, with an estimated average sortie duration (ASD) of 4.0 hours, the KC-46A aircraft would fly 2,010 sorties annually. The 2,010 annual sorties would be flown at a combination of the unit's home-station as well as off-station airfields, where they are able to train in a different setting than their home-station. Each of the five alternative installations currently fly a different number of airfield operations per sortie, as well as a different percent of home-station/off-station operations. In developing the analysis for each

installation, the installations' unique ratio of airfield operations was assumed to remain the same into the future, as were the percent of home-station/off-station operations. This resulted in a range of home-station airfield operations across the five action alternatives. Further, it is recognized that there is a recent trend toward an increasing use of flight simulators, which can reduce the number of hours flown. However, without a clear definition in the use of the simulator as opposed to actual airfield operations, the full 8,040 flying hour program has been analyzed for each action alternative. No changes are proposed to airfield departure/arrival patterns and tracks, flight profiles, and use of runways from those that are currently performed with the KC-135 at each MOB 2 location. Any existing noise abatement procedures would continue to be followed.

Under the Proposed Action, there would be some increases in the frequency of use and number of operations conducted in the airspace currently used by the KC-135, depending on the increase of sorties over the current baseline at each alternative installation. The KC-46A would use the same airspace currently used by the selected installation, with no new airspace required to support the mission. The types of airspace used would consist of published air refueling tracks, Anchors, Warning Areas, and Military Operations Areas (MOAs). These are found in the Department of Defense (DoD) AP/1B, Flight Information Publication, and Area Planning documents. All air refueling is accomplished above 10,000 feet mean sea level (MSL), although some MOAs are approved for lower altitude flight for training not involving air refueling. While a large percentage of air refueling occurs close to the home-station airfield, KC-135 aircraft refuel in other refueling tracks and Warning Areas located throughout the U.S. Under the Proposed Action, the KC-46A would use the airspace in the same manner as the KC-135 aircraft. It is anticipated that the KC-46A would operate in existing airspace and conduct flight operations similar to the existing KC-135 aircraft; therefore, detailed analysis of airspace has not been conducted in this EIS.

Identification of the Preferred Alternative

The USAF has identified Pease ANGS as the preferred alternative for the MOB 2 KC-46A beddown. The USAF selected Pease ANGS based on an operational analysis, results of site surveys, and military judgment factors.

NO ACTION ALTERNATIVE

The Council on Environmental Quality (CEQ) regulation 40 CFR § 1502.14(d) specifically requires analysis of the "No Action" alternative in all NEPA documents. Under the No Action Alternative, the proposed aircraft beddown would not occur, and the NGB would not implement the components described above under the five Action Alternatives. There would be no change in based aircraft; use of the airfield at the proposed locations; or use of Special Use Airspace

(SUA), construction, or personnel assigned to the KC-46A aircraft squadron. Under the No Action Alternative, the NGB would continue to conduct their current mission using the existing KC-135 aircraft with multiple configurations and crews that are not trained to accomplish every mission. This lack of standardized equipment and training throughout the fleet would continue to negatively impact the ability for KC-135 aircrews to support, on a large scale, multi-role missions or exploit new tactics and procedures. The continued use of the KC-135 aircraft would not meet the identified needs of the NGB or the USAF; however, this alternative is carried forward for analysis in this EIS per CEQ regulations, and as a baseline from which to compare the potential impacts of the Proposed Action and alternatives.

ENVIRONMENTAL CONSEQUENCES

NEPA requires focused analysis on environmental resources and impact topics potentially affected by the Proposed Action or its alternatives. Based on the potential for the Proposed Action to affect the environment at and surrounding the five alternative locations, as well as public and agency concerns, several specific environmental resources were evaluated in detail in this EIS. The potential consequences of each alternative on these resources were evaluated and are summarized in Table ES-2.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Noise					
Airfield operations would increase by 4,110 (39 percent increase in 190 ARW operations, 17 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres. Impacts from noise would be negligible.	Airfield operations would increase by 9,268 (111 percent increase in 108 WG operations, 15 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would increase by 1,831 acres. Impacts from noise would be negligible.	Airfield operations would increase by 2,700 (44 percent increase in 157 ARW operations, 7 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Impacts from noise would be negligible.	Airfield operations would decrease by 3,834 (29 percent decrease from the currently published baseline FAR Part 150 Noise Compatibility Program [2006]; and a 2 percent increase in actual 2012 airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 79 acres. Impacts from noise would be negligible.	Airfield operations would decrease by 6,283 (48 percent decrease from the currently published baseline FAR Part 150 Noise Compatibility Program [2007]; and a 1 percent increase in actual 2012 airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. Impacts from noise would be negligible.	Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. The noise environment at each of the five alternative airfields would continue to be managed through their existing AICUZ or FAR Part 150 airfield compatibility programs. There would be no additional Noise impacts at any of the alternative installations under the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Air Quality					
Forbes ANGS is located in an attainment area for all criteria pollutants. While there would be increases in operational criteria pollutant emissions, they would be below the PSD threshold, and would not be significant. Impacts from construction emissions and operational HAP emissions would be negligible.	The 108 WG installation is in a nonattainment area for O3 (marginal nonattainment) and maintenance area for PM2.5 and CO, and is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants, except NOx, which would be above the *de minimis* threshold of 100 tpy. A conformity determination will be prepared. Impacts from construction emissions and operational HAP emissions are negligible.	The Pease ANGS installation is in a maintenance area for O3, and is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants. Impacts from construction emissions and operational HAP emissions are negligible.	The Pittsburgh ANGS is located within a non-attainment area for PM2.5, a moderate nonattainment area for the 1997 8-hour O3 standard, and is classified as a marginal nonattainment area for the 2008 8-hour O3 standard, according to 40 CFR 81.339. The Pittsburgh ANGS is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants. Impacts from construction emissions and operational HAP emissions are negligible.	The Rickenbacker ANGS is located in a nonattainment area for the O3 and PM2.5 NAAQS. While there are increases in operational criteria pollutant emissions, they are below the PSD/*de minimis* thresholds for all pollutants and are not significant. Impacts from construction emissions and operational HAP emissions are negligible.	Air Quality at each alternative airfield would remain as it currently is. Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. Emissions at each of the alternative installations would continue to be in compliance with their respective SIPs. There would be no additional impacts to Air Quality at each alternative installation under the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Safety					
There would be a 39 percent increase in actual 190 ARW airfield operations (17 percent increase in total airfield operations) at Forbes Field Airport with commensurate increase in mishap and BASH potential.	There would be a 111 percent increase in actual 108 WG airfield operations (15 percent increase in total airfield operations) at JB MDL with a commensurate increase in mishap and BASH potential.	There would be a 44 percent increase in actual 157 ARW airfield operations (7 percent increase in total airfield operations) at Portsmouth IAP with a commensurate increase in mishap and BASH potential.	There would be a 33 percent increase in actual 2012 171 ARW airfield operations (2 percent increase in total airfield operations) at Pittsburgh IAP with a commensurate increase in mishap and BASH potential.	There would be a 6 percent increase over the actual 2012 121 ARW airfield operations (1 percent increase in total airfield operations) at Rickenbacker IAP with a commensurate increase in mishap and BASH potential.	Both ground and flight safety at each alternative airfield would remain as they currently are. Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. There would be no additional impacts to Safety under the No Action Alternative.
Construction activities would involve no unusual or extraordinary techniques. During construction, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.					
Soils and Water					
There would be approximately 5.9 acres of temporary soil disturbance and no new impervious surface as a result of the proposed construction.	There would be approximately 4.7 acres of temporary soil disturbance and 2.4 acres of new impervious surface as a result of the proposed construction.	There would be approximately 3.0 acres of temporary soil disturbance and 0.5 acres of new impervious surface as a result of the proposed construction.	There would be approximately 4.3 acres of temporary soil disturbance and 2.0 acres of new impervious surface as a result of the proposed construction.	There would be approximately 8.5 acres of temporary soil disturbance and 0.3 acres of new impervious surface as a result of the proposed construction.	Soils and Water Resources at each alternative airfield would remain as they currently are. There would be no additional impacts to Soils and Water Resources as a result of the No Action alternative.
To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. In addition, as the construction is for national defense purposes and the surrounding land is already in urban development, the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.		To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. Proposed construction would not impact prime farmlands; therefore, the Farmland Protection Policy Act does not apply to this alternative. As a result, impacts to soil and water resources would be negligible.			

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Biological Resources					
No impacts to vegetation and wetlands. Impacts to wildlife species from operational noise would be imperceptibly beneficial due to the slight decrease in noise. 39 percent increase in 190 ARW (17 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to wildlife due to construction would be negligible. No special status species or critical habitat is known to occur on Forbes Field Airport; therefore, there would be no impacts to these species.	Impacts to vegetation would be minor. No impacts to wetlands. Impacts to wildlife species from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. 111 percent increase in 108 WG (15 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally listed species or critical habitat is known to occur on McGuire Field. Six state listed species are known to occur on McGuire Field. There would be no impacts to federally listed and impacts to state listed species would be minor.	Impacts to vegetation would be negligible. No impacts to wetlands. Impacts to wildlife species from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. 44 percent increase in 157 ARW (7 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Portsmouth IAP; therefore, there would be no impacts to federally listed species.	Impacts to vegetation would be negligible. No significant impacts to wetlands. Impacts to wildlife species from operational noise would be minor due to the 33 percent increase in 171 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally listed or critical habitat is known to occur on Pittsburgh IAP; therefore, there would be no impacts to federally listed species. There would be no impacts to state listed species.	Impacts to vegetation would be negligible. No impacts to wetlands. Impacts to wildlife species from operational noise would be minor due to the 6 percent increase in 121 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Rickenbacker IAP; therefore, there would be no impacts to federally listed species.	There would be no change to Biological Resources under this alternative. There would be no additional impacts to Biological Resources as a result of the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Cultural Resources					
Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. Minor interior modifications to Building 679 would not affect the NRHP-eligibility of the building. The Kansas SHPO has concurred with these findings. The installation has been intensively surveyed and no known traditional resources are known to occur. Two responses have been received from the Kaw Nation and the Wichita and Affiliated Tribes stating that they have no objection to the Proposed Action. Additional efforts were made to contact non-responsive tribes without success. While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts	Construction activities associated with this alternative would be primarily limited to the developed areas of the installation in the areas of the aircraft hangars and airfield pavements. A small amount of construction (0.15 acre) would occur in forested area near this developed area. Based on previous archaeological surveys at McGuire Field, the area of proposed construction does not contain any known NRHP-eligible sites and is considered to have a low potential for containing buried materials. The New Jersey SHPO has concurred with these findings. No traditional resources have been identified. Responses from the Delaware Tribe of Indians and the Delaware Nation stated that their review indicated no religious or culturally significant sites in the area. SHPO consultation for this EIS has provided concurrence that no historic properties would be	Based on previous archaeological surveys on the installation, the area of proposed construction does not contain any known NRHP-eligible sites or traditional resources. Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. The New Hampshire SHPO has concurred with these findings. The Penobscot Indian Nation is the only federally-recognized tribal entity affiliated with Pease ANGS, and has responded stating that they have no issues with the Proposed Action. No impacts to cultural impacts would be expected to occur.	The installation contains no known traditional resources. Given the extensive development on the installation, it is unlikely that there are traditional resources located at the Pittsburgh ANGS. Construction activities associated with this alternative are limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements and all impacts would be negligible. Correspondence has been received from all tribes consulted including the Seneca Nation of Indians, the Cayuga Nation of New York, the Tonowanda Band of Seneca, Tuscarora Nation of New York, and the Onondaga Nation of New York stating that they have no objection to the Proposed Action	Construction activities at Rickenbacker ANGS would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. The installation has been intensively surveyed for cultural resources and no traditional cultural resources are known to exist in the area. The one significant archaeological resource that is located within the installation is not within the proposed construction areas and would not be impacted. Two NRHP-eligible hangars (883 and 885) could be adversely impacted by construction under this alternative. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, additional consultation would be conducted to minimize and mitigate	Under the No Action Alternative, Cultural Resources at each alternative installation would remain as they currently are. None of the proposed facility construction/renovations would occur at any of the installations, and thus, there would be no potential impacts to facilities that are eligible for listing on the NRHP. There would be no surface disturbance from construction activities, and thus no potential to impact unknown archaeological resources. There would be no additional impacts to Cultural Resources as a result of the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Forbes ANGS is now complete.	affected under the proposed action.			adverse effects to these buildings. Correspondence has been received from the Peoria Tribe of Indians, the Pokagon Band of Potawatomi Indians, the Turtle Mountain Band of Chippewa Indians of North Dakota, the Delaware Nation, and the Shawnee Tribe who indicated that they had no objection to the proposed project. Additional efforts were made to contact non-responsive tribes without success. While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Rickenbacker ANGS is now complete.	
Land Use					
Total annual airfield operations would increase by 4,110 (17 percent).	Total annual airfield operations would increase by 9,268 (15 percent).	Total annual airfield operations would increase by 2,700 (44 percent).	Airfield operations would decrease by 3,834 (29 percent decrease) from the currently	The number of airfield operations would decrease by 6,283 (48 percent decrease) from the	Land Use at each alternative airfield would remain as it currently is. Each of the five installations would retain the

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres (55 acres off airport-controlled property). Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would be compatible with current land use and zoning designations and would result in imperceptibly beneficial impacts by reducing the off-airport areas currently exposed to a DNL between 65 dB and 70 dB. Airport Hazard Areas would not be affected.	Acreage within the 65 dB DNL (and greater) noise contour off DoD-controlled property would increase by 419 acres. An additional 8 acres of residential use areas would be exposed to greater than 65 dB DNL. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in minor adverse impacts due to an increase in off-airport areas (including residential areas) exposed to a DNL between 65 dB and 75 dB. Airport Hazard Areas would not be affected.	Acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Of this increase in acreage, 4 acres would be off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts due to an increase in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	published FAR Part 150 Noise Compatibility Program (2006), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 79 acres. There would be a decrease of approximately 23 acres within the 65 dB DNL noise contour that are off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	currently published FAR Part 150 Noise Compatibility Program (2007), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. Decrease of 72 acres within the 65 dB DNL noise contour that are off airport-controlled property, resulting in 345 acres off airport-controlled property that lie within the 65 dB contour. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. There would be no additional impacts to Land Use under the No Action Alternative at any of the alternative locations.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Infrastructure and Transportation					
Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increased demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.					Infrastructure and Transportation at each alternative installation would remain as they currently are. There would be no change to the based personnel at any of the alternative locations. There would be no increase in use of various utilities or roadway systems under this alternative. There would be no additional impacts under the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Hazardous Materials and Waste					
There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media were encountered during the course of site preparation or site development, work would cease until 190 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	One of the ERP Sites, SS-39, overlaps with a portion of the existing fuel hydrants that would be capped, as well as the proposed addition to Hangar 3336. Remedial investigation is on-going with this site. It is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations. If contaminated media were encountered during the course of site preparation or site development, work would cease until 108 WG Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media were encountered during the course of site preparation or site development, work would cease until 171 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media are encountered during the course of site preparation or site development, work would cease until 121 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	Hazardous Materials and Wastes at each alternative installation would remain as described in the baseline section for each alternative location. The benefit of eliminating ozone depleting substances with the KC-46A would not be realized. The throughput and management of hazardous materials and wastes would not change from baseline conditions. There would be no additional impacts to Hazardous Materials and Wastes under the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
There would not be an increased risk of hazardous waste releases or exposure from this alternative. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations.					
Socioeconomics					
Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.					Socioeconomics at each alternative installation would remain as described in the baseline section for each alternative. The minor economic benefit of additional based personnel and construction activity would not occur at any of the alternative installations. There would be no additional impacts to Socioeconomics under the No Action Alternative.

Table ES-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Environmental Justice and the Protection of Children					
There would be no residential populations, including no minority or low-income populations, and no additional schools located within the vicinity of Forbes Field Airport exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	The percentage of minority and low-income persons affected would remain approximately the same as baseline. There would be no disproportionate impacts to minority or low-income populations. The child development center that is currently under the 65 dB contour would be located under the 70 dB contour. There would be no special health or safety risks to children.	There are no residential areas within the noise contours. No additional schools would be located within the vicinity of Portsmouth IAP exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations and no special health or safety risks to children.	There would be no residential populations, including no minority or low-income populations, and no additional schools located within the vicinity of Pittsburgh IAP exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	There would be no residential populations, including no minority or low-income populations, and no additional schools exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	Under the No Action Alternative, Environmental Justice and the Protection of Children at each alternative installation would remain as described in the baseline section for each alternative. There were no disproportionate impacts to low-income, minority, or children identified under any of the action alternatives. There would be no additional impacts as a result of the No Action Alternative.

Notes: 190 ARW = 190th Air Refueling Wing; dB = decibel; DNL = Day-Night Average Sound Level; DoD = Department of Defense; 108 WG = 108th Wing; 157 ARW = 157th Air Refueling Wing; FAR = Federal Aviation Regulations; AICUZ = Air Installation Compatible Use Zone; ANGS = Air National Guard Station; PSD = Prevention of Significant Deterioration; HAP = hazardous air pollutant; O_3 = ozone; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO = carbon monoxide; NO_x = oxides of nitrogen; tpy = tons per year; CFR = Code of Federal Regulations; SIP = State Implementation Plan; BASH = Bird/Wildlife Aircraft Strike Hazard; JB MDL = Joint Base McGuire-Dix-Lakehurst; IAP = International Airport; 171 ARW = 171st Air Refueling Wing; 121 ARW = 121st Air Refueling Wing; NRHP = National Register of Historic Places; SHPO = State Historic Preservation Office; ERP = Environmental Restoration Program; LBP = lead-based paint; ACM = asbestos-containing material; USAF = United States Air Force

CHAPTER 1
PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States Air Force (USAF) plans to replace existing KC-135s with the KC-46A, which will be a new aircraft to the USAF's fleet. As such, the USAF plans to identify locations for the beddown of a formal training unit (FTU) and the first main operating base (MOB 1), which will both be led by active duty units. The USAF will also beddown the KC-46A at the Second Main Operating Base (MOB 2), which will be led by an Air National Guard (ANG) unit. The FTU alternative installations are Altus Air Force Base (AFB), Oklahoma and McConnell AFB, Kansas. The MOB 1 alternative installations include both Altus and McConnell AFBs, in addition to Fairchild AFB, Washington; and Grand Forks AFB, North Dakota. This particular document will analyze the potential environmental impacts associated with the MOB 2 beddown only, and will further reference the proposed FTU and MOB 1 beddowns only as necessary in the context of the proposed MOB 2 beddown. A separate Environmental Impact Statement (EIS) is currently being prepared for the FTU and MOB 1 beddowns.

The Secretary of the Air Force proposes to beddown KC-46A aircraft for MOB 2 at one of five alternative locations. The goal of KC-46A basing and fielding is to continue to provide optimum Combatant Commander support and to efficiently meet regional and global receiver demands while replacing existing KC-135s. This action would involve the beddown of one KC-46A squadron consisting of 12 Primary Aerospace Vehicles Authorized (PAA), and establishing a KC-46A Main Operating Base (MOB). Five alternative ANG locations (Figure 1.1-1) were selected for this beddown based on criteria identified in Section 2.2:

- Forbes Air National Guard Station (ANGS), Kansas;
- Joint Base McGuire-Dix-Lakehurst (JB MDL), New Jersey;
- Pease ANGS, New Hampshire;
- Pittsburgh ANGS, Pennsylvania; and,
- Rickenbacker ANGS, Ohio.

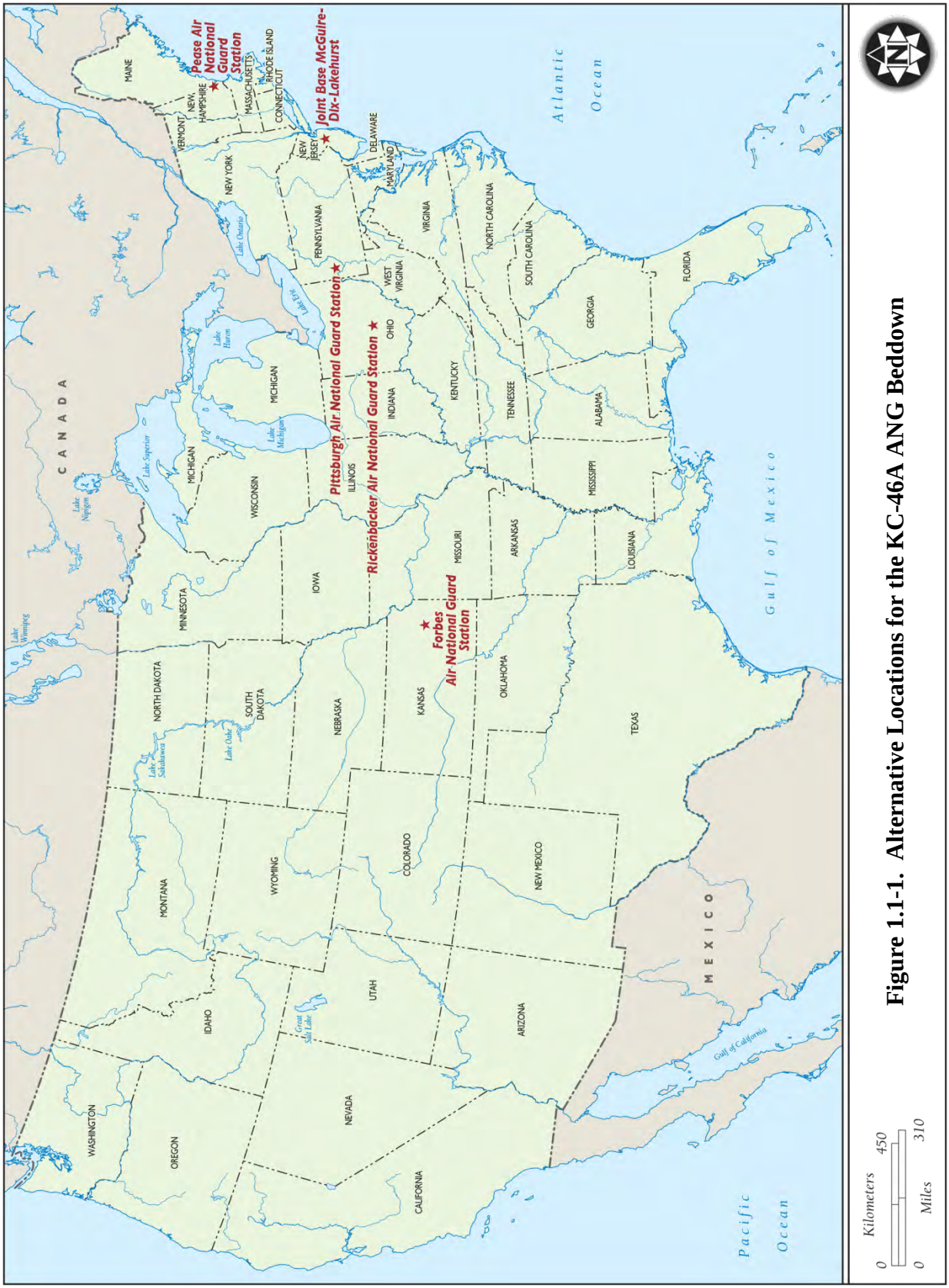

Figure 1.1-1. Alternative Locations for the KC-46A ANG Beddown

Concurrent with the beddown of the 12 KC-46A, 12 existing KC-135 aircraft would be retired out of the USAF fleet. The existing KC-135 aircraft at the selected installation would either be relocated to another installation and/or retired out of the USAF inventory, depending on the age and maintenance status of each aircraft. Separate documentation would be prepared if the KC-135 aircraft are relocated to another installation. The beddown of the MOB 2 KC-46A would follow the Total Force Integration (TFI) concept that was enacted into law through the passage of the 2008 National Defense Authorization Act (NDAA), pairing two USAF component units (host and associate) together to operate as one. TFI supports USAF transformation by developing, promoting, and implementing new and creative organizational constructs and by advocating changes in personnel policy that enhance the integration of active, reserve, and civilian work forces. In support of TFI, an active duty associate unit would be integrated with ANG personnel and equipment under any of the action alternatives, enabling joint training and execution of missions using ANG-assigned aircraft. The ANG host unit would be assigned principal responsibility of the physical resources for mission accomplishment (aircraft, equipment, facilities) and the active duty associate unit would share those resources.

In accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321-4347), Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of NEPA* (40 Code of Federal Regulations [CFR] Parts 1500-1508), and Air Force Instruction (AFI) 32-7061 as promulgated at 32 CFR Part 989 *et seq.*, *Environmental Impact Analysis Process*, the National Guard Bureau (NGB) has prepared this EIS, that considers the potential consequences to the human and natural environment that may result from implementation of this action.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.2.1 Purpose of Action

Air refueling is the backbone of the United States' (U.S.) ability to project global reach and combat power. Air refueling aircraft, also known as "tankers," are a joint asset, serving our sister services and U.S. allies who rely on the range and flexibility of tankers to strengthen their contribution to the coalition fight. Without a robust air refueling capability, U.S. forces would be limited in their ability to provide global reach. The original mission of the current USAF air refueling aircraft, the KC-135 Stratotanker, was primarily to refuel strategic bomber aircraft while in flight, which enhances the ability of aircraft to provide sustained mission capability without landing to refuel. Through the course of the KC-135's service life, structural and functional modifications have added capabilities to select aircraft. The result is a fleet of aircraft with multiple configurations and crews that may not be trained to accomplish every mission for which the aircraft is capable. This lack of standardized equipment and training throughout the fleet limits the ability for KC-135s to support, on a large scale, multi-role missions or exploit

new tactics and procedures. The following are examples of capabilities that the current KC-135 fleet lacks.

- Multi-Point Refueling. Simultaneous refueling of two probe-equipped receiver aircraft from the same tanker is limited to 20 sets of wing-mounted refueling pods installed on the aircraft for the fleet of tankers.
- Boom/Probe and Drogue Refueling. With the exception of the refueling pod equipped aircraft, the KC-135 fleet does not have capability to perform boom and probe/drogue refueling on the same sortie[1].
- Receiver capabilities. Only eight KC-135s have air refueling receptacles, which means that only eight of the KC-135 aircraft in the fleet can receive fuel in flight. This restricts force extension and limits persistence over the battlefield. It also results in inefficient use of valuable, but limited air refueling assets and limits flexibility within the maintenance schedule.
- Night Vision Imaging System (NVIS). The KC-135 fleet currently lacks a standard NVIS for tanker cockpits and boom operator positions. Additionally, exterior lighting is not currently NVIS-compatible, which prohibits air refueling in tactical NVIS (low vision) conditions. This limits the ability to perform covert air refueling operations at night, and degrades effectiveness of special operations support.
- Command, Control, Communications, and Computers (C4). KC-135s lack robust connectivity to command and control agencies. No secure tactical datalink exists and these aircraft have limited C4 connectivity to other combat, combat support, and mobility aircraft.
- Defensive Protection. KC-135s currently are not normally equipped with aircraft defensive systems, which limits aircraft from operating in anything other than a low-threat environment.

The purpose of this action is to ensure that the NGB will have air refueling support for both conventional global strike and nuclear deterrence operations into the future. The purpose of the KC-46A is to support air superiority through air refueling of fighter, bomber, attack, special operations, Command and Control, Intelligence, Surveillance and Reconnaissance, and transport aircraft; and to support employment of combat units deploying to areas of operations. Finally, the KC-46A will also support the Command and Control (C2) core function as a communications "gateway" when equipped with a roll-on gateway system to provide connectivity between tactical network partners in theater.

[1] Probe and drogue refueling employs a flexible hose that trails from the tanker aircraft. The drogue is a fitting resembling a windsock, and is attached with a valve to a flexible hose.

1.2.2 Need for Action

In support of the USAF worldwide operations and as part of the TFI, the NGB requires a refueling aircraft that will be equipped with major technological improvements designed to enhance operations and increase mission effectiveness. The KC-46A is the USAF's newest air refueling aircraft that meets this need. NGB requires a location to beddown the KC-46A aircraft in support of MOB 2. The base will support the beddown and training of crewmembers and personnel in the operation and maintenance of the KC-46A aircraft in an appropriate geographic location that can provide sufficient airfield, facilities, infrastructure, and airspace to support the KC-46A training and operations.

1.3 BACKGROUND OF THE KC-46A

1.3.1 Aircraft Characteristics

This section compares the aircraft characteristics of the KC-46A and the existing KC-135. Some key specifications of the KC-135 and the KC-46A are compared in Table 1.3-1

Table 1.3-1. Comparison of KC-135 and KC-46A

Specification	*KC-135*	*KC-46A*
Length	136 feet, 3 inches	165 feet, 6 inches
Height	41 feet, 8 inches	52 feet, 10 inches
Wingspan	130 feet, 10 inches	156 feet, 1 inch
Power Plant	4 F108 CF-100	2 Pratt Whitney 4062
Takeoff Thrust	21,634 pounds per engine	62,000 pounds per engine
Speed	530 miles per hour (mph) at 30,000 feet	530 mph at 30,000 feet
Ceiling	50,000 feet	40,100 feet
Maximum Take-off Weight	322,500 pounds	415,000 pounds
Maximum Fuel Capacity	200,000 pounds	212,000 pounds
Pallets/Palletized Cargo Weight Capacity	6/36,000 pounds	18/65,000 pounds
Crew	3 crewmembers	3 crewmembers
Receiver Fuel Transfer	Very limited	Yes
Fuel Jettison	Yes	Yes
Night Vision Imaging System	No	Yes
Multi-point Refueling	Very limited	Yes
C2 Network	No	Yes
Defensive Protection	Very limited	Yes
Aeromedical Evacuation	Limited	Yes

1.3.2 Aircraft Characteristics of the KC-135

KC-135

The KC-135 Stratotanker was developed in 1954 as the USAF's first jet-powered refueling tanker to replace the KC-97 Stratotanker and is derived from a commercial Boeing 367-80 commercial passenger plane. Between 1956 and 1966, 820 KC-135 aircraft of many different variations were built. Over the last 50 years, the KC-135 fleet has undergone substantial modifications to add capability. The KC-135 was originally developed to refuel strategic bombers. It was used in the Vietnam War and in all conflicts up to and including Operation Enduring Freedom in Afghanistan. For this EIS, all KC-135 models, including the current R model, are referred to as KC-135. Originally, all KC-135s were equipped with four Pratt & Whitney J-57-P-59W turbojet engines capable of producing approximately 13,000 pounds of thrust each. The current R models were upgraded to use the CFM56-2B1 (Military designation F108-CF-100) turbofan engines, which are capable of generating approximately 21,634 pounds of thrust per engine. The KC-135 has a maximum take-off weight of more than 322,500 pounds and the ability to off-load in excess of 150,000 pounds of fuel. In addition, the KC-135 is capable of transporting up to 36,000 pounds of palletized cargo and/or ambulatory patients during aeromedical evacuations. A cargo deck above the refueling system can hold a mixed load of passengers and cargo depending on the fuel storage configuration. The KC-135 pumps fuel through the flying boom, but some aircraft have been specially fitted with wing pods to allow a multi-point aerial refueling drogue system. As noted previously, the aircraft is limited by not possessing the capability for receiver fuel transfer, NVIS, defensive protection, and C2 capabilities.

1.3.3 Aircraft Characteristics of the KC-46A

KC-46A

The KC-46A is derived from a commercial Boeing 767-200ER series aircraft and will be powered by two Pratt & Whitney 4062 engines with thrust reversers removed. Each engine will have the capability to provide approximately 62,000 pounds of thrust. The aircraft will be Federal Aviation Administration (FAA)-certified for worldwide operations. The KC-46A is a fully provisioned version of the Boeing 767-2C, FAA Amended Type Certified aircraft. It is required to meet the FAA Part 36 Stage 4 (most restrictive commercial aircraft noise level standard) and the International Congress of Aeronautical Organizations, Committee of Environmental Protection 6 air contaminant emission limits. Three crewmembers, (pilot, copilot, and boom operator) will operate the aircraft with permanent seating for an additional 12 aircrew members. With new technology and a maximum fuel capacity expected to be over 212,000 pounds, the KC-46A is capable of accomplishing all current Air Mobility Command (AMC) refueling missions.

The KC-46A will be able to refuel any certified fixed-wing receiver-capable aircraft on any mission both day and night. The aircraft will be equipped with a modernized KC-10 refueling boom integrated with proven fly-by-wire control system and will have the ability to deliver fuel through a centerline hose and drogue system, which adds additional mission capability independent of the boom system.

This aircraft will be capable of accomplishing multi-role missions. By trading fuel for cargo, it will be able to carry up to 18 standard cargo pallets with a total palletized cargo payload of up to 65,000 pounds. With a far greater cargo area contour than the KC-135, KC-46A centerline pallet positions 1 through 8 can be built to carry full height (96-inch-high) cargo without the need for contouring, compared to KC-135 pallets, which are typically restricted to 65-inch-high cargo and must be contoured on the right-hand side starting at 50 inches off the top pallet surface. In normal operations, the KC-46A can be configured to carry 58 passengers and will be capable of providing urgent Aeromedical Evacuation, transporting up to 50 medical patients (24 litters/26 ambulatory).

Additional features include a flush-mounted air refueling receptacle, wing air refueling pods capability, boom air refueling camera and computer control systems, defensive and communication systems, NVIS/covert lighting, and military radio/navigation receivers. The boom operator will control the refueling systems from the crew compartment via the Air

Refueling Operating Station. A series of cameras mounted on the tanker's fuselage provide a 185-degree field of view under day and night lighting conditions. Imaging may be captured in three-dimensional or two-dimensional high-definition video. Fuel is automatically transferred within the aircraft to maintain center of gravity in all axes. The flow of fuel in, out, and within the aircraft can be manually or automatically controlled by the aircraft and can be manually controlled by the aircrew via control display units at the appropriate duty station.

In addition to fuel and cargo transport, each KC-46A aircraft will possess a secure airborne communications capability, which will provide beyond-the-line-of-sight messaging and line-of-sight tactical datalink multi-modal communications via secure networks. Hosting a suite of network-centric communications equipment, the KC-46A will function with most current C2 systems. The KC-46A will also support the C2 core function as a communications "gateway" when equipped with a roll-on gateway system to provide connectivity between tactical network partners in theater.

This aircraft will have self-defense and protection (both active and passive) capabilities and the necessary operational environment awareness to mitigate threats, but will not be operated in areas of high threats without requesting suppression of enemy air defenses and air support. This aircraft is capable of ferrying fuel into semi-austere airfields. By following Forward Area Refueling Point procedures, the aircraft can off-load fuel into fuel pits, bladders, trucks, or other aircraft, with or without the engines running, without the need for special equipment. The aircraft will be able to operate at certain night vision goggle and/or defensive system-required airfields with a minimum of 7,000 feet of paved runway available for take-off/landing.

The aircraft will be capable of operating in day-night and adverse weather conditions over vast distances to enable deployment, employment, sustainment, and redeployment of U.S., joint, allied, and coalition forces.

1.3.4 Training Requirements

KC-46A aircrews at the selected MOB 2 installation would complete operational sorties as part of their global reach missions and local training sorties to maintain proficiency in the aircraft. Training requirements for the KC-46A aircraft would be similar to those depicted for the KC-135 flight crews, which are detailed in AFI 11-2KC-135 Vol I (2012). An AFI 11-2KC-46 Vol. 1 is currently being developed to provide each flight crew member the minimum semi-annual and annual flying training requirements to qualify and maintain proficiency/currency (allowing for unsupervised flight) for the KC-46A and will provide the same minimum requirements for training.

Flight training, including air refueling and training in the flight simulator, is designed to provide basic and continuation aircrew training needs. A typical KC-46A proficiency training sortie would be very similar to a KC-135 training sortie and would include a departure from the installation, climb to altitude for air refueling training in appropriate airspace, return to the home installation for additional closed pattern training before landing for the sortie termination. Proficiency training sorties to fulfill the requirements of the AFI above typically depart from and return to the home installation on the same day. A global reach mission typically departs the home installation, returns on a later day, and accomplishes training as a by-product of the operational mission. Although some in-flight training and certification would occur, the majority of KC-46A system continuation training would be completed in simulators.

1.4 THE ENVIRONMENTAL IMPACT ANALYSIS PROCESS

In accordance with NEPA of 1969 (42 USC 4321-4347), CEQ *Regulations for Implementing the Procedural Provisions of NEPA* (40 CFR Parts 1500-1508), and AFI 32-7061 as promulgated at 32 CFR Part 989 *et seq.*, *Environmental Impact Analysis Process*, the NGB and USAF have prepared this EIS, which considers the potential consequences to the human and natural environment that may result from implementation of these activities.

NEPA requires federal agencies to take into consideration the potential environmental consequences of proposed actions in their decision-making process. The intent of NEPA is to protect, restore, and enhance the environment through well-informed federal decisions. The CEQ was established under NEPA to implement and oversee federal policy in this process. The CEQ subsequently issued the *Regulations for Implementing the Procedural Provisions of NEPA* (40 CFR Parts 1500-1508) (CEQ 1978).

The activities addressed within this document constitute a major federal action and therefore must be assessed in accordance with NEPA. To comply with NEPA, as well as other pertinent environmental requirements, the decision-making process for the Proposed Action includes the development of this EIS to address the environmental issues related to the proposed activities.

1.5 PUBLIC INVOLVEMENT/ENVIRONMENTAL COORDINATION

This EIS was prepared in compliance with all applicable local, state, and federal environmental regulations. An EIS is prepared as a tool for compiling information for a proposal and provides a full and fair discussion of environmental impacts to the natural and human environment. Reasonable alternatives to the Proposed Action, including the No Action Alternative are also evaluated in an EIS. The USAF has evaluated all reasonable alternatives to ensure that an informed decision is made after review and consideration of the potential environmental consequences.

Compliance with NEPA guidance for preparation of an EIS involves several critical steps summarized below.

1. *Announce that an EIS will be prepared*. For this EIS, a Notice of Intent (NOI) was published in the *Federal Register* on May 17, 2013.

2. *Conduct scoping.* This is the first major step in identifying the relevant issues to be analyzed in detail, and to eliminate issues that are not relevant. Scoping for this EIS occurred between May 17 and July 5, 2013. Throughout the scoping period, the NGB actively solicited public comments on the proposal. Information related to the proposal has been disseminated to the public through several avenues, including newspaper advertisements, public service announcements, a project website (www.angkc46aeis.com), and periodic fact sheets.

   Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, requires intergovernmental notifications prior to making any detailed statement of environmental impacts. Through the process of Interagency and Intergovernmental Coordination for Environmental Planning, the proponent must notify concerned federal, state, and local agencies and allow them sufficient time to evaluate potential environmental impacts of a Proposed Action. Comments from these agencies are subsequently incorporated into the environmental impact analysis process. Letters requesting input have been distributed to federal, state, and local agencies and are a part of the official project record. Appendix B

provides a list of relevant federal, state, and local agencies as well as sample notification letters, and comments received during the scoping period.

On November 27, 1999, the Department of Defense (DoD) promulgated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. This Policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective services (DoD American Indian/Alaska Native Policy), as does DoD Instruction 4710.02, *Interaction with Federally Recognized Tribes* (September 14, 2006). In addition, coordination with federally recognized Native American tribes must occur in accordance with EO 13175, *Consultation and Coordination with Indian Tribal Governments*. Section 106 consultation and government-to-government consultation for this project continued throughout the duration of EIS preparation. NGB has initiated government-to-government consultation with federally-recognized tribes that are historically, culturally, and linguistically affiliated with the area in recognition of the tribes' sovereignty as nations. This consultation also provides additional information and is used for Section 106 consultation (see Appendix B for example letters and responses received from tribes).

Concerns and comments identified during the scoping process have been included in the analyses, as appropriate. Scoping meetings were held in New Egypt, New Jersey and Moon Township, Pennsylvania on June 4; Portsmouth, New Hampshire and Columbus, Ohio on June 6; and Topeka, Kansas on June 20, 2013. During the scoping meetings, the NGB presented details about the proposal, the NEPA process, and provided an opportunity for public and agency involvement. In addition to receiving verbal and written comments at the scoping meeting, the NGB has also accepted written comments from the public and agencies through U.S. mail, website, and email. The majority of the comments received during the official comment submittal period (17 May to 5 July 2013) were in support of the KC-46A beddown at each specific location. However, there were some concerns regarding noise impacts and aircraft emissions. To the extent possible, scoping comments have been used to shape the analysis and focus the issues in this EIS.

3. *Prepare a Draft EIS.* The Draft EIS is a comprehensive document for public and agency review. The Draft EIS describes the purpose and need of the Proposed Action and alternatives; presents the existing conditions in the region potentially affected; and provides analysis of the environmental consequences of the Proposed Action and

alternatives, including the No Action Alternative. The Draft EIS was distributed to agencies, regional libraries, and members of the public who requested copies.

4. *Public/Agency Review.* There was a 45-day public comment period following the Notice of Availability (NOA) for the Draft EIS, which was published in the *Federal Register* on February 7, 2014. This initiated the public comment period, and public hearings were held at each alternative location. During the public hearings, the NGB presented details about the proposal, the NEPA process, and provided attendees an opportunity to provide written and/or oral comments. In addition to receiving verbal and written comments at the hearings, the NGB also accepted written comments from the public and agencies through U.S. mail, website, and email. All substantive comments received during the public comment period have been fully considered and addressed in the Final EIS, as appropriate. Written comments submitted at the public hearing and those received via other means were given equal consideration in the preparation of the Final EIS.

   Generally, substantive comments are regarded as those comments that challenge the analysis, methodologies, or information in the Draft EIS as being factually inaccurate or analytically inadequate; that identify impacts not analyzed or develop and evaluate reasonable alternatives or feasible mitigations not considered by the agency; or that offer specific information that may have a bearing on the decision, such as differences in interpretations of significance or of scientific or technical conclusions. Non-substantive comments, which do not require an agency response, are generally considered those comments that express a conclusion, an opinion, or a vote for or against the proposal itself, or some aspect of it; that state a position for or against a particular alternative; or that otherwise state a personal preference or opinion.

5. *Prepare a Final EIS.* The Final EIS has been prepared following the public comment period and includes all written comments and verbal testimony from public and agency reviewers during the public hearing and the comment period. The Final EIS has been revised to reflect public and agency comments, the proponent's responses, and additional information received from reviewers. The Final EIS provides the decision-maker with a comprehensive review of the potential environmental consequences of selecting any of the alternatives carried forward for detailed analysis. A NOA will be published in the *Federal Register* to announce availability of the Final EIS.

6. *Issue a Record of Decision.* The final step in the NEPA process is approval of the Record of Decision (ROD). After the NOA is published in the *Federal Register*, there is a 30-day waiting period before the ROD is signed. The ROD will identify the action that has been selected by the Secretary of the Air Force and what management actions or other

measures would be carried out to reduce, where possible, adverse impacts to the environment.

1.6 LEAD AND COOPERATING AGENCIES

The role of a federal agency in the NEPA process depends on the agency's expertise and relationship to the proposed undertaking. The agency carrying out the proposed action is responsible for complying with the requirements of NEPA. In some cases, there may be more than one federal agency involved in an undertaking. In this situation, a lead agency is designated to supervise preparation of the environmental analysis. Federal agencies, together with state, tribal, or local agencies, may act as joint lead agencies. The NGB and USAF are the proponents for this proposal and are the responsible agencies for preparation of the EIS. As defined in 40 CFR § 1508.5, a cooperating agency is "any Federal agency other than a lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. A state or local agency of similar qualifications, or when the effects are on a reservation, an Indian Tribe may, by agreement with the lead agency, become a cooperating agency." No cooperating agencies have been identified for this EIS.

1.7 ORGANIZATION OF THIS ENVIRONMENTAL IMPACT STATEMENT

Chapter 2 describes the Proposed Action and reasonable alternatives, including the No Action Alternative, and the alternative selection process. Chapter 3 is organized by each of the five alternative bases and presents the environmental baseline conditions at each base. Chapter 4 is also organized by each of the five action alternatives as well as the No Action alternative, and presents the potential environmental impacts associated with implementation of any of the alternatives. Chapter 5 identifies past, present, and reasonably foreseeable projects within the regional context of each of the five alternative locations, and describes potential cumulative impacts of the Proposed Action in combination with these other regional actions at each alternative base. Chapter 6 lists the references cited in the document. Chapter 7 lists those agencies, organizations, and persons that were contacted during the preparation of this EIS. Chapter 8 contains the list of preparers and contributors. In addition to the main text, the following appendices are included in this document: Appendix A, Resource Definitions and Methodologies; Appendix B, Correspondence; Appendix C, Background Information for the Noise Analysis; Appendix D, Air Quality; and Appendix E, Special Status Species Lists.

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CHAPTER 2
DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

2.1.1 Overview of the Proposed Action

The USAF has a requirement to provide refueling aircraft that will be equipped with major technological improvements designed to enhance operations and increase mission effectiveness. The NGB proposes to beddown one squadron of 12 KC-46A aircraft at one of five alternative locations: Forbes ANGS, Kansas; JB MDL, New Jersey; Pease ANGS, New Hampshire; Pittsburgh ANGS, Pennsylvania; or Rickenbacker ANGS, Ohio. Additionally, one active duty associate unit would be integrated with ANG personnel and equipment, enabling joint training and execution of missions using ANG-assigned aircraft. Furthermore, the NGB would implement construction projects associated with the aircraft beddown at the selected installation. Concurrent with the beddown of the KC-46A, the existing KC-135 aircraft at the selected installation would either be relocated to another installation and/or retired out of the USAF inventory.

As a result of the Proposed Action, there would be a change to the type of aircraft based at the selected installation; a change to the mix of aircraft using the associated airspace; changes to staffing and manpower at the selected location; changes to the number of airfield operations; as well as minor required construction, building renovation, and facility demolition. There would be no new or modified airspace required to support this action. The proposed beddown is estimated to begin in FY 2018 for the NGB, and construction is estimated to begin in FY 2015. Although proposed construction is necessary for the long-term viability of the beddown, aircraft operations with the KC-46A could begin prior to implementation of the construction.

2.1.2 Requirements of the Proposed Action

2.1.2.1 Aircraft Beddown/Transition

The KC-46A is planned to eventually replace existing USAF KC-135s. The NGB proposes to begin this process by replacing the aircraft at the selected location with 12 KC-46A operational aircraft (regardless of how many aircraft are currently at the alternative location). It is estimated that the 12 KC-46A aircraft would be beddown at the selected location beginning in FY 2018. The existing KC-135 aircraft at the selected location would either be relocated to another

installation and/or would be retired out of the USAF inventory. The relocation/retirement actions would be evaluated under NEPA, as appropriate.

2.1.2.2 Facility and Infrastructure Requirements

While basing the KC-46A would require certain facilities and infrastructure to support necessary training and operational requirements, utilizing existing infrastructure to the maximum extent feasible comprises a fundamental basis of the Proposed Action. Where existing facilities and infrastructure cannot meet the needs of the Proposed Action, the NGB would implement construction of necessary new and/or renovated infrastructure and facilities at the selected alternative installation. The type of construction needed would vary by installation and is detailed further in each respective installation Sections 2.3.1 through 2.3.5.

Facility requirements include:

- *Squadron Operations Facility* – Necessary for daily operational activities.
- *Flight Simulator/Boom Operator Training Facility* - Major aircrew training devices required for a 12 PAA KC-46A aircrew continuation training program include one Flight Simulator, one Boom Operator Trainer, and a Fuselage Trainer.
- *Academic Training Facility (ANG uses Reserve Forces general purpose training areas)* - Space is necessary to provide space for classroom training and brief/debrief areas.
- *Aircrew Flight Equipment Facility (ANG incorporates this facility with Squadron Operations)* – Aircraft equipment and mobility bins are best suited to be located at or near a flightline entry control point.
- *Vehicle Operations Administration and Maintenance Shop*
- *Command Post* – an adequate operational, administrative, and training office space with the ability to discuss up to and including Top Secret, and perform daily and contingency C2 duties.
- *Maintenance Hangar*
- *Corrosion Control/Wash Rack Facility*
- *Fuel System Maintenance Hangar*
- *Parking Ramp for a minimum of eight KC-46A parking spots*
- *Aircraft General Purpose Shops*
- *Maintenance Training Facility*
- *Aerospace Ground Equipment (AGE) Shop*
- *Supply Warehousing*
- *Aerial Port Cargo Facility/Processing yard*

2.1.2.3 Personnel Changes

The KC-46A would provide substantial expanded capabilities with only minor overall changes in military personnel; however, the mission would require basing sufficient and appropriate personnel to operate and maintain the Wing and to provide necessary support services. In addition, there would be an active duty associate unit based with the selected MOB 2 alternative installation. The number of personnel would vary by installation and is detailed further in each respective installation Sections 2.3.1 through 2.3.5.

2.1.2.4 KC-46A Operations

Under the Proposed Action, the 12 PAA KC-46A aircraft would fly 670 hours per aircraft, per year, for a total of 8,040 hours annually. Because this is a new aircraft flying with a combination of ANG and associate active duty personnel, a uniform distribution of flying hours was assumed for each alternative. This is considered a conservative estimate and any deviation from this would likely be fewer hours flown. Thus, with an average sortie duration (ASD) of 4.0 hours, the KC-46A aircraft would fly 2,010 sorties annually. The 2,010 annual sorties would be flown at a combination of the unit's home-station as well as off-station airfields, where they are able to train in a different setting than their home-station. As discussed in Section 2.3, each of the five alternative installations currently fly a different number of airfield operations per sortie, as well as a different percent of home-station/off-station operations. In developing the analysis for each installation, the installations' unique ratio of airfield operations was assumed to remain the same into the future, as were the percent of home-station/off-station operations. This resulted in a range of home-station airfield operations across the five action alternatives. Further, it is recognized that there is a recent trend toward an increasing use of flight simulators, which can reduce the number of hours flown. However, without a clear definition in the use of the simulator as opposed to actual airfield operations, the full 8,040 flying hour program has been analyzed for each action alternative. No changes are proposed to airfield departure/arrival patterns and tracks, flight profiles, and use of runways from those that are currently performed with the KC-135 at each MOB 2 location. Any existing noise abatement procedures would continue to be followed.

Common Operational Terms

Sortie: refers to a single military aircraft from take-off through final landing, and everything that might be conducted during that flying mission. A *sortie* will always include more than one *operation*.

Operation: this term can apply to both airfield and airspace activities. At an airfield, an operation consists of a single action such as a take-off, or a landing (i.e., two operations). For airspace and ranges, an operation consists of the use of one airspace unit (e.g., Military Operations Area [MOA], Air Refueling Track) by one aircraft. Each time a single aircraft flies into a different airspace unit, one operation is counted. During a single sortie, an aircraft could fly in several airspace units, and conduct a number of operations; therefore, the number of operations exceeds the number of sorties.

Under the Proposed Action, there would be some increases in the frequency of use and number of operations conducted in the airspace currently used by the KC-135, depending on the increase of sorties over the current baseline at each alternative installation (described in more detail in Sections 2.3.1 through 2.3.5). The KC-46A would use the same airspace currently used by the selected installation, with no new airspace required to support the mission. The types of airspace used would consist of published air refueling tracks, Anchors, Warning Areas, and Military Operations Areas (MOAs). These are found in the Department of Defense (DoD) AP/1B, Flight Information Publication, and Area Planning documents. All air refueling is accomplished above 10,000 feet mean sea level (MSL), although some MOAs are approved for lower altitude flight for training not involving air refueling. While a large percentage of air refueling occurs close to the home-station airfield, KC-135 aircraft refuel in other refueling tracks and Warning Areas located throughout the U.S. Under the Proposed Action, the KC-46A would use the airspace in the same manner as the KC-135 aircraft. It is anticipated that the KC-46A would operate in existing airspace and conduct flight operations similar to the existing KC-135 aircraft; therefore, detailed analysis of airspace will not be conducted in this EIS.

Air Refueling Airspace Terms

Air refueling tracks: Published linear routes identified on air navigation charts that define the flight path used by aircraft when refueling other aircraft. For fixed wing aircraft, this generally occurs above 10,000 feet MSL.

Anchors: Air refueling tracks that go in a race-track shape (i.e., loop).

Warning Areas: A warning area is airspace of defined dimensions, extending from 3 nautical miles outward from the coast of the United States, containing activity that may be hazardous to non-participating aircraft. The purpose of such areas is to warn non-participating pilots of the potential danger. A warning area may be located over domestic or international waters or both. The airspace is designated with a "W" followed by a number (e.g., W-237).

Military Operations Area (MOA): Airspace below 18,000 feet mean sea level (MSL) established to separate military activities from Instrument Flight Rule (IFR) traffic and to identify where these activities are conducted for the benefit of pilots using Visual Flight Rule (VFR).

2.2 NARROWING PROCESS FOR ALTERNATIVE BASES

As previously described, the NGB is programmed to beddown one squadron of 12 PAA KC-46A aircraft at one of five alternative locations. Identification and analysis of alternatives is one of the core elements of the environmental process under NEPA and the USAF's implementing regulations. The NGB may expressly eliminate alternatives from detailed analysis based on reasonable selection standards (32 CFR 989.8(c)). Based on extensive analysis by the USAF operations community, a siting study was conducted to determine the specific requirements for beddown of the KC-46A aircraft and to identify potential military installations where this beddown could occur. Following this study, the Secretary of the Air Force and the Chief of Staff of the Air Force approved selection criteria for the KC-46A beddown.

In general, the USAF uses the Strategic Basing process outlined in AFI 10-503 (2010) to select locations to beddown USAF missions. The process begins by identifying all the installations that could reasonably support a given mission. This enterprise of installations is then evaluated using objective criteria to screen the top candidate installations. Major Command-led site surveys are then conducted at each alternative location to determine if the installation could reasonably support the mission in question. The Strategic Basing Executive Steering Group oversees the process and reports findings directly to the Secretary of the Air Force and Chief of Staff of the Air Force. This process was mandated by the Secretary of the Air Force to ensure basing decisions were made using a deliberate, standardized, and repeatable process. The KC-46A basing decision followed this general basing process.

In September 2011, Air Mobility Command (AMC) presented to the Secretary of the Air Force the Lead Command Intent for the KC-46A. This Lead Command Intent described the proposed basing action tenets, force structure mix, basing timelines, other critical information, and will ultimately be used to shape and inform decisions made throughout the USAF Strategic Basing Process. The following planning conventions were derived from the Lead Command Intent:

1. Identify the number of KC-46A aircraft scheduled to be delivered between 2014 and 2018. This time period corresponded to the DoD Future Years Defense Program, which is the program and financial plan approved by the Secretary of Defense, and provides a basis for USAF planning. Planning beyond this time period is speculative due to the uncertainty of funding availability.
2. Identify the number of KC-46A aircraft to be allocated to operations based on then-current national strategic considerations.
3. Determine the number of bases capable of supporting one squadron of up to 12 PAA. PAA are those aircraft assigned to meet the primary aircraft authorization and reflect the number of aircraft flown by a unit in performance of its mission.
4. Recognize additional factors of Plans and Guidance and Global Positioning, which include strategic considerations but do not provide meaningful distinction among bases for USAF training within the U.S. and its territories. An additional Logistics Supportability factor equates to Boeing's support capacity set forth in its contract with the USAF. This factor does not distinguish among bases and is not included in the identification of reasonable MOB 2 beddown alternatives.

Consideration of the planning conventions above led to an initial screening of all ANG installations against the following standards for the MOB 2: 1) A runway of at least 7,000 feet in length, 2) the presence of an ANG Wing on the installation, and 3) the installation had to be located in the continental United States (CONUS). The initial screening yielded a defined enterprise of 83 candidate installations to be evaluated for the MOB 2 beddown. In 2012, AMC presented objective screening criteria to the Strategic Basing Executive Steering Group to be used in the identification of bases for the beddown of the KC-46A. The approved criteria were

used to screen the enterprise of 83 candidate installations to identify those installations' capacity to successfully support the MOB 2 mission. The objective criteria included mission, capacity, environmental considerations, and cost and are described in more detail below:

Ability to meet the mission requirements. Under this criterion, the candidate location must be within reasonable proximity to refueling receiver demand, airfield and airspace availability, fuel system capabilities, and must have the potential to establish an association with an active duty unit.

Capacity. The candidate location must have hangar capacity; runway length and weight bearing capacity; ramp space; base operation support capacity; squadron operations facilities with aircraft maintenance units; aircrew, maintenance, and fuselage training capabilities; and the necessary communications infrastructure.

Environmental Constraints. The candidate location must be able to demonstrate conformity with the respective State Implementation Plan (SIP), meet the local community's adoption of zoning or other land use controls to reduce encroachment and preserve the base's flying operations, waivers or absence of incompatible development in the clear zone (CZ) and/or accident potential zone (APZ), and have an absence or limited amount of incompatible development within noise contours above 65-decibel (dB) Day-Night Average Sound Level (DNL).

Cost. Given budgetary constraints, it was important for the USAF to select candidate bases that have a favorable area construction factor based on DoD Facilities Pricing Guide, dated June 2007 (DoD 2007), as updated by the June 2009 draft Office of the Secretary of Defense Pricing Guide (DoD 2009a).

The Secretary of the Air Force considered the objective screening results as well as qualitative operational factors in determining the alternative installations for the KC-46A MOB 2 mission. These military judgment factors included:

- Plans and Guidance
- Global and Regional Coverage
- Combatant Commander Support
- Total Force
- Beddown Timing
- Force Structure
- Training Requirements and Efficiencies
- Logistic Supportability
- Resources/Budgeting

The Strategic Basing Process described above resulted in the identification of five alternative bases for consideration.

- Forbes ANGS, Kansas
- JB MDL, New Jersey
- Pease ANGS, New Hampshire
- Pittsburgh ANGS, Pennsylvania
- Rickenbacker ANGS, Ohio

2.3 ACTION ALTERNATIVES CARRIED FORWARD

This section describes the specific requirements of the beddown of one squadron of 12 KC-46A aircraft at each of the five alternative installations.

2.3.1 Alternative #1 – Forbes Air National Guard Station

2.3.1.1 Background

Forbes ANGS, home of the 190th Air Refueling Wing (190 ARW) of the Kansas Air National Guard (KS ANG), is located approximately 5 miles south of Topeka in Shawnee County, Kansas (Figure 2.3-1). The 190 ARW base is situated on the northwest side of Forbes Field Airport, a municipal airport owned and operated by Metropolitan Topeka Airport Authority (MTAA). The 190 ARW holds a lease with the Forbes Field Airport for the installation property with a termination date of 2057. The installation occupies approximately 216 acres.

2.3.1.2 Mission

The 190 ARW of the KS ANG is a tenant at Forbes Field Airport in Topeka, Kansas. The 190 ARW is tasked with providing air-to-air refueling and airlift capabilities for DoD assets worldwide. The 190 ARW also supports state emergency missions. The 190 ARW currently flies and maintains 12 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 190 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

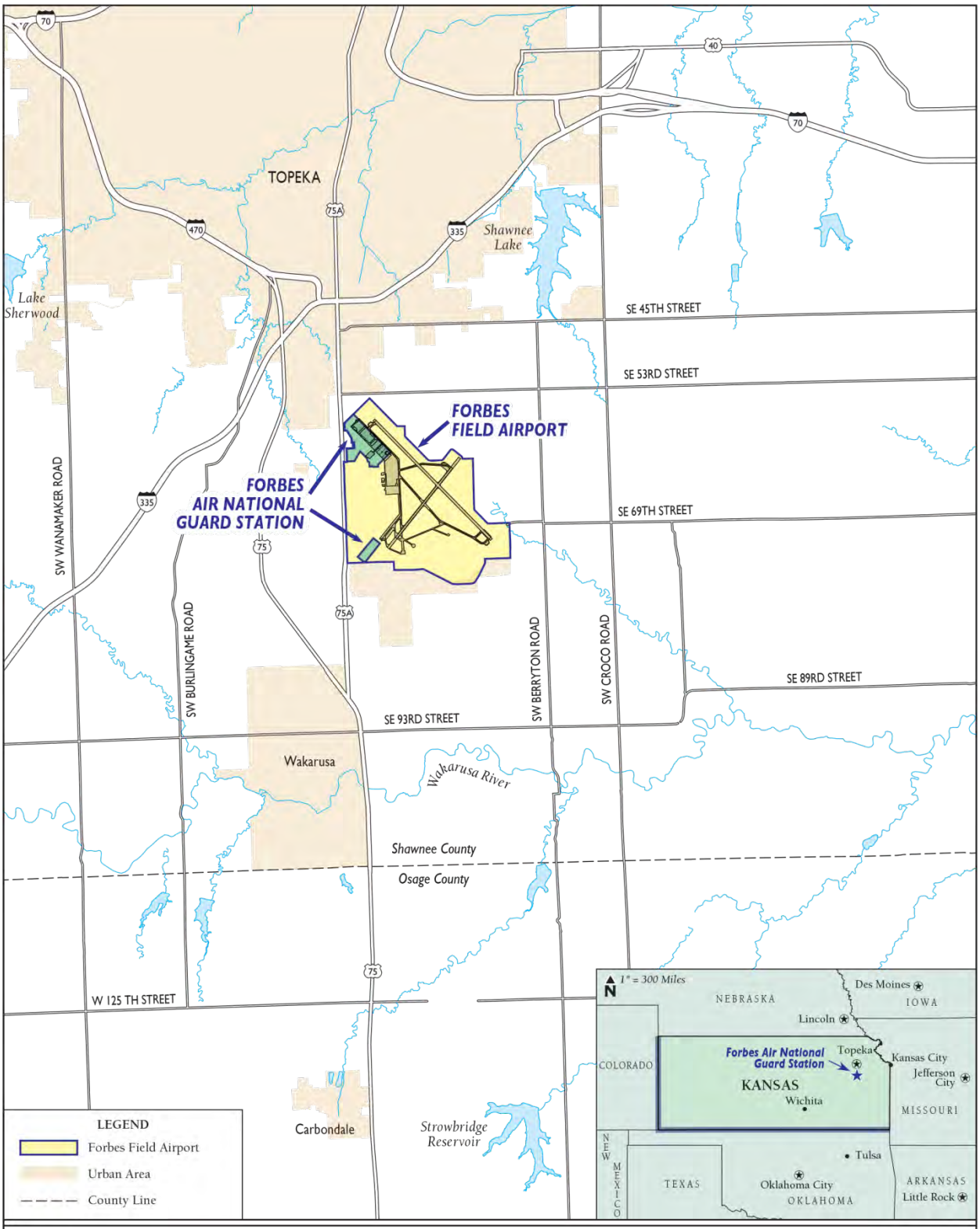


Figure 2.3-1.
Regional Location
Forbes ANGS

2.3.1.3 Aircraft Conversion

Under Alternative #1, the 190 ARW would convert from 12 KC-135 PAA and no KC-135 Backup Aerospace Vehicle Inventory (BAI) to 12 KC-46A PAA. Concurrent with the beddown of the 12 KC-46A PAA at Forbes ANGS, the existing KC-135 aircraft would either be relocated to other installations or retired out of the USAF inventory, depending on the life-cycle status of each particular aircraft. Separate NEPA documentation would be prepared for any of the aircraft relocated to other installations.

2.3.1.4 Airfield Operations

Forbes Field Airport has two runways; Runway 13/31 is 12,802 feet long and 200 feet wide and Runway 03/21 is 7,001 feet long and 150 feet wide (AirNav 2013a).

The 190 ARW currently flies 1,478 sorties annually. According to the unit's scheduling data and airport traffic counts, 946 of these sorties were flown from Forbes Field Airport, or 64 percent of the total annual sorties flown. The remaining sorties were flown from other airfields in the U.S. and/or overseas in support of operational missions. Actual airfield operational data collected for 2012 indicates that the 190 ARW accounted for 10,452 airfield operations, with an average of 11 airfield operations per sortie (Table 2.3-1).

Table 2.3-1. Current 190 ARW KC-135 Operations at Forbes Field Airport

	Departures		Arrivals		Total		Grand
Aircraft	*Day*	*Night*[1]	*Day*	*Night*[1]	*Day*	*Night*[1]	*Total*[1]
KC-135	4,541	685	4,390	836	8,931	1,521	10,452

Notes: 1. Night –Between 10 p.m. and 7 a.m. for environmental night.
Source: FAA 2012a.

Following the aircraft beddown under Alternative #1, the KC-46A aircraft would fly a total of 8,040 hours annually, with an ASD of 4.0 hours. This would result in 2,010 sorties annually, 64 percent of which would be performed at the home-station (Forbes ANGS). Thus, it is expected that up to 1,286 sorties would be flown at Forbes Field Airport annually under this alternative. This would be an increase of 36 percent over the 946 home-station sorties identified in 2012 (it is assumed that the same percentage of the sorties found under current baseline conditions would be flown at Forbes ANGS under this alternative). Based on 1,286 annual home-station sorties and an average of 11.32 operations per sortie, there would be 14,562 annual home-station operations, or an additional 4,110 airfield operations annually at Forbes Field Airport (Table 2.3-2). This would increase the average daily airfield operations from 40.2 to 56.0 (Table 2.3-3). There would be no changes expected to departure/arrival patterns and tracks, flight profiles, and use of runways. Current noise abatement procedures would continue to be followed (see Section 4.1.1, *Noise*).

Table 2.3-2. Proposed 190 ARW KC-46A Operations at Forbes Field Airport

Aircraft	Departures		Arrivals		Total[1]		Grand Total[1]
	Day	Night[2]	Day	Night[2]	Day	Night[2]	
KC-46A	6,322	959	6,118	1,163	12,440	2,122	14,562

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.

Table 2.3-3. Changes to 190 ARW Airfield Operations with Proposed KC-46A Aircraft[1]

Unit	Total Based KC-135 Annual Airfield Operations (Average Daily Airfield Operations)	Total Proposed KC-46A Annual Airfield Operations (Average Daily Airfield Operations)	Increased Airfield Operations Annually for Proposed KC-46A Operations (Percent Increase)
190 ARW	10,452 (40.2)	14,562 (56.0)	4,110 (39.3%)

Note: 1. Yearly operations for Forbes are based on a 5-day flying week, or 260 days/year.

2.3.1.5 Airspace Operations

The 190 ARW conducts air refueling for both training and contingency missions for receiver aircraft. Primary air refueling tracks used by the 190 ARW are described in Table 2.3-4. Under Alternative #1, there would be a change to the frequency of use due to the proposed increase in the sorties. The KC-46A will also have a requirement for training as a receiver aircraft (on-loading fuel) and would use the existing air refueling tracks as a receiver in addition to the normal use as a refueling aircraft (off-loading fuel). However, the minutes in the airspace for each sortie and the operational training conducted would not be expected to change in any of the airspace described.

Table 2.3-4. Current and Proposed Local Air Refueling Airspace Used by the 190 ARW[1]

Airspace Unit Altitude Floor and Ceiling	*Current Aircraft Proposed Aircraft*	*Minutes in Airspace for Each Sortie*	*Average KIAS[2]*	ANNUAL SORTIE OPERATIONS	
				Current	*Proposed*
AR 116 12,000-FL220	KC-135 KC-46A	55	275	100	136
AR 330 FL190-FL220	KC-135 KC-46A	55	275	100	136
AR 406H FL 260-290	KC-135 KC-46A	55	275	100	136
AR 406L FL200-FL220	KC-135 KC-46A	55	275	100	136
AR 406H FL260-FL280	KC-135 KC-46A	55	275	100	136
AR 110 FL240-FL270	KC-135 KC-46A	55	275	100	136
112 FL240-FL310	KC-135 KC-46A	55	275	100	136
AR 105 FL190-FL330	KC-135 KC-46A	55	275	100	136
Eureka MOA R 5502 6,000 feet MSL UTBNI FL 180	KC-135 KC-46A	30	315	100	136
Bison MOA 1,000 feet MSL UTBNI FL180	KC-135 KC-46A	30	315	100	136
Truman MOA 5,000 feet MSL UTBNI FL180	KC-135 KC-46A	30	315	100	136
HOG HI MOA 6,000 feet MSL UTBNI FL180	KC- 135 KC-46A	30	315	100	136

Notes: 1. This table only shows KC-135 and KC-46A aircraft that are or would be flown by the 190 ARW in this airspace. Additional aircraft flown by other units that use this airspace are not shown.
2. Annual sortie operations are the number of times air refueling track/MOA is scheduled to be used by unit.
KIAS = knots indicated airspeed; FL = Flight Level; MOA = military operations area; UTBNI = up to, but not including; MSL = mean sea level.

2.3.1.6 Construction Required

Under Alternative #1, 12 KC-46A PAA aircraft would be beddown at the 190 ARW installation at Forbes Field Airport, Kansas; the 190 ARW would also implement construction projects for that conversion (Table 2.3-5). The proposed construction projects would comply with standards set forth in ANG Handbook 32-1084, *Facility Space Standards* (November 2012). Anti-Terrorism/Force Protection (AT/FP) requirements also would be incorporated. Proposed facilities would be sited approximately as shown in Figure 2.3-2. The precise layout and design of proposed facilities is in the early planning stages; therefore, exact locations and layouts are not finalized. Should locations and final layout of the facilities differ substantially from those anticipated and depicted herein, further environmental analysis would be required. Each of these projects is described in more detail in the following sections.

Table 2.3-5. Proposed 190 ARW Construction Projects at Forbes Field Airport

Project Description	*Total New Construction Footprint (SF)*	*New Impervious Surface (SF)*	*Estimated Year of Implementation*
Project #1 (Option 1) – Addition to Hangar 662			
This project would include the construction of two additions totaling 11,657 SF to Hangar 662 in order to provide an adequately sized hangar for the new KC-46A aircraft, Fuel Cell Hangar, Maintenance Hangar, Weapons System Trainer, and Boom Operator Trainer.	11,657	0	FY 2015
Project #1 (Option 2) – Addition to Hangar 662			
This project would involve a 5,847 SF addition to include a Maintenance Hangar, Weapons System Trainer, and Boom Operator Trainer, and Fuselage Trainer	5,847	0	FY 2015
Project #2 (Option 1) – Internal Renovations to Hangar 665			
Renovate the building interior to include a Fuselage Trainer.	0	0	FY 2015
Project #2 (Option 2) – Addition to Hangar 665			
This project would include a 18,985 SF addition to the Fuel Cell Hangar in order to provide an adequately sized hangar for the new KC-46A aircraft.	18,985	0	FY 2015
Project #3 – Internal Renovations to Building 679			
This project would reallocate space within the building for aircrew flight equipment. No modifications would be necessary for squadron operation, base operations, and command post.	0	0	FY 2015
Project #4 (Option 1 and 2) – Pave Apron /Hydrants and Airfield Hold Ramp[1]			
This project would include the repair of pavement over the hydrant system and apron pavement between the hangars (184,820 SF).	184,820	0	FY 2015
Project #4 (Option 2) – Pave Apron /Hydrants and Airfield Hold Ramp			
This project would include repavement of approximately 42,687 SF of the airfield hold ramp off the second runway as well as the 184,820 SF addition described above.	227,507	0	FY 2015
Total	**258,149**[2]	**0**	

Notes: 1. Two options are possible for the modifications to these projects. Only one of these options would be implemented.
2. The total construction footprint includes only the project option that has the greatest footprint of each of the options so as to represent the most conservative (highest amount) facility footprint given the multiple options possible.
SF=square feet; FY = fiscal year

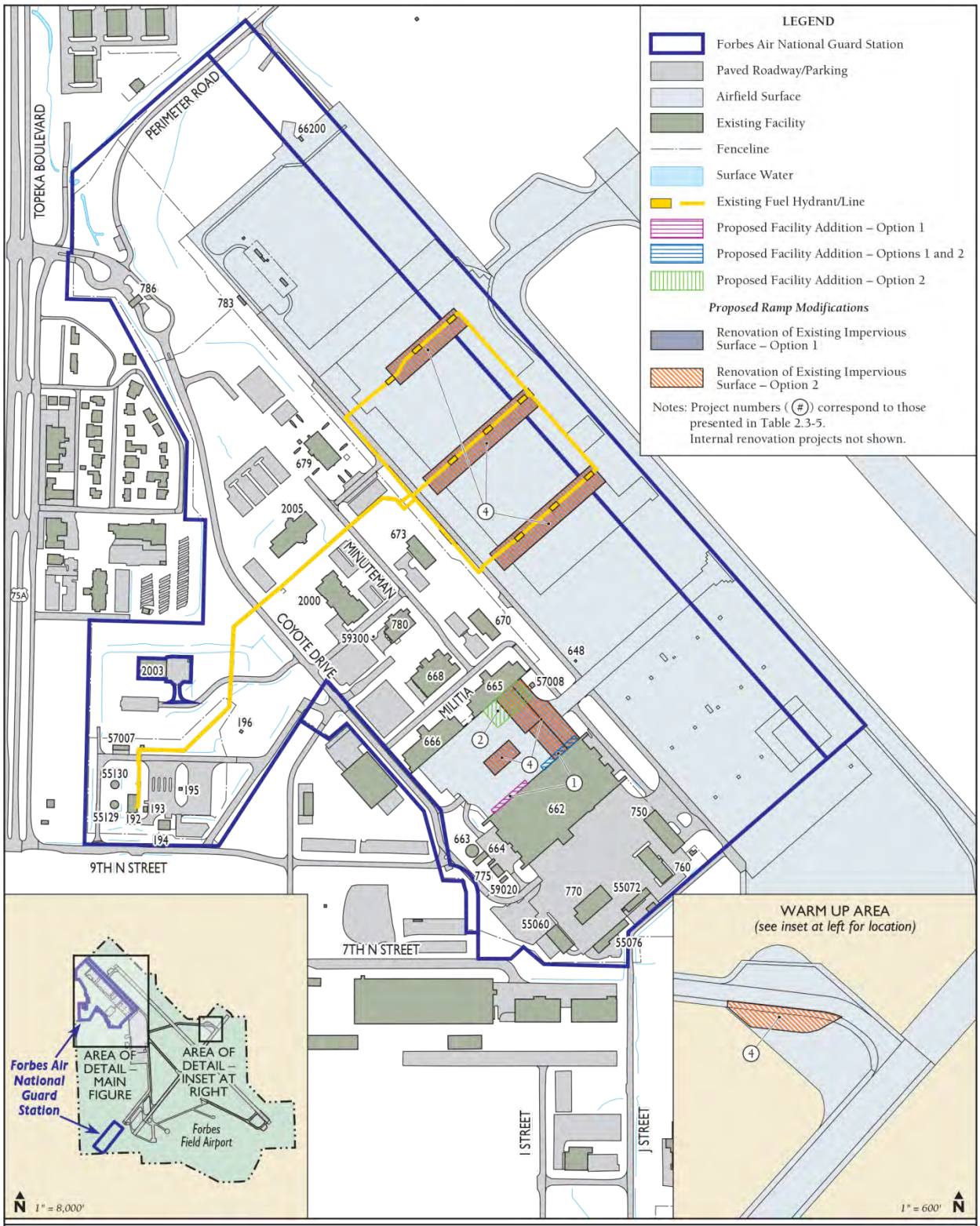


Figure 2.3-2. Construction Associated with Alternative #1, Forbes ANGS

Implementation of the KC-46A aircraft beddown would require the 190 ARW to ensure its installation has properly sized and adequately configured facilities to support 12 KC-46A aircraft. The Forbes ANGS location was deemed to have an acceptable level of facilities to support this beddown and has facilities that currently meet the majority of the requirements identified in Section 2.1.2.2. However, some functional areas require modification. Two construction scenarios are under consideration. Under Option 1, two buildings would be renovated to accommodate the KC-46A maintenance, fuel cell, Weapons System Trainer, Boom Operator Trainer, and Fuselage Trainer. Minor adaptations would be made to a third building to accommodate aircrew flight equipment. This option assumes Sustainment, Restoration, and Modernization execution of pre-existing ramp and primary runway repairs. No changes to fuel hydrants and fuel lines would be required on the parking apron under this option. Under Option 2, two buildings would be renovated: Hangar 662, the Maintenance Hangar, would be modified to house the Maintenance Hangar, Weapons System Trainer, Boom Operator Trainer, and the Fuselage Trainer. Hangar 665, the Fuel Cell Hangar, would be modified to house the Fuel Cell Hangar. Concrete pavements directly over the existing hydrant systems would be repaired and the ramp would be re-striped. Pavement would be added to the airfield hold ramp off the second runway. The hydrant system would be maintained in its current state.

The projects described would incorporate Leadership in Energy and Environmental Design (LEED) and sustainable development concepts. This would achieve optimum resource efficiency, constructability, sustainability, and energy conservation, while minimizing adverse impacts to the built and natural environments through all phases of their life cycle. This may result in primary facility costs exceeding DoD costing standards, but the initial investment in higher acquisition cost would be offset with lower life cycle costs. This is consistent with the requirements of the Energy Policy Act of 2005, 10 USC 2802, EO 13423, and other applicable laws and EOs.

Addition to Hangar 662

A minimum of one Fuel Cell Hangar is required to support the maintenance and operations of KC-46A. Additionally, a minimum of one Maintenance Hangar is required to support the maintenance and operations of KC-46A. Hangars provide an environmentally controlled area to perform maintenance on vital components of the aircraft system. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135, thus requiring slightly larger hangars. Hangar 662 would be modified to meet KC-46A requirements. One of two options could occur

South Side of Hangar 662

to satisfy these requirements. Option 1 would house the maintenance shops and safety systems required to perform fuel systems maintenance including pressure checks and inspections. Aircraft hangar space for on-aircraft open fuel cell maintenance would be provided. Interior modifications also would be made to house the KC-46A Weapons System Trainer and Boom Operator Trainer. Option 1 would include the construction of two additions totaling 11,657 square feet (SF). Option 2 would provide space for a Maintenance Hangar, Weapons System Trainer, Boom Operator Trainer, and the Fuselage Trainer. Option 2 would include the construction of a 5,847 SF addition.

Hangar 665 (on the right)

Modify Hangar 665

Space would be required for housing the various KC-46A simulators and maintenance functions. One of two options could occur to satisfy this requirement. Option 1 includes internal renovations to Hangar 665 to house the KC-46A Fuselage Trainer. Option 2 includes internal renovations and the construction of an 18,985 SF addition to Hangar 665 to accommodate aircraft fuel cell maintenance.

Modify Building 679

Building 679 was recently renovated; however, areas within the building would need minor interior modifications to house Aircrew Flight Equipment.

Building 679

Pave Aprons/Hydrant Areas and Airfield Hold Area

The pavement conditions, such as thickness and strength of the hydrant and aircraft apron areas, are important factors in avoiding damage to the KC-46A and/or to the airfield pavement. One of two options could occur under Alternative #1 to satisfy the pavement requirements. Under both Option 1 and Option 2, this project would replace the concrete over the hydrant system and apron areas in the quad; the concrete in these areas currently is rated as in 'poor' condition. Under Option 2, a 42,687 SF area of the Airfield Hold Area would also be repaved. Under both options, this project would add pavement to the airfield hold ramp off the secondary runway.

2.3.1.7 Personnel Changes

The 190 ARW currently is authorized 1,242 personnel (Table 2.3-6). Under this alternative, the KC-46A mission would add an additional 194 military positions to the authorized manning requirement at Forbes ANGS (approximately a 16 percent increase in total personnel). Changes to authorized personnel under this alternative are shown in Table 2.3-6.

Table 2.3-6. Comparison of Currently Authorized and Proposed 190 ARW Personnel

Personnel	*Authorized*	*Proposed*	*Change*
Full Time			
Active Associate (USAF)	0	199	199
Active Guard and Reserve	78	78	0
Dual Status Technician (Guard civilians, federal)[1]	297	310	13
Non-Dual Status (DoD civilians, Air Traffic Control)	28	28	0
Subtotal	*403*	*615*	*212*
Part Time			
Drill Status Guardsmen	839	821	-18
Total Personnel Assignments[2]	**1,242**	**1,436**	**194**
Total Personnel On Base	**945**	**1,126**	**181**

Note: 1. Total personnel on base is the sum of all categories minus the number of people with two assignments.
2. Some personnel work off-site but are assigned to the unit.

2.3.2 Alternative #2 – Joint Base McGuire-Dix-Lakehurst

2.3.2.1 Background

JB MDL, home of the 108th Wing (108 WG) of the New Jersey Air National Guard (NJ ANG), is located in central New Jersey, spanning more than 20 miles with more than 42,000 contiguous acres (see Figure 2.3-3). The base is located 18 miles southeast of Trenton, 45 miles east of Philadelphia, 50 miles south of New York City, and 14 miles inland from the Atlantic Ocean. JB MDL is located in Ocean and Burlington Counties. The 108 WG installation is situated on the northwest side of McGuire Field within JB MDL. The 108 WG holds an indefinite lease with JB MDL for the installation property. Within Chapters 3 and 4, various resources discuss either JB MDL or McGuire Field, based on the region of influence (ROI) for each particular resource.

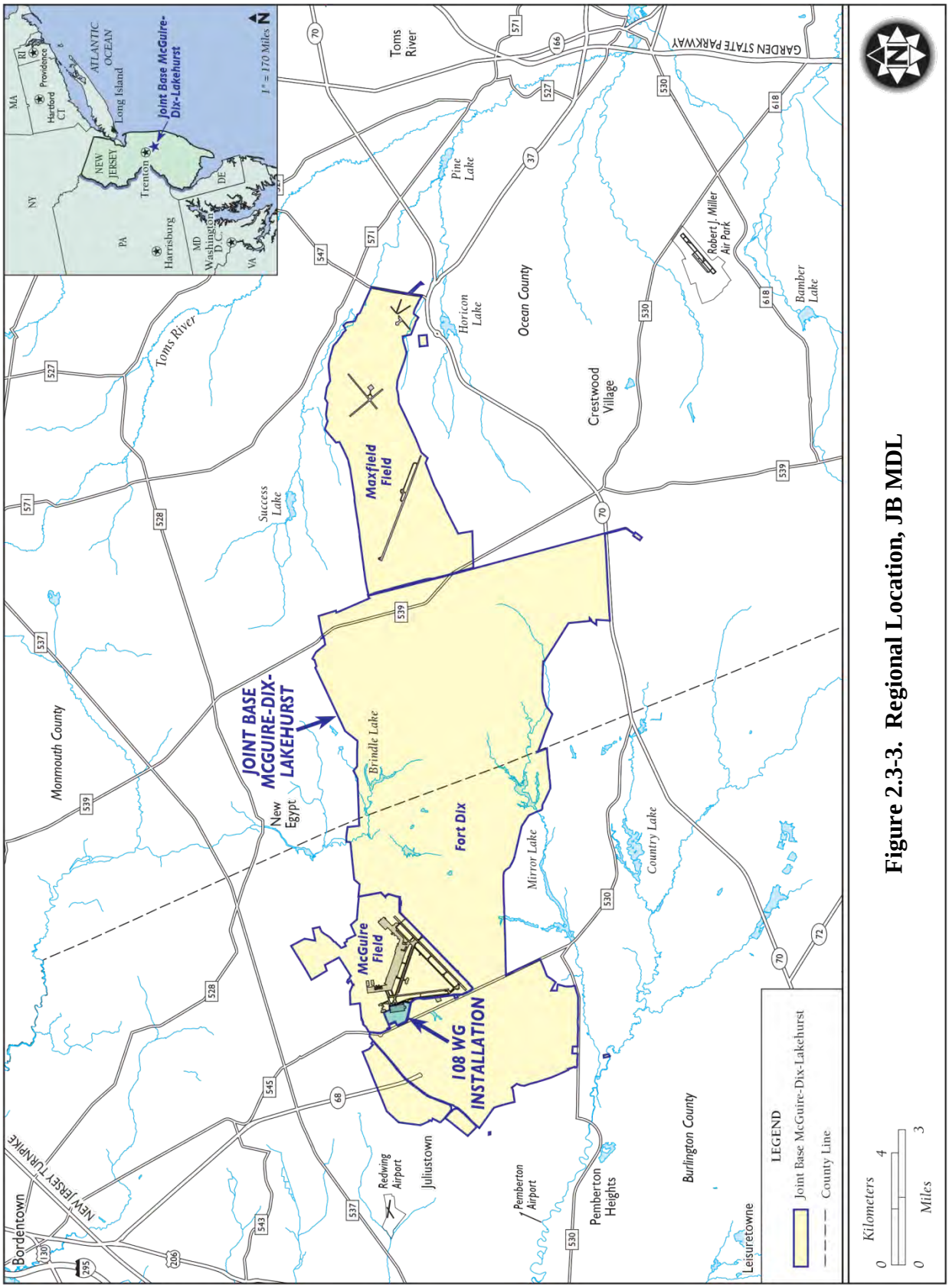


Figure 2.3-3. Regional Location, JB MDL

2.3.2.2 Mission

The mission of the 108 WG is to provide support for federal, state, and community interests by providing timely worldwide air refueling, airlift, and support forces; protecting life and property; and preserving peace, order, and public safety. The 108 WG currently flies and maintains eight KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 108 WG include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

2.3.2.3 Aircraft Conversion

Under Alternative #2, the 108 WG would convert from 8 KC-135 PAA and 1 KC-135 BAI to 12 KC-46A PAA. Concurrent with the beddown of the 12 KC-46A PAA at JB MDL, the existing KC-135 aircraft would either be relocated to other installations or retired out of the USAF inventory, depending on the life-cycle status of each particular aircraft. Separate NEPA documentation would be prepared for any of the aircraft relocated to other installations.

2.3.2.4 Airfield Operations

McGuire Field has two runways; Runway 06/24 is 10,014 feet long and 150 feet wide and Runway 18/36 is 150 feet wide and 7,126 feet long (JB MDL 2013a).

The 108 WG currently flies 1,112 sorties annually. According to the unit's scheduling data and Air Traffic Control counts, 834 of these sorties were flown from McGuire Field, or 75 percent of the total annual sorties flown (108 WG 2013a). The remaining sorties were flown from other airfields in the U.S. and/or overseas in support of operational missions. Actual airfield operational data collected from 2012 indicates that the 108 WG accounted for 8,340 annual operations with an average of 10 operations per sortie (Table 2.3-7) (108 WG 2013a).

Table 2.3-7. Current 108 WG KC-135 Operations at McGuire Field

Aircraft	Departures		Arrivals		Total[1]		Grand Total[1]
	Day	Night[2]	Day	Night[2]	Day	Night[2]	
KC-135	3,346	815	3,325	854	6,671	1,669	8,340

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
Source: 108 WG 2013a.

Following the aircraft beddown under Alternative #2, the KC-46A aircraft would fly a total of 8,040 hours, with an ASD of 4.0 hours. This would result in 2,010 annual sorties, 75 percent of which would be performed at the home-station (McGuire Field). Thus, it is expected that up to 1,508 sorties would be flown at McGuire Field. This would be an increase of 81 percent over the baseline 834 sorties identified in the McGuire Field Noise Study (it is assumed that the same percentage of the sorties found under current baseline conditions would be flown at McGuire Field under this alternative) (JB MDL 2013a). Based on 1,508 annual home-station sorties and an average of 11.68 operations per sortie, there would be 17,608 annual home-station operations, or an additional 9,268 airfield operations annually at McGuire Field (Table 2.3-8). This would increase the average daily airfield operations from 22.9 to 48.2 (Table 2.3-9). There would be no changes expected to departure/arrival patterns and tracks, and use of runways. Current noise abatement procedures would continue to be followed (see Section 4.2.1, *Noise*).

Table 2.3-8. Proposed 108 WG KC-46A Operations at McGuire Field

Aircraft	Departures		Arrivals		Total[1]		Grand Total[1]
	Day	Night	Day	Night[2]	Day	Night[2]	
KC-46A	8,047	764	7,863	934	15,910	1,698	17,608

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night – Between 10 p.m. and 7 a.m. for environmental night.

Table 2.3-9. Changes to 108 WG Airfield Operations with Proposed KC-46A Aircraft

Unit	Total Based KC-135 Annual Airfield Operations (Average Daily Airfield Operations)	Total Proposed KC-46A Annual Airfield Operations (Average Daily Airfield Operations)	Increased Airfield Operations Annually for Proposed KC-46A Operations (Percent Increase)
108 WG	8,340 (22.9)	17,608 (48.2)	9,268 (111.1%)

2.3.2.5 Airspace Operations

The 108 WG conducts air refueling for both training and contingency missions for the receiver aircraft. Primary air refueling tracks used by the 108 WG are described in Table 2.3-10. Under Alternative #2, there would be an increase to the frequency of use of the associated airspace due to the proposed increase in the number of sorties conducted annually. The KC-46A will also

have a requirement for training as a receiver aircraft (on-loading fuel) and would use the existing air refueling tracks as a receiver in addition to the normal use as a refueling aircraft (off-loading fuel). Currently, approximately 80 percent of the sorties flown from McGuire Field conduct air refueling training using the tracks found in Table 2.3-10. There would be an increase of 5,400 air refueling operations spread over the existing air refueling tracks currently used by the 108 WG. The increase would range from a maximum annual increase of 88 air refueling operations on the AR 777 track, to the smallest increase of 4 air refueling operations on AR 633. The refueling tracks identified in Table 2.3-10 are the most commonly used with a wide variety of other tracks being used less frequently.

Table 2.3-10. Current and Proposed Local Air Refueling Airspace Used by the 108 WG[1]

Airspace Unit Altitude[2] Floor and Ceiling	*Current Aircraft Proposed Aircraft*	*Minutes in Airspace for Each Sortie*	*Average KIAS*	ANNUAL SORTIE OPERATIONS	
				Current	*Proposed*
W107[2] A-Unlimited[3]	KC-135 KC-46A	60	315	70	127
AR 777 FL210-FL280	KC-135 KC-46A	80	275	109	197
AR 220/218 FL190-FL220	KC-135 KC-46A	75	275	20	36
AR 631/609 FL200-FL260	KC-135 KC-46A	75	265	48	87
AR 636 FL200-FL290	KC-135 KC-46A	75	300	25	45
AR 207 SW/NE FL180-FL280	KC-135 KC-46A	90	265	17	31
AR 202 S/AN FL250-280	KC-135 KC-46A	75	265	15	27
AR 328 FL180-FL230	KC-135 KC-46A	90	275	16	29
AR 633 FL180-FL230	KC-135 KC-46A	70	275	5	9

Notes: 1. This table only shows KC-135 and KC-46A aircraft that are or would be flown by the 108 ARW in this airspace. Additional aircraft flown by other units that use this airspace are not shown.
2. W-Warning Area Floor is the surface but no refuelings occur below 10,000 feet MSL.
3. FL Altitude is Mean Sea Level.
KIAS = knots indicated airspeed; FL = Flight Level

Source: 108 WG 2013b.

2.3.2.6 Construction Required

Under Alternative #2, 12 KC-46A PAA aircraft would be beddown at the 108 WG installation at JB MDL; the 108 WG would also implement minor construction projects for that conversion (Table 2.3-11). The proposed construction projects would comply with standards set forth in ANG Handbook 32-1084, *Facility Space Standards (*November 2012). AT/FP requirements would also be addressed to the extent practicable. Proposed facilities would be sited approximately as shown in Figure 2.3-4. The precise layout and design of proposed facilities is in the early planning stages, and therefore, exact locations and layouts are not finalized. Should

locations and final layout of the facilities differ substantially from those anticipated and depicted herein, further environmental analysis would be required. Each of these projects is described in more detail in the following sections.

Table 2.3-11. Proposed 108 WG Construction Projects at McGuire Field

Project Description	*Total New Construction Footprint (SF)*	*New Impervious Surface (SF)*	*Estimated Year of Implementation*
Project #1 – Addition to Hangar 3333			
This project would involve the addition of a 17,892 SF addition to the existing Maintenance Hangar 3333 to provide an adequately sized hangar for the new KC-46A aircraft.	17,892	4,728	FY 2015
Project #2 – Addition to Hangar 3336			
This project would involve the addition of an 18,206 SF addition to the existing Fuel Cell Hangar 3336 to provide an adequately sized hangar for the new KC-46A aircraft.	18,206	5,137	FY 2015
Project #3 – Internal Renovations to Hangar 3322			
This project would include internal renovations only to provide sufficient space to house the KC-46A Fuselage Trainer Simulator.	0	0	FY 2015
Project #4 – New Simulator Building			
This project would include the construction of a new 6,700 SF simulator building to house the Weapons System Trainer and the Boom Operator Trainer.	6,700	6,700	FY 2015
Project #5 (Option 1) – Modifications to Existing Parking Ramp and Taxiway[1]			
This project would include the addition of concrete and asphalt to the existing parking ramp and renovation of a small portion of the taxiway. The construction footprint for this project would total approximately 160,074 SF.	160,074	88,319	FY 2015
Project #5 (Option 2) – Modifications to Existing Parking Ramp and Taxiway			
This project would include the addition of 12,029 SF of concrete and asphalt to the existing parking ramp as well as renovation of approximately 2,062 SF of existing taxiway surfaces .	14,091	12,029	FY 2015
Project #6 – New Hydrants and Fuel Lines and Demolition of Existing Hydrants			
This project would include the addition of eight new fuel hydrants as well as new fuel lines to these hydrants. Approximately 1,137 SF of disturbance would occur as a result of the new hydrants and fuel lines.	1,137	0	FY 2015
Total	**204,009[2]**	**104,884[2]**	

Notes: 1. Two options are possible for the modifications to the existing parking ramp and taxiway. Only one of these options would be implemented.
2. The total construction footprint includes only the project option that has the greatest footprint of each of the options so as to represent the most conservative (highest amount) facility footprint given the multiple options possible.

SF = square foot; FY = fiscal year

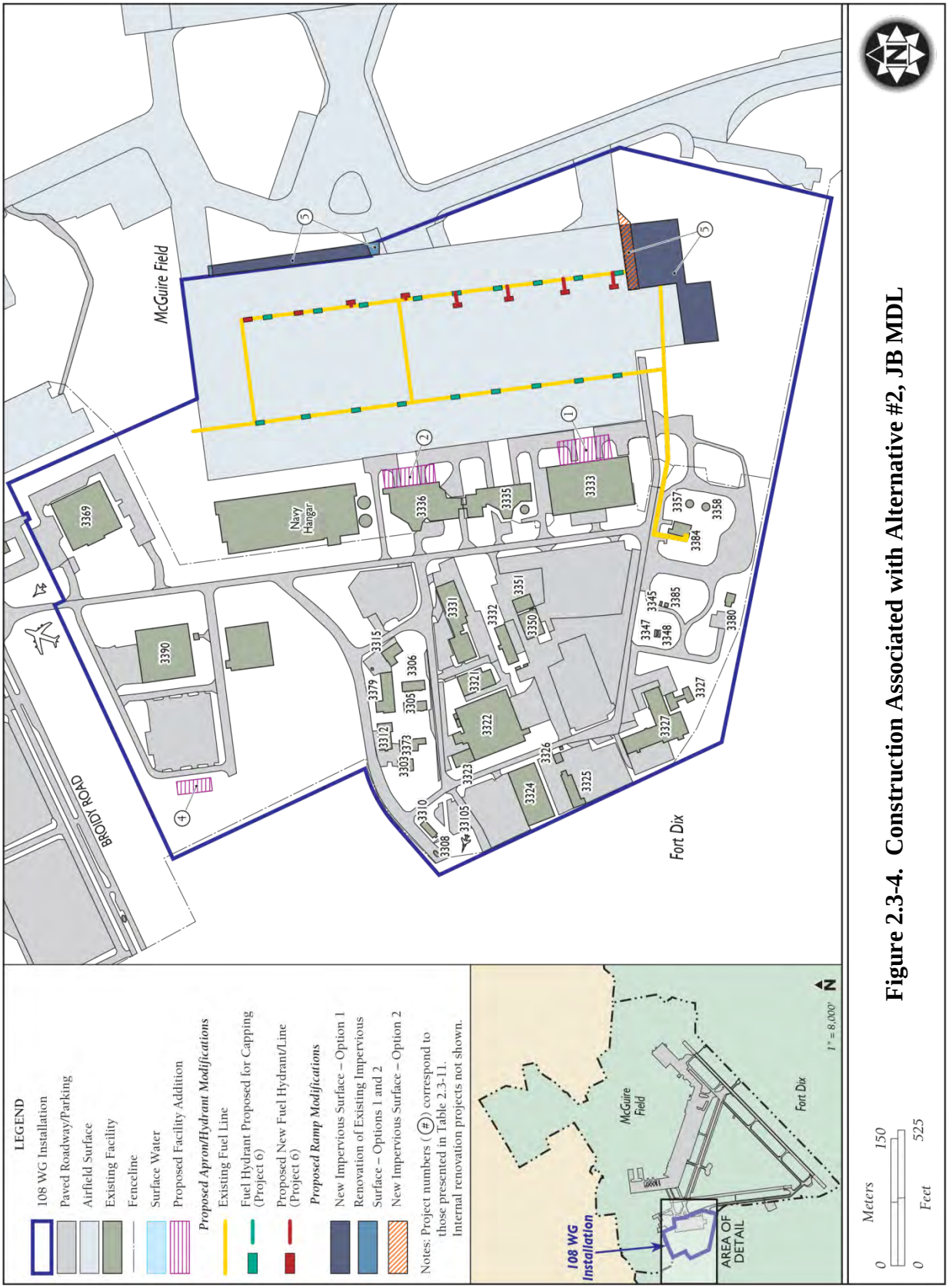


Figure 2.3-4. Construction Associated with Alternative #2, JB MDL

Implementation of the KC-46A aircraft beddown would require the 108 WG to ensure their installation has properly sized and adequately configured facilities to support 12 KC-46A aircraft. Although the JB MDL location was deemed to have an acceptable level of facilities to support this beddown, and has facilities that currently meet the majority of the requirements laid out in Section 2.1.2.2, there remain some functional areas that would require modification. Proposed construction includes: addition to Hangar 3333, addition to Hangar 3336, internal renovations of Hangar 3332, construction of a new simulator building, modification to existing ramp and taxiway, and addition and demolition of hydrants and fuel lines on the parking apron.

The projects described below would incorporate LEED and sustainable development concepts, so as to achieve optimum resource efficiency, constructability, sustainability, and energy conservation, while minimizing adverse impacts to the built and natural environments through all phases of their life cycle. This may result in primary facility costs exceeding DoD costing standards, but the initial investment in higher acquisition cost would be rewarded with lower life cycle costs. This is consistent with the requirements of the Energy Policy Act of 2005, 10 USC 2802, EO 13423, and other applicable laws and EOs.

Addition to Hangar 3333

Hangar 3333

A minimum of one Maintenance Hangar is required to support the maintenance and operations of the KC-46A. Hangars provide an environmentally controlled area to perform maintenance. The hangar bays require enough space to use the support equipment such as stands and carts to perform maintenance functions. The hangars would house the maintenance shops, tool cribs, and personnel. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, a 17,892 SF addition to Hangar 3333 would need to be added to accommodate the larger aircraft inside the maintenance hangar. Following the construction, there would be an increase of approximately 4,728 SF of impervious surface as a result of this project.

Addition to Hangar 3336

Hangar 3336

A minimum of one Fuel Systems Maintenance Hangar is required to support the maintenance and operations of the KC-46A aircraft. The Fuel Systems Maintenance Hangar provides space for covered aircraft maintenance, shop and administrative functions, and contains utilities and safety systems required to perform fuel systems maintenance to include pressure checks and inspections. Aircraft hangar space is required for on-aircraft open fuel cell maintenance. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, an 18,206 SF addition to Hangar 3336 would be required to accommodate the larger aircraft inside the maintenance hangar. Following the construction, there would be an increase of approximately 5,137 SF of impervious surface as a result of this project.

Internal Renovations to Hangar 3322

Internal renovations to Hangar 3322 would be implemented to house the KC-46A Fuselage Trainer Simulator.

New Simulator Building

Proposed Area for the New Simulator Building

A new 6,700 SF building would be constructed west of Building 3390 to house the Weapons System Trainer and the Boom Operator Trainer. Following the construction, there would be an increase of approximately 6,700 SF of impervious surface as a result of this project.

Modifications to Existing Parking Ramp

The proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. Additional concrete would be added to the parking ramp and taxiway at JB MDL in order to increase the size of the parking ramp to accommodate the larger KC-46A aircraft. Two options are possible for the modifications to the existing parking ramp. Only one of these options would be implemented.

Proposed Area for Parking Ramp Modifications

1. The first option is to add additional pavement to the northeast side of the apron to increase width for taxiing; add pavement to the southeast side for taxiing; and add pavement to the south side for engine run-ups. This would allow for a 50-foot wing clearance for taxiing. In addition, this option would include the renovation of approximately 2,062 SF of the existing taxiway. This project would include a total of 160,074 SF of new pavement. Following the construction, there would be an increase of approximately 88,319 SF of impervious surface as a result of this project.
2. The second option would include a 12,029 SF addition of a small pavement area on the southeast side of the apron as well as the renovation of approximately 2,062 SF of the existing taxiway. Under this option, a waiver would be required since the wing tip clearance would be reduced to only 25 feet instead of 50 feet. The total SF of disturbance would be approximately 14,091 SF. Following the construction, there would be an increase of approximately 12,029 SF of impervious surface as a result of this project.

New Hydrants and Fuel Lines and Demolition of Existing Hydrants

The proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. A fuel hydrant system provides all the equipment and controls to provide clean fuel to fueling points in the aircraft parking apron. The system reduces the amount of physical movement of fuel around an airfield. To fuel an aircraft, one R-12 fueling truck is needed instead of several. Under Alternative #2, eight new fuel hydrants would be added to the existing parking ramp as well as new fuel lines to one of these hydrants. Approximately 1,137 SF of disturbance would occur as a result of the new hydrants and fuel lines.

2.3.2.7 Personnel Changes

The 108 WG currently is authorized 1,329 personnel. Under Alternative #2, the KC-46A mission would add an additional 287 military positions to the authorized manning requirement (approximately a 22 percent increase in total personnel). Changes to authorized personnel under this alternative are shown in Table 2.3-12.

Table 2.3-12. Comparison of Currently Authorized and Proposed 108 WG Personnel

Personnel	*Authorized*	*Proposed*	*Change*
Full Time			
Active Associate (USAF)	0	199	199
Active Guard and Reserve	138	138	0
Dual Status Technician (Guard civilians, federal)[1]	278	310	32
Non-Dual Status (DoD civilians, Air Traffic Control)	0	0	0
Subtotal	*416*	*647*	*231*
Part Time			
Drill Status Guardsmen	913	969	56
Total Personnel Assignments[2]	**1,329**	**1,616**	**287**
Total Personnel On Base	**1,051**	**1,306**	**255**

Note: 1. Total personnel on base is the sum of all categories minus the number of people with two assignments.
2. Some personnel work off-site but are assigned to the unit.

2.3.3 Alternative #3 – Pease Air National Guard Station

2.3.3.1 Background

Pease ANGS, home of the 157th Air Refueling Wing (157 ARW) of the New Hampshire Air National Guard (NH ANG), is located in Portsmouth and Newington, New Hampshire, approximately 55 miles north of Boston, Massachusetts (Figure 2.3-5). The 157 ARW base is situated on the northeast side of the Portsmouth International Airport (IAP) at Pease, which is owned and operated by Pease Development Authority (PDA). The 157 ARW holds an indefinite lease for the installation property. The 157 ARW installation occupies approximately 220 acres.

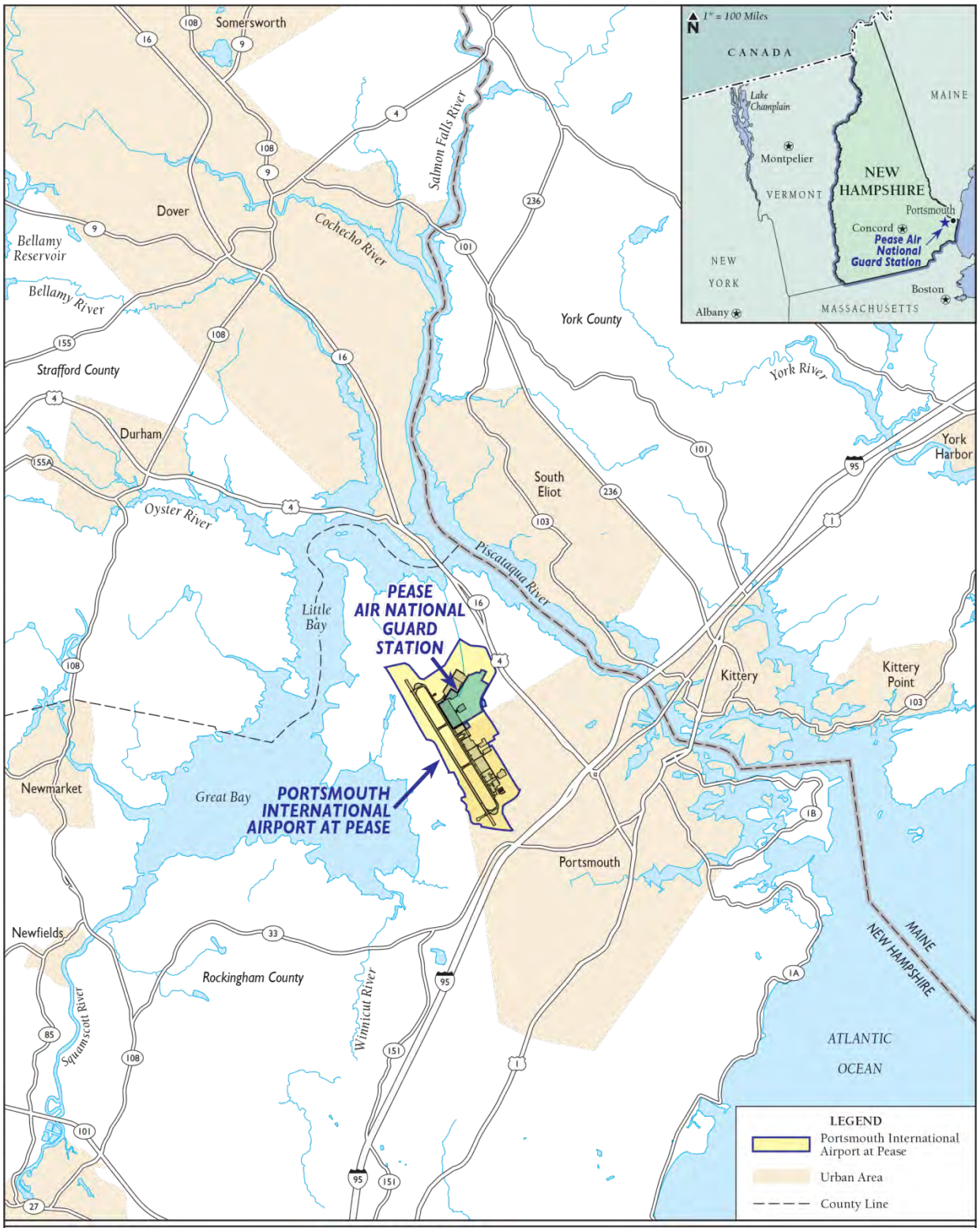


Figure 2.3-5.
Regional Location
Pease ANGS

2.3.3.2 Mission

The primary mission of the 157 ARW is to provide worldwide support with the KC-135 air refueling tanker aircraft and to staff, equip, and train combat flying and combat support units to augment the USAF. In addition, the 157 ARW provides both homeland defense and assistance with state emergencies and natural disasters to protect life and property, and to preserve peace, order, and public safety. The major support operations performed at the installation include aircraft fueling, aircraft deicing, aircraft maintenance, AGE maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. Pease ANGS also hosts the 64th Air Refueling Squadron (64 ARS), which stood up at Pease on October 2, 2009. The 64 ARS is administratively assigned to McConnell AFB's 22d Operations Group but is located with, and gets operational direction from, its host unit, the 157 ARW at Pease. This partnership is part of the USAF's TFI effort to increase efficiency by combining active-duty, Guard, and Reserve resources. Aircrew, maintenance, and support personnel assigned to the 64 ARS work alongside Guardsmen flying and maintaining the 157 ARW's aircraft to accomplish the Wing's refueling missions. As of February 2013, 129 active associate personnel were authorized at Pease. It is the first active-duty USAF unit to return to the ANG Base since 1991, when Pease AFB, then an active-duty installation, closed.

Additionally, the installation has a Medical Training Group and operational command of the 260th Air Traffic Control Squadron, which operates the air traffic control tower for the airport (157 ARW 2008a).

2.3.3.3 Aircraft Conversion

Under Alternative #3, the 157 ARW would convert from 8 PAA KC-135 and 1 KC-135 BAI aircraft to 12 KC-46A PAA. Concurrent with the beddown of the 12 KC-46A PAA at Pease ANGS, the existing KC-135 aircraft would either be relocated to other installations or retired out of the USAF inventory, depending on the life-cycle status of each particular aircraft. Separate NEPA documentation would be prepared for any of the aircraft relocated to other installations.

2.3.3.4 Airfield Operations

Portsmouth IAP has one grooved concrete and asphalt runway, Runway 16/34, which is approximately 11,321 feet long and 150 feet wide (SkyVector 2013a).

The 157 ARW currently flies 1,382 sorties annually. According to the unit's scheduling data and airport traffic counts, 614 were flown from Portsmouth IAP, or 44 percent of the annual sorties flown. The remaining sorties were flown from other airfields in the U.S. and/or overseas in support of operational missions. Actual airfield data indicates that the 157 ARW accounted for 6,140 annual operations with an average of 10.0 operations per sortie (Table 2.3-13).

Table 2.3-13. Current 157 ARW Operations at Portsmouth IAP

Aircraft	Departures		Arrivals		Total		Grand Total[1]
	Day	Night[1]	Day	Night[1]	Day	Night[1]	
KC-135[2]	2,939	131	2,939	131	5,878	262	6,140

Notes: 1. Night –Between 10 p.m. and 7 a.m. for environmental night.
2. Based on KC-135 data provided by 157 ARW/CC.
Source: 157 ARW 2013a.

Following the aircraft beddown under Alternative #3, the KC-46A aircraft would fly a total of 8,040 hours annually, with an ASD of 4.0 hours. This would result in 2,010 sorties, 44 percent of which would be performed at the home-station (Pease ANGS). Thus, 884 sorties would be flown at Pease ANGS annually under this alternative. This would be an increase of 44.0 percent over the baseline 614 annual sorties currently flown from Pease ANGS (it is assumed the same percentage of sorties would be flown away from Pease ANGS under this alternative as under the current baseline conditions). Based on 884 annual home-station sorties and an average of 10.0 operations per sortie, there would be 8,840 annual home-station operations, or an additional 2,700 airfield operations annually at Portsmouth IAP (Table 2.3-14). This would increase the average daily airfield operations from 16.8 to 24.2 (Table 2.3-15). There would be no changes expected to departure/arrival patterns and tracks, flight profiles, and use of runways. Current noise abatement procedures would continue to be followed (see Section 4.3.1, *Noise*).

Table 2.3-14. Proposed 157 ARW KC-46A Operations at Portsmouth IAP

Aircraft	Departures		Arrivals		Total[1]		Grand Total[1]
	Day	Night[2]	Day	Night[2]	Day	Night[2]	
KC-46A	4,231	189	4,231	189	8,462	376	8,840

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.

Table 2.3-15. Changes to 157 ARW Airfield Operations with Proposed KC-46A Aircraft

Unit	Total Based KC-135 Annual Airfield Operations (Average Daily Airfield Operations)	Total Proposed KC-46A Annual Airfield Operations (Average Daily Airfield Operations)	Increased Airfield Operations Annually for Proposed KC-46A Operations (Percent Increase)
157 ARW	6,140 (16.8)	8,840 (24.2)	2,700 (44.0%)

2.3.3.5 Airspace Operations

The 157 ARW conducts air refueling for both training and contingency missions for receiver aircraft. Primary air refueling tracks used by the 157 ARW are described in Table 2.3-16. Under Alternative #3, there would be a slight change to the frequency of use of the airspace due to the proposed increase in the sorties. The KC-46A will also have a requirement for training as a receiver aircraft (on-loading fuel) and will use the existing air refueling tracks as a receiver in

addition to the normal use as a refueling aircraft (off-loading fuel). However, the minutes in the airspace for each sortie, and the operational training conducted would not be expected to change in any of the airspace described.

Table 2.3-16. Current and Proposed Local Air Refueling Airspace Used by the 157 ARW[1]

Airspace Unit Altitude Floor and Ceiling	*Current Aircraft Proposed Aircraft*	*Minutes in Airspace for Each Sortie*	*Average KIAS*	ANNUAL SORTIE OPERATIONS	
				Current	*Proposed*
AR 020 17,000 feet MSL–FL190	KC-135 KC-46A	60	275	154	222
AR 777 FL210-FL280	KC-135 KC-46A	60	275	165	238
AR 062 FL210-FL280	KC-135 KC-46A	60	275	78	112
AR 107 14,000 MSL – FL230	KC-135 KC-46A	60	275	56	81
AR 631 FL200-FL260	KC-135 KC-46A	60	275	198	285
W102 Above 17,000 MSL to FL600	KC-135 KC-46A	30	300	3	4
W105 SFC to FL500	KC-135 KC-46A	30	300	16	23
W107 Surface to Unlimited	KC-135 KC-46A	30	315	19	27
W122 FL190-FL220	KC-135 KC-46A	30	315	2	3
W386 Surface to Unlimited	KC-135 KC-46A	30	315	3	4
Kiwi MOA FL190-FL230	KC-135 KC-46A	30	300	14	20
Duke Surface to 8,000 MSL	KC-135 KC-46A	30	300	9	13
Falcon MOA FL200-FL260	KC-135 KC-46A	30	300	3	4
Yankee 1[2] 9,000 feet MSL UTBNI FL180	KC-135 KC-46A	30	300	5	7

Notes: 1. This table only shows KC-135 and KC-46A aircraft that are or would be flown by the 157 ARW in this airspace. Additional aircraft flown by other units that use this airspace are not shown.
2. MOA Floor is 9,000 feet MSL but no refueling occurs below 10,000 feet MSL.
KIAS = knots indicated airspeed; MSL = mean sea level; FL = Flight Level; MOA = military operations area; UTBNI = up to, but not including.

Source: 157 ARW 2013a.

2.3.3.6 Construction Required

Under Alternative #3, the 157 ARW would implement construction projects for the conversion to 12 KC-46A PAA (Table 2.3-17). The proposed construction projects would comply with standards set forth in ANG Handbook 32-1084, *Facility Space Standards* (November 2012). AT/FP requirements also would be incorporated. Proposed facilities would be sited approximately as shown in Figure 2.3-6. The precise layout and design of proposed facilities is in the early planning stages; therefore, exact locations and layouts are not finalized. Should locations and final layout of the facilities differ substantially from those anticipated and depicted herein, further environmental analysis would be required. Each of these projects is described in more detail in the following sections.

Implementation of the KC-46A aircraft beddown would require the 157 ARW to ensure its installation has properly sized and adequately configured facilities to support 12 KC-46A aircraft. The Pease ANGS location was deemed to have an acceptable level of facilities to support this beddown and has facilities that currently meet the majority of the requirements laid out in Section 2.1.2.2. However, some functional areas require modification. Proposed construction includes: renovation and additions to Buildings/Hangars 156, 264, 166, 251, 253, and 254; construction and upgrade of the taxiway; and demolition and installation of new fuel hydrants and fuel lines on the parking apron.

Construction projects would incorporate LEED and sustainable development concepts. This would achieve optimum resource efficiency, constructability, sustainability, and energy conservation, while minimizing adverse impacts to the built and natural environments through all phases of the project's life cycle. While implementation of LEED standards may result in primary facility costs that exceed DoD costing standards, the initial investment in higher acquisition cost would be offset with lower life cycle costs. LEED certified construction is consistent with the requirements of the Energy Policy Act of 2005, 10 USC 2802, EO 13423, and other applicable laws and EOs.

Table 2.3-17. Proposed 157 ARW Construction Projects at Portsmouth IAP

Project Description	*Total New Construction Footprint (SF)*	*New Impervious Surface (SF)*	*Estimated Year of Implementation*
Project #1 (Option 1) – Renovation/Addition to Building 156[1]			
Remove KC-135 Weapons System Trainer and reuse main bay for the KC-46A Weapons System Trainer; upgrade facilities to support storage in the simulator bays: and construct addition to the ground floor to house the Boom Operator Trainer.	750	750	FY 2015
Project #1 (Option 2) – Renovation/Addition to Building 264[1]			
This project would construct an 11,600 SF addition to Building 264 to house the KC-46A Weapons System Trainer Bay, KC-46A Boom Operator Trainer Bay, and Computer Server Room.	11,600	11,600	FY 2015
Project #2 - Addition to Building 166			
Add refueler vehicle parking spaces and driveway.	1,100	1,100	FY 2015
Project #3 – Internal Renovations to Hangar 251			
Renovate mezzanines for administrative space and alter hangar bay for deployment processing/fuselage trainer.	0	0	FY 2015
Project #4 (Option 1)– Addition/Alteration to Hangar 253[1]			
Remove existing hangar door and construct hangar addition; reconfigure interior for Fuel Cell Hangar, storage and maintenance, and corrosion control shops.	18,985	0	FY 2015
Project #4 (Option 2)– Demolition/Addition/Alteration to Hangar 253[1]			
Demolish building and rebuild double hangar with Hangar 254.	36,026	0	FY 2015
Project #5–Demolition/Addition/Alteration to Hangar 254			
Construct new tail addition and reconfigure interior for KC-46A.	18,530	0	FY 2015
Project #6 – Alter Aircraft Taxiway			
Construct a concrete taxiway (6,843 SF), an asphalt shoulder (4,074 SF), and upgrade concrete taxiway (828 SF).	11,745	10,917	FY 2015
Project #7 – Demolition/Modify/Install Aprons and Hydrants			
This project would reuse existing hydrants in the north and south loops; add interstitial monitoring and secondary containment; and relocate parking.	2,890	0	FY 2015
Project #8 – Repave Quad Apron			
Repave surfaces used to tow aircraft in and out of the hangar and fuel cell, but not the entire facility.	49,075	0	FY 2015
Total	**130,966**	**23,617**	

Notes: 1. Two options are possible for the modifications to these projects. Only one of these options would be implemented.
2. The total construction footprint includes only the project option that has the greatest footprint of each of the options so as to represent the most conservative (highest amount) facility footprint given the multiple options possible.

SF=square feet; FY = fiscal year

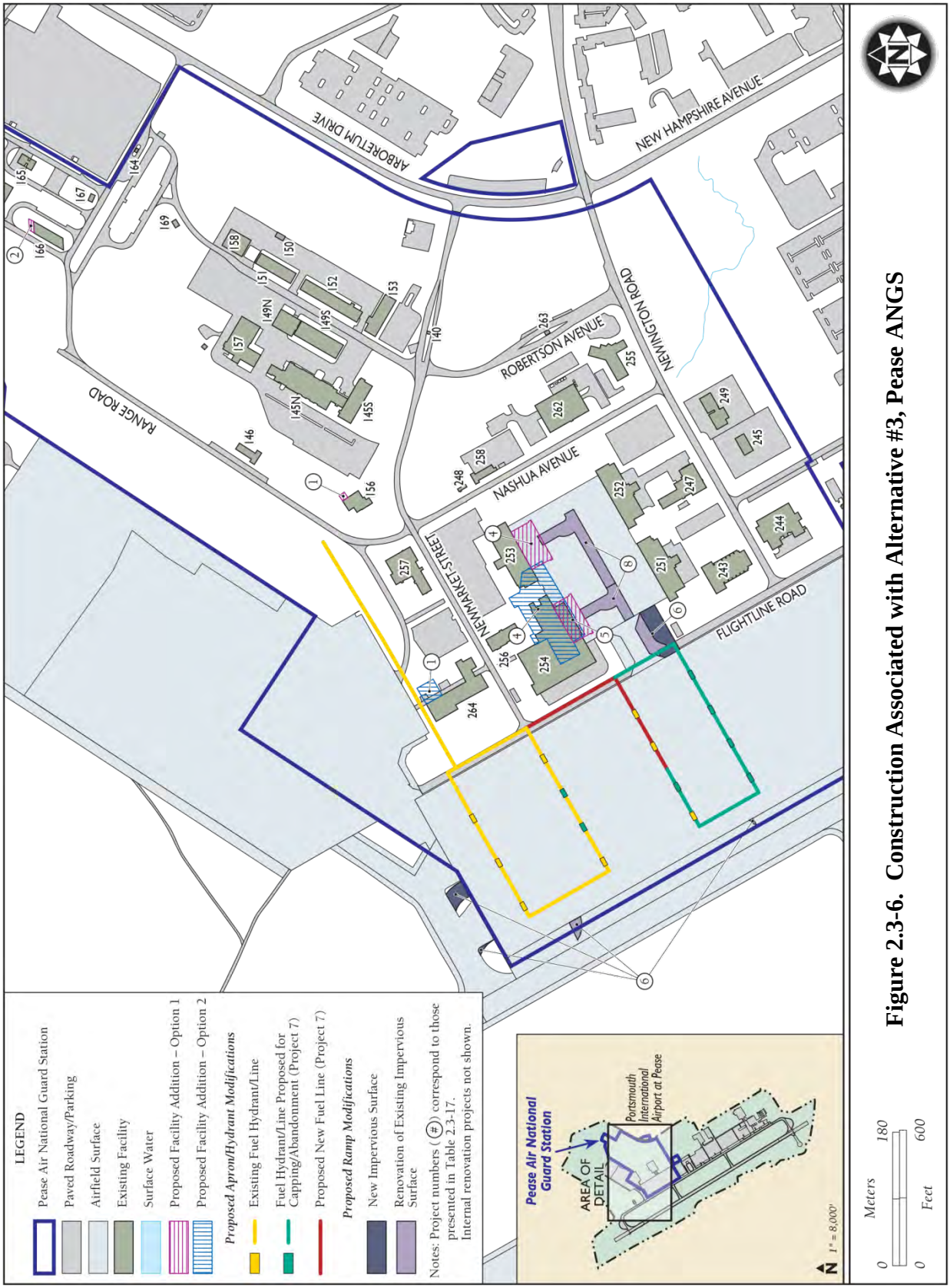


Figure 2.3-6. Construction Associated with Alternative #3, Pease ANGS

Alteration or Addition to Building 156 for Weapons System Trainer and Boom Operator Trainer

The KC-46A beddown would require the construction of a new KC-46A Weapons System Trainer and Boom Operator Trainer to train flight crews. One of two options could occur under Alternative #3 to satisfy this requirement. Option 1 would remove the KC-135 Weapons System Trainer in Building 156 and reuse the main bay for the KC-46A Weapons System Trainer. In addition, under Option 1, a 750 SF addition to Building 156 would be constructed to house the KC-46A Boom Operator Trainer. Option 2 would leave the KC-135 Weapons System Trainer in Building 156 and construct an 11,600 SF addition to the new Squadron Operations Building, Building 264 (currently under construction), to house the Weapons System Trainer, the KC-46A Boom Operator Trainer, and supporting Computer Server Room.

Additions to Building 166 Refueler Parking Area

Alteration of this facility is required to provide a facility large enough to house assigned R-11, R-12, and C-300 refueling vehicles. To accommodate refueling vehicles, covered parking spaces would be added, and a new driveway would be built (adjacent to Building 166). Following the construction, there would be an increase of approximately 1,100 SF of impervious surface as a result of this project.

Internal Renovations to Hangar 251

The Mezzanine within Hangar 251 would be renovated for KC-46A administrative space and the hangar bay would be altered to accommodate the Fuselage Trainer and Deployment Processing Center. In addition, the utilities for aircraft power and potable water would be upgraded.

Addition to Hangar 253 and Hangar 254

The hangar bays require enough space to use the support equipment such as stands and carts to perform KC-46A maintenance functions. The hangars would house the maintenance shops, tool cribs, and personnel. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135, thus requiring slightly larger hangars. Hangar 254 and Hangar 253 require modifications to meet KC-46A requirements. One of two options could occur under Alternative #3 to satisfy these requirements.

Under Option 1, an 18,985 SF addition would be added to the hangar, while existing maintenance shops would be reused, and a 2-hour firewall would be added. A high-bay tail addition and door would be added to the south side of this hangar. Also, mid-bay areas for Wing Air Refueling Pod storage and maintenance with overhead cranes, and corrosion control would be built. Mezzanines would be renovated for administrative use. Under Option 2, both Hangar 253 and the hangar space in Hangar 254 would be demolished. A new 36,026 SF double hangar would be built incorporating the existing Hangar 253 shops in Hangar 254.

Hangar 253

Addition to Hangar 254

The existing dormer would be demolished and a new 18,530 SF dormer would be added to the hangar to accommodate the KC-46A. The existing roofs would also be replaced. Excess space in the existing jet engine shop would be used to store aircraft support equipment. The existing maintenance shops would be reused.

Hangar 254

Alter Aircraft Taxiway

Alteration of the existing taxiway would be required at Pease ANGS to enable the KC-46A aircraft to access the maintenance hangars. The existing taxiway from the main apron to the hangar area is configured for towing of KC-135 aircraft to the existing hangars. Construction of tail additions combined with the larger dimensions of the KC-46A would not allow the existing taxiway to be reused as-is. In addition, the taxiways would need to be wide enough to support the turning radii of the KC-46A. Under Alternative #3, 828 SF of concrete taxiway would be upgraded, and 6,843 SF concrete taxiway and 4,074 SF asphalt shoulder would be constructed to the quad area to accommodate the aircraft. Following the construction, there would be an increase of approximately 10,917 SF of impervious surface as a result of this project.

Taxiway Proposed for Modifications

New Hydrants and Demolition of Existing Hydrants

The beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. A fuel hydrant system provides all the equipment and controls to provide clean fuel to fueling points in the aircraft parking apron. The system reduces the amount of physical movement of fuel around an airfield. One of two options could occur under Alternative #3 to satisfy this requirement. Option 1 would reuse six of the seven existing hydrants in North Loop and would cap one hydrant under the proposed parking area. In the South Loop, interstitial monitoring and secondary containment would be added; only two hydrants would be used in this area. Under Option 2, the old piping would be demolished and new piping installed; valves and pits would be installed in Rows 4 and 5. Eight existing hydrant valve pits would be used. Approximately 2,890 SF of disturbance would occur as a result of the new hydrants and fuel lines.

Quad Apron

This project would repave surfaces used to tow aircraft in and out of the hangar and fuel cell. The quad apron is currently degrading and is in need of renovations for KC-46A operations. Under Alternative #3, 49,075 SF of surface area used to tow aircraft in and out of the hangar and fuel cell would be repaved.

2.3.3.7 Personnel Changes

The 157 ARW currently is authorized 1,382 personnel (Table 2.3-18). Under Alternative #3, the KC-46A mission would add an additional 171 military positions to the authorized manning requirement (approximately a 12 percent increase in total personnel). Changes to authorized personnel under this alternative are shown in Table 2.3-18.

Table 2.3-18. Comparison of Currently Authorized and Proposed 157 ARW Personnel

Personnel	*Authorized*	*Proposed*	*Change*
Full Time			
Active Associate (USAF)	127	199	72
Active Guard and Reserve	120	120	0
Dual Status Technician (Guard civilians, federal)[1]	283	326	43
Non-Dual Status (DoD civilians, Air Traffic Control)	9	9	0
Subtotal	*539*	*654*	*115*
Part Time			
Drill Status Guardsmen	843	899	56
Total Personnel Assignments[2]	**1,382**	**1,553**	**171**
Total Personnel On Base	**1,099**	**1,227**	**128**

Note: 1. Total personnel on base is the sum of all categories minus the number of people with two assignments.
2. Some personnel work off-site but are assigned to the unit.

2.3.4 Alternative #4 – Pittsburgh Air National Guard Station

2.3.4.1 Background

Pittsburgh ANGS, home of the 171st Air Refueling Wing (171 ARW) of the Pennsylvania Air National Guard (PA ANG), is located approximately 12 miles northwest of Pittsburgh, Pennsylvania in Allegheny County (Figure 2.3-7). The 171 ARW installation is situated on the southeastern side of the Pittsburgh IAP, an international airport owned and operated by the Allegheny County Airport Authority (ACAA). The 171 ARW installation currently occupies approximately 179 acres in the southeastern corner of Pittsburgh IAP. The 171 ARW holds a lease with the Pittsburgh IAP with a termination date of 2050.

2.3.4.2 Mission

The mission of the 171 ARW is to provide support for federal, state, and community interests by providing timely worldwide air refueling, airlift, and support forces; protecting life and property; and preserving peace, order, and public safety. The 171 ARW currently flies and maintains 16 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 171 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

2.3.4.3 Aircraft Conversion

Under Alternative #4, the 171 ARW would convert from 16 KC-135 PAA and no KC-135 BAI to 12 KC-46A PAA. Concurrent with the beddown of the 12 KC-46A PAA at Pittsburgh ANGS, the existing KC-135 aircraft would either be relocated to other installations or retired out of the USAF inventory, depending on the life-cycle status of each particular aircraft. Separate NEPA documentation would be prepared for any of the aircraft relocated to other installations.

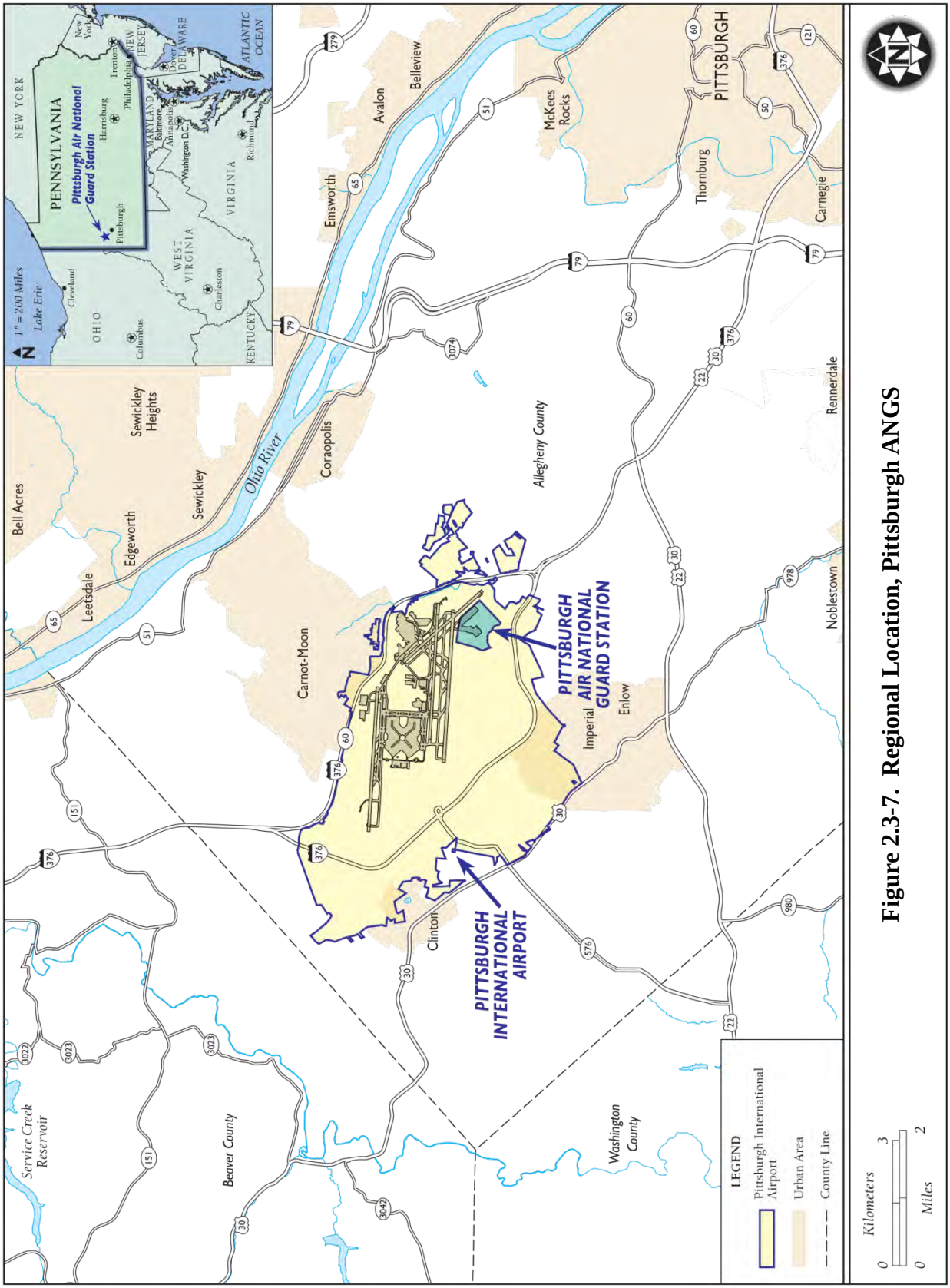


Figure 2.3-7. Regional Location, Pittsburgh ANGS

2.3.4.4 Airfield Operations

Pittsburgh IAP has four runways. Runway 10R/28L is 11,500 feet long and 200 feet wide. Runway 10L/28R is 10,502 feet long and 150 feet wide. Runway 10C/28C is 10,774 feet long for takeoff and 9,708 feet long for landing and 150 feet wide. Runway 14/32 is 8,101 feet long and 150 feet wide (AirNav 2013b).

The 171 ARW currently flies 1,569 sorties annually. According to the unit's scheduling data and airport traffic counts, 926 were flown from Pittsburgh IAP, or 59 percent of the total annual sorties flown (171 ARW 2013a). The remaining sorties were flown from other airfields in the U.S. and/or overseas in support of operational missions. Actual airfield data indicates that the 171 ARW flew 6,943 airfield operations with an average of 7.5 operations per sortie during 2012 (Table 2.3-19).

Table 2.3-19. Current 171 ARW KC-135 Aircraft Operations at Pittsburgh IAP

	Departures		Arrivals		Total[1]		Grand
Aircraft	*Day*	*Night*[2]	*Day*	Night[2]	*Day*	*Night*[2]	*Total*[1]
KC-135	3,272	200	3,176	295	6,448	495	6,943

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
Source: 171 ARW 2013a.

Following the aircraft beddown under Alternative #4, the KC-46A aircraft would fly a total of 8,040 hours annually, with an ASD of 4.0 hours. This would result in 2,010 sorties, 59 percent of which would be performed at the home-station (Pittsburgh ANGS). Thus, 1,186 sorties would be flown at Pittsburgh IAP annually under this alternative. This would be an increase of 27 percent over the baseline 926 sorties currently flown at Pittsburgh IAP (it is assumed that the same percentage of the sorties found under current baseline conditions would be flown at Pittsburgh IAP under this alternative). Based on 1,186 annual home-station sorties and an average of 7.78 operations per sortie, there would be 9,226 annual home-station operations, or an additional 2,283 airfield operations annually at Pittsburgh IAP (Table 2.3-20). This would increase the average daily airfield operations from 19.0 to 25.3 (Table 2.3-21). There would be no changes expected to departure/arrival patterns and tracks, and use of runways. Current noise abatement procedures would continue to be followed (see Section 4.4.1, *Noise*).

Table 2.3-20. Proposed 171 ARW KC-46A Operations at Pittsburgh IAP

	Departures		Arrivals		Total[1]		Grand
Aircraft	*Day*	*Night*[2]	*Day*	*Night*[2]	*Day*	*Night*[2]	*Total*[1]
KC-46A	4,287	326	4,275	338	8,562	664	9,226

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night – Between 10 p.m. and 7 a.m. for environmental night.

Table 2.3-21. Changes to 171 ARW Airfield Operations with Proposed KC-46A Aircraft

Unit	*Total Based KC-135 Annual Airfield Operations (Average Daily Airfield Operations)*	*Total Proposed KC-46A Annual Airfield Operations (Average Daily Airfield Operations)*	*Increased Airfield Operations Annually for Proposed KC-46A Operations (Percent Increase)*
171 ARW	6,943 (19.0)	9,226 (25.3)	2,283 (32.9%)

2.3.4.5 Airspace Operations

The 171 ARW conducts air refueling for both training and contingency missions for the receiver aircraft. Primary air refueling tracks used by the 171 ARW are described in Table 2.3-22. Under Alternative #4, there would be a slight change to the frequency of use due to the proposed increase in the sorties. The KC-46A will also have a requirement for training as a receiver aircraft (on-loading fuel) and will be using the existing air refueling tracks as a receiver in addition to the normal use as a refueling aircraft (off-loading fuel), but the minutes in the airspace for each sortie, and the operational training conducted would not change in any of the airspace described.

2.3.4.6 Construction Required

Under Alternative #4, 12 KC-46A PAA aircraft would be beddown at the 171 ARW installation at Pittsburgh ANGS; the 171 ARW would also implement minor construction projects for that conversion (Table 2-3-23). The proposed construction projects would comply with standards set forth in ANG Handbook 32-1084, *Facility Space Standards* (November 2012). AT/FP requirements would also be addressed to the extent practicable. Proposed facilities would be sited approximately as shown in Figure 2.3-8. The precise layout and design of proposed facilities is in the early planning stages, and therefore, exact locations and layouts are not finalized. Should locations and final layout of the facilities differ substantially from those anticipated and depicted herein, further environmental analysis would be required. Each of these projects is described in more detail in the following sections.

Table 2.3-22. Current and Proposed Local Air Refueling Airspace Used by the 171 ARW[1]

Airspace Unit Altitude[2] Floor and Ceiling	*Current Aircraft Proposed Aircraft*	*Minutes in Airspace for Each Sortie*	*Average KIAS*	ANNUAL SORTIE OPERATIONS	
				Current	*Proposed*
Duke MOA[3] ATCAA 8,000 feet –FL180 ATCAA FL180-As Assigned	KC-135 KC-46A	30	315	17	18
W105[4] Surface-FL500	KC-135 KC-46A	45	315	45	54
W107[4] Surface-Unlimited	KC-135 KC-46A	45	315	35	42
193WA TBD	KC-135 KC-46A	60	210	80	97
AR 777 FL210-FL280	KC-135 KC-46A	75	275	56	68
AR 109H/L FL250-310H FL190-230L	KC-135 KC-46A	45	275	41	49
AR 110 FL240-270	KC-135 KC-46A	50	260	21	25
AR 609 FL180-FL280	KC-135 KC-46A	60	300	25	30
AR 631 FL200-FL260	KC-135 KC-46A	60	265	30	36
AR 206H/L FL280-FL310H FL250-FL270L	KC-135 KC-46A	50	295	14	16
KIWI MOA[3] FL190-FL230	KC-135 KC-46A	60	315	20	24
AR 636 FL200-290	KC-135 KC-46A	60	300	16	19
AR 202 FL260-FL280	KC-135 KC-46A	55	265	29	35
AR 207 FL260-280	KC-135 KC-46A	75	265	37	45
AR 216 FL260-FL280	KC-135 KC-46A	75	265	33	39
AR220 FL190-FL220	KC-135 KC-46A	70	275	239	289
AR 633 FL180-FL230	KC-135 KC-46A	60	275	40	48
AR328 FL180-FL230	KC-135 KC-46A	60	275	20	24

Notes: 1. This table only shows KC-135 and KC-46A aircraft that are or would be flown by the 171 ARW in this airspace. Additional aircraft flown by other units that use this airspace are not shown."
2. FL Altitude is Mean Sea Level.
3. Military Operations Area (MOA) but no refuelings occur below 10,000 feet MSL.
4. W-Warning Area Floor is the Surface but no refuelings occur below 10,000 feet MSL.

KIAS = knots indicated airspeed; MOA = Military Operations Area; ATCAA = Air Traffic Control Assigned Airspace; FL = Flight Level

Source: 171 ARW 2013a.

Table 2.3-23. Proposed 171 ARW Construction Projects at Pittsburgh IAP

Project Description	*Total New Construction Footprint (SF)*	*New Impervious Surface (SF)*	*Estimated Year of Implementation*
Project #1 – Addition to Hangar 302			
This project would involve the addition of a 20,464 SF addition to the existing Maintenance Hangar 302 in order to provide an adequately sized hangar for the new KC-46A aircraft.	20,464	0	FY 2015
Project #2 – Addition to Hangar 320			
This project would involve the addition of a 19,180 SF addition to the existing Fuel Cell Hangar 320 in order to provide an adequately sized hangar for the new KC-46A aircraft.	19,180	0	FY 2015
Project #3 – Internal Renovation to Hangar 301			
This project would include internal renovations only in order to provide sufficient space to house the KC-46A Fuselage Trainer, the Weapons System Trainer, and the Boom Operator Trainer.	0	0	FY 2015
Project #4 – Modifications to Existing Parking Ramp and Taxiway			
This project would include the addition of 143,505 SF of concrete and asphalt to the existing parking ramp and taxiway that leads to the parking ramp.	143,505	88,529	FY 2015
Project #5 – New Hydrants and Fuel Lines and Demolition of Existing Hydrants			
This project would include the addition of eight new fuel hydrants as well as new fuel lines to these hydrants. Approximately 58,335 SF of disturbance would occur as a result of the new hydrants and fuel lines.	3,246	0	FY 2015
Total	**186,395**	**88,529**	

Notes: SF = square foot; FY = fiscal year

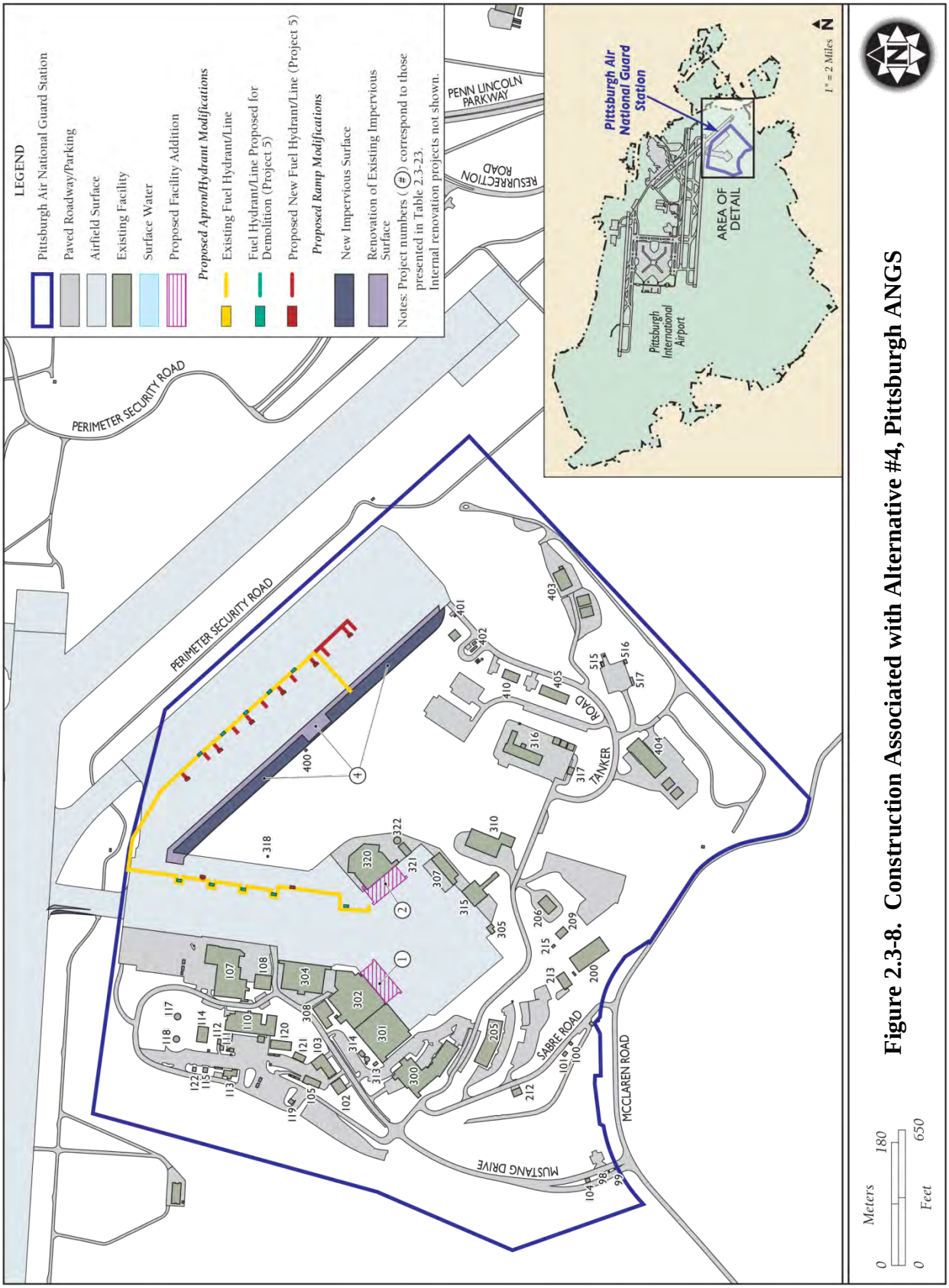


Figure 2.3-8. Construction Associated with Alternative #4, Pittsburgh ANGS

Implementation of the KC-46A aircraft beddown would require the 171 ARW to ensure their installation has properly sized and adequately configured facilities to support 12 KC-46A aircraft. Although the Pittsburgh ANGS location was deemed to have an acceptable level of facilities to support this beddown, and has facilities that currently meet the majority of the requirements laid out in Section 2.1.2.2, there remain some functional areas that require modification. Proposed construction includes an addition to Hangar 302, an addition to Hangar 320, internal renovations of Hangar 301, modification to existing ramp and taxiway, and addition and demolition of hydrants and fuel lines on the parking apron.

The projects described below would incorporate LEED and sustainable development concepts, so as to achieve optimum resource efficiency, constructability, sustainability, and energy conservation, while minimizing adverse impacts to the built and natural environments through all phases of their life cycle. This may result in primary facility costs exceeding DoD costing standards, but the initial investment in higher acquisition cost would be rewarded with lower life cycle costs. This is consistent with the requirements of the Energy Policy Act of 2005, 10 USC 2802, EO 13423, and other applicable laws and EOs.

Addition to Hangar 302

Hangar 302

A minimum of one Maintenance Hangar is required to support the maintenance and operations of KC-46A. Hangars provide an environmentally controlled area to perform maintenance. The hangar bays require enough space to use the support equipment such as stands and carts to perform maintenance functions. The hangars would house the maintenance shops, tool cribs, and personnel. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, a 20,464 SF addition to Hangar 302 would need to be added in order to accommodate the larger aircraft inside the maintenance hangar.

Addition to Hangar 320

Hangar 320

A minimum of one Fuel Systems Maintenance Hangar is required to support the maintenance and operations of KC-46A. The Fuel Systems Maintenance Hangar provides space for covered aircraft maintenance, shop, and administrative functions, and contains utilities and safety systems required to perform fuel systems maintenance to include pressure checks and inspections. Aircraft hangar space is required for on-aircraft open fuel cell maintenance. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, a 19,180 SF addition to Hangar 320 would need to be added in order to accommodate the larger aircraft inside the maintenance hangar.

Internal Renovations to Hangar 301

Internal renovations to Hangar 301 would be made in order to house the KC-46A Fuselage Trainer, the Weapons System Trainer, and the Boom Operator Trainer.

Modifications to Existing Parking Ramp and Taxiway

Area Adjacent to Taxiway that is Proposed to Receive Pavement Addition

The proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. Additional concrete would need to be added to the parking ramp and taxiway at Pittsburgh IAP in order to increase the size of the parking ramp to accommodate the larger KC-46A aircraft. In addition, the taxiways would need to be wide enough to support the turning radii of the KC-46A. Therefore, under Alternative #4, the addition of 143,505 SF of concrete and asphalt would be added to the existing parking ramp and the taxiway that leads to the parking ramp. Following the construction, there would be an increase of approximately 88,529 SF of impervious surface as a result of this project.

New Hydrants and Fuel Lines and Demolition of Existing Hydrants

As stated above, the proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. A fuel hydrant system provides all

the equipment and controls to provide clean fuel to fueling points in the aircraft parking apron. The system reduces the amount of physical movement of fuel around an airfield. Under Alternative #4, eight new fuel hydrants would be added to the existing parking ramp as well as new fuel lines to one of these hydrants. Approximately 3,246 SF of disturbance would occur as a result of the new hydrants and fuel lines.

2.3.4.7 Personnel Changes

The 171 ARW currently is authorized 1,306 personnel (Table 2.3-24). Under Alternative #4, the KC-46A mission would add an additional 59 military positions to the authorized manning requirement (approximately a 5 percent increase in total personnel). Changes to the authorized personnel under this alternative are shown in Table 2.3-24.

Table 2.3-24. Comparison of Currently Authorized and Proposed 171 ARW Personnel

Personnel	*Authorized*	*Proposed*	*Change*
Full Time			
Active Associate (USAF)	0	199	199
Active Guard and Reserve	101	101	0
Dual Status Technician (Guard civilians, federal)[1]	292	328	36
Non-Dual Status (DoD civilians, Air Traffic Control)	0	0	0
Subtotal	*393*	*628*	*235*
Part Time			
Drill Status Guardsmen	913	737	-176
Total Personnel Assignments[2]	**1,306**	**1,365**	**59**
Total Personnel On Base	**1,014**	**1,037**	**23**

Note: 1. Total personnel on base is the sum of all categories minus the number of people with two assignments.
2. Some personnel work off-site but are assigned to the unit.

2.3.5 Alternative #5 – Rickenbacker Air National Guard Station

2.3.5.1 Background

Rickenbacker ANGS, home of the 121st Air Refueling Wing (121 ARW) of the Ohio Air National Guard (OH ANG), is located approximately 12 miles southeast of downtown Columbus, Ohio in Franklin County (Figure 2.3-9). The 121 ARW installation is situated on the west side of Rickenbacker IAP, an international airport operated by the Columbus Regional Airport Authority (CRAA). The 121 ARW holds a lease with the Rickenbacker IAP for the installation property with a termination date of 2061. The installation occupies approximately 170 acres, most of which are within the main cantonment area.

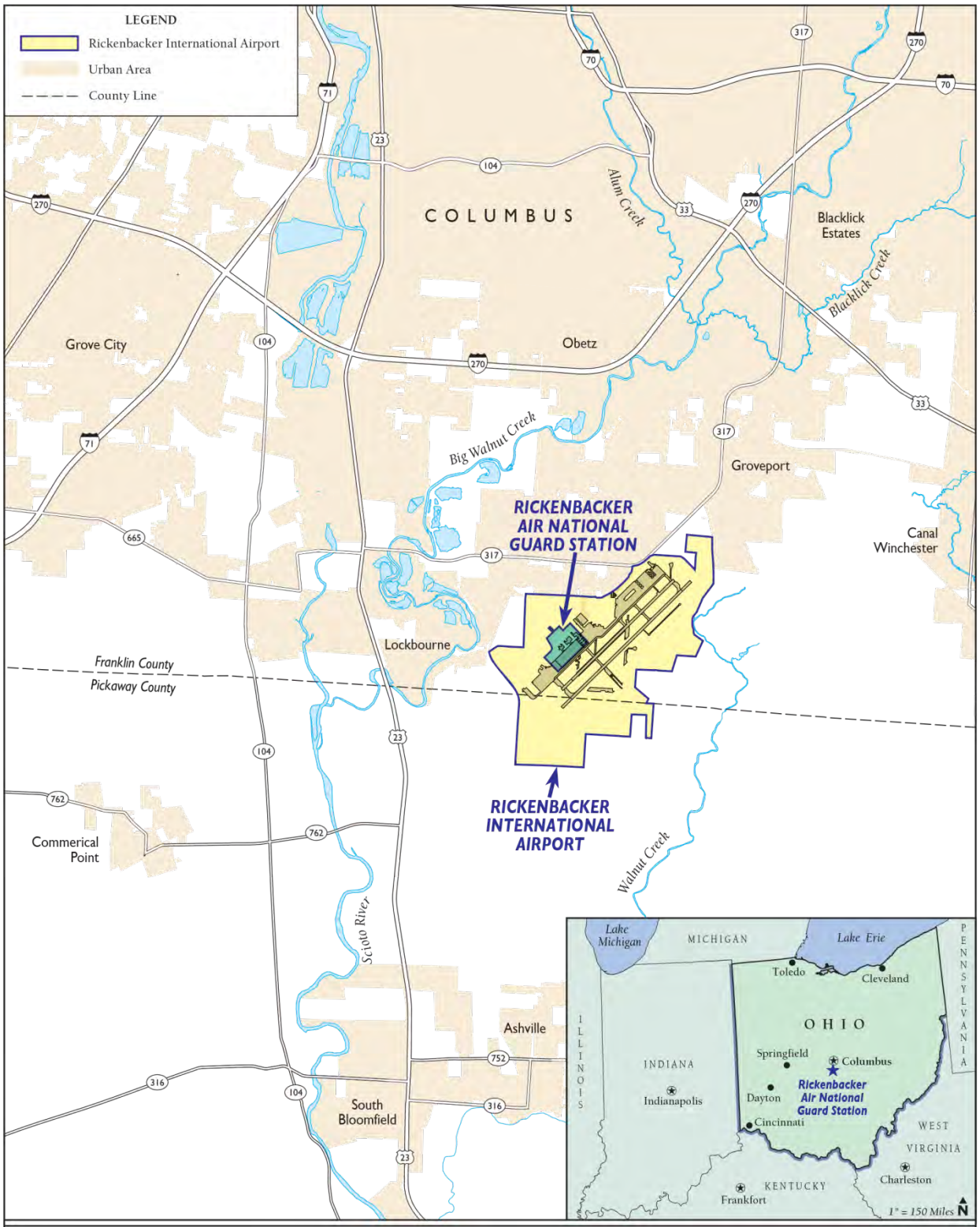


Figure 2.3-9.
Regional Location
Rickenbacker ANGS

2.3.5.2 Mission

The mission of the 121 ARW is to provide support for federal, state, and community interests by providing timely worldwide air refueling, airlift, and support forces; protecting life and property; and preserving peace, order, and public safety. The 121 ARW currently flies and maintains 18 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 121 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

2.3.5.3 Aircraft Conversion

Under Alternative #5, the 121 ARW would convert from 18 KC-135 PAA and no KC-135 BAI to 12 KC-46A PAA. Concurrent with the beddown of the 12 KC-46A PAA at Rickenbacker ANGS, the existing KC-135 aircraft would either be relocated to other installations or retired out of the USAF inventory, depending on the life-cycle status of each particular aircraft. Separate NEPA documentation would be prepared for any of the aircraft relocated to other installations, as necessary.

2.3.5.4 Airfield Operations

Rickenbacker IAP has two parallel runways spaced approximately 1,000 feet apart. Runway 05R/23L is 12,102 feet long and 200 feet wide and Runway 05L/23R is 11,902 feet long and 150 feet wide (AirNav 2013c).

In 2012, the 121 ARW flew 2,014 sorties. According to the unit's scheduling data and airport traffic counts, the unit flew 1,289 of these sorties from Rickenbacker IAP, or 64 percent of the total annual sorties flown. The remaining sorties were flown from other airfields in the U.S. and/or overseas in support of operational missions. Actual airfield data indicates that the 121 ARW conducted 6,445 operations with an average of 5.0 operations per sortie at the airfield (Table 2.3-25).

Table 2.3-25. Current 121 ARW KC-135 Operations at Rickenbacker IAP

	Departures		Arrivals		Total[1]		Grand
Aircraft	*Day*	*Night[2]*	*Day*	*Night[2]*	*Day*	*Night[2]*	*Total[1]*
KC-135	3,223	0	3,061	161[3]	6,284	161	6,445

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Night operations are limited due to Maintenance Union Agreement.

Source: 121 ARW 2013a.

Following the aircraft beddown under Alternative #5, the KC-46A aircraft would fly a total of 8,040 hours annually, with an ASD of 4.0 hours. This would result in 2,010 annual sorties, 64 percent of which would be performed at the home-station (Rickenbacker ANGS). Thus, it is expected that up to 1,286 sorties would be flown at Rickenbacker IAP annually under this alternative. This would be essentially the same as the baseline 1,289 sorties (it is assumed that the same percentage of the sorties found under current baseline conditions would be flown at Rickenbacker IAP under this alternative). Based on 1,286 annual home-station sorties and an average of 5.33 operations per sortie, there would be 6,857 annual home-station operations, or an additional 412 airfield operations annually at Rickenbacker IAP (Table 2.3-26). This would increase the average daily airfield operations from 17.7 to 18.8 (Table 2.3.27). There would be no changes expected to departure/arrival patterns and tracks, and use of runways. Current noise abatement procedures would continue to be followed (see Section 4.5.1, *Noise*).

Table 2.3-26. Proposed 121 ARW KC-46A Aircraft Operations at Rickenbacker IAP

Aircraft	DEPARTURES		ARRIVALS		TOTAL[1]		*Grand Total[1]*
	Day	*Night[2]*	*Day*	*Night[2]*	*Day*	*Night[2]*	
KC-46A	3,424	0	3,157	276	6,581	276	6,857

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night – Between 10 p.m. and 7 a.m. for environmental night.
3. Night Operations are limited due to Maintenance Union Agreement.

Table 2.3-27. Changes to 121 ARW Airfield Operations with Proposed KC-46A Aircraft

Unit	*Total Based KC-135 Annual Airfield Operations (Average Daily Airfield Operations)*	*Total Proposed KC-46A Annual Airfield Operations (Average Daily Airfield Operations)*	*Increased Airfield Operations Annually for Proposed KC-46A Operations (Percent Increase)*
121 ARW	6,445 (17.7)	6,857 (18.8)	412 (6.4%)

2.3.5.5 Airspace Operations

The 121 ARW conducts air refueling for both training and contingency missions for the receiver aircraft. Primary air refueling tracks used by the 121 ARW are described in Table 2.3-28. Under Alternative #5, there would be a slight change to the frequency of use due to the proposed increase in the sorties. The KC-46A will also have a requirement for training as a receiver aircraft (on-loading fuel) and will use the existing air refueling tracks as a receiver in addition to the normal use as a refueling aircraft (off-loading fuel). However, the minutes in the airspace for each sortie and the operational training conducted would not be expected to change in any of the airspace described.

Table 2.3-28. Current and Proposed Local Air Refueling Airspace Used by the 121 ARW[1]

Airspace Unit Altitude Floor and Ceiling	*Current Aircraft Proposed Aircraft*	*Minutes in Airspace for Each Sortie*	*Average KIAS*	ANNUAL SORTIE OPERATIONS	
				Current	*Proposed*
Buckeye MOA[2] ATCAA 6,000 feet MSL -FL500[3]	KC-135 KC-46A	30	300	100	101
Steelhead MOA ATCAA FL240-FL260	KC-135 KC-46A	30	315	24	24
AR 202 FL260-FL280	KC-135 KC-46A	60	275	150	151
AR 207 FL260-280	KC-135 KC-46A	60	275	200	204
AR 216 FL260-FL280	KC-135 KC-46A	60	275	200	204
AR 220 FL190-FL220	KC-135 KC-46A	60	275	20	21
AR 315[2] FL190-FL210	KC-135 KC-46A	60	275	300	305
AR 328 FL180-FL230	KC-135 KC-46A	60	275	50	51
AR 455 FL250-FL270	KC-135 KC-46A	60	275	100	101

Notes: 1. This table only shows KC-135 and KC-46A aircraft that are or would be flown by the 121 ARW in this airspace. Additional aircraft flown by other units that use this airspace are not shown.
2. MOA Floor is 6,000 feet MSL but no refueling occurs below 10,000 feet MSL
3. 50,000 feet MSL (FL500)
KIAS = knots indicated airspeed; MOA = military operations area; ATCAA = Air Traffic Control Assigned Airspace; MSL = mean sea level; FL = Flight Level

Source: 121 ARW 2013b.

2.3.5.6 Construction Required

Under Alternative #5, 12 KC-46A PAA aircraft would be beddown at the 121 ARW installation at Rickenbacker ANGS; the 121 ARW would also implement minor construction projects for that conversion (Table 2.3-29). The proposed construction projects would comply with standards set forth in ANG Handbook 32-1084, *Facility Space Standards* (November 2012). AT/FP requirements would also be addressed to the extent practicable. Proposed facilities would be sited approximately as shown in Figure 2.3-10. The precise layout and design of proposed facilities is in the early planning stages, and therefore, exact locations and layouts are not finalized. Should locations and final layout of the facilities differ substantially from those anticipated and depicted herein, further environmental analysis would be required. Each of these projects is described in more detail in the following sections.

Implementation of the KC-46A aircraft beddown would require the 121 ARW to ensure their installation has properly sized and adequately configured facilities to support 12 KC-46A aircraft. Although the Rickenbacker ANGS location was deemed to have an acceptable level of facilities to support this beddown, and has facilities that currently meet the majority of the requirements laid out in Section 2.1.2.2, there remain some functional areas that require

modification. Proposed construction includes additions and renovations to Hangar 885, an addition to Hangar 883, internal renovations of Hangar 888, modifications to the existing ramp and taxiway, and addition and demolition of hydrants and fuel lines on the parking apron.

The projects described below would incorporate LEED and sustainable development concepts, so as to achieve optimum resource efficiency, constructability, sustainability, and energy conservation, while minimizing adverse impacts to the built and natural environments through all phases of their life cycle. This may result in primary facility costs exceeding DoD costing standards, but the initial investment in higher acquisition cost would be rewarded with lower life cycle costs. This is consistent with the requirements of the Energy Policy Act of 2005, 10 USC 2802, EO 13423, and other applicable laws and EOs.

Table 2.3-29. Proposed 121 ARW Construction Projects at Rickenbacker IAP

Project Description	*Total New Construction Footprint (SF)*	*New Impervious Surface (SF)*	*Estimated Year of Implementation*
Project #1 – Addition and Modifications to Hangar 885			
This project would involve a 4,000 SF addition to the existing Maintenance Hangar 885 in order to provide an adequately sized hangar for the new KC-46A aircraft, and modification of existing spaces to address changes in the Life Safety code. The Weapons System Trainer and the Boom Operator Trainer would also be installed within this facility.	4,000	0	FY 2015
Project #2 – Addition to Hangar 883			
This project would involve a 17,290 SF addition to the existing Fuel Cell Hangar 883 in order to provide an adequately sized hangar for the new KC-46A aircraft.	17,290	0	FY 2015
Project #3 – Internal Renovation to Hangar 888			
This project would include internal renovations only in order to provide sufficient space to house the KC-46A Fuselage Trainer.	0	0	FY 2015
Project #4 – Modifications to Existing Parking Ramp and Taxilane			
This project would include the renovation of 338,877 SF of concrete to the existing parking ramp and the taxilane that leads to the hangars from the parking ramp, as well as the end of this same parking ramp.	338,877	14,660	FY 2015
Project #5 – New Hydrants and Fuel Lines and Demolition of Existing Hydrants			
This project would include the addition of seven new fuel hydrants. New fuel lines would be added to two of these hydrants, while five would be re-piped from the existing spurs. In addition, demolition of seven hydrants would occur. Approximately 8,163 SF of disturbance would occur as a result of the new hydrants and fuel lines, while an additional 1,206 SF of disturbance would occur as a result of the demolition of existing hydrants and fuel lines.	8,163	0	FY 2015
Total	**368,330**	**14,660**	

Notes: SF = square foot; FY = fiscal year

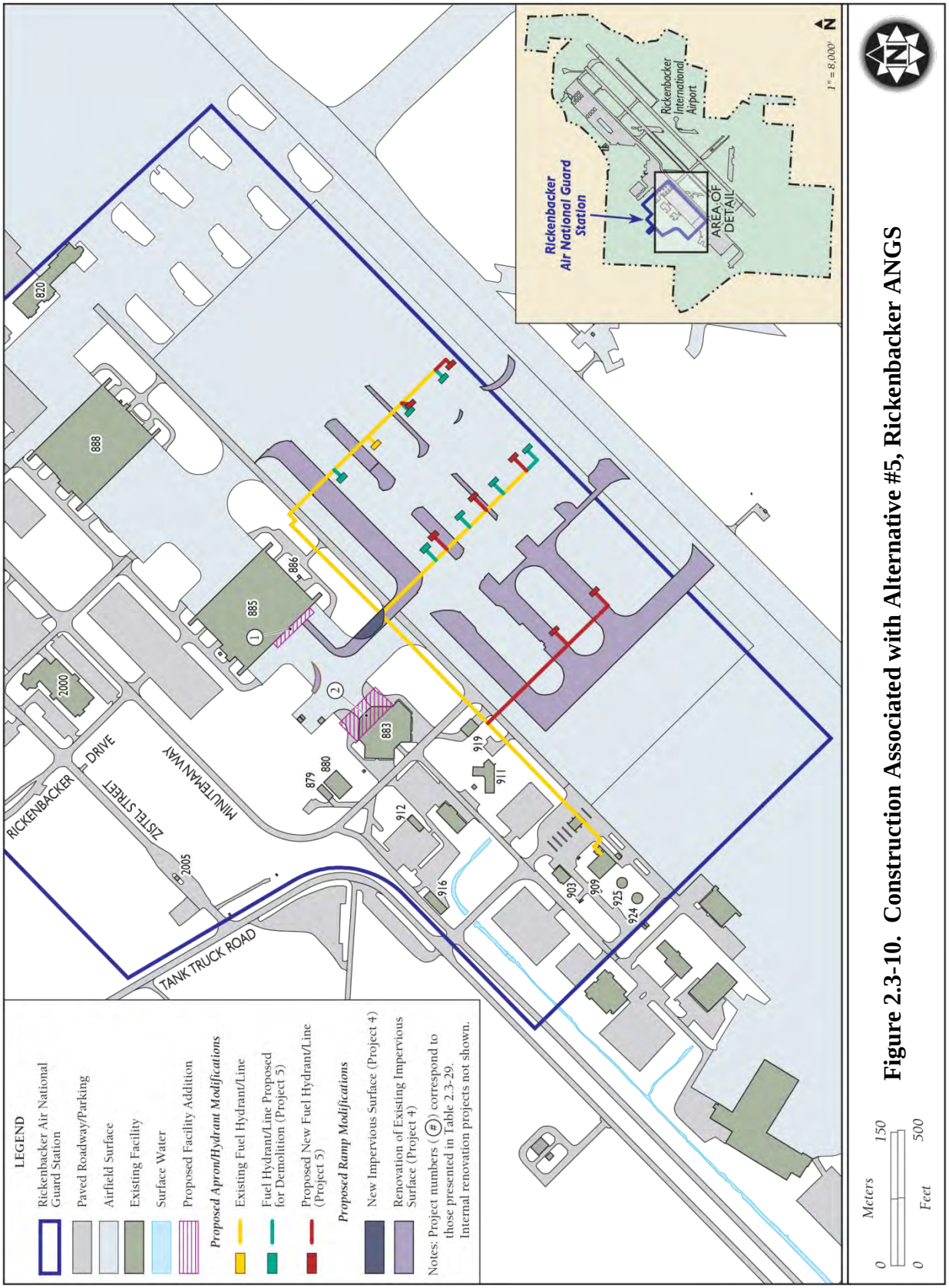


Figure 2.3-10. Construction Associated with Alternative #5, Rickenbacker ANGS

Addition and Modifications to Hangar 885

Hangar 885

A minimum of one Maintenance Hangar is required to support the maintenance and operations of KC-46A. Hangars provide an environmentally controlled area to perform maintenance. The hangar bays require enough space to use the support equipment such as stands and carts to perform maintenance functions. The hangars will house the maintenance shops, tool cribs, and personnel. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, a 4,000 SF addition to Hangar 885 would need to be added in order to accommodate the larger aircraft inside the maintenance hangar. Interior modifications of Hangar 885 are required to address changes to Life Safety Codes.

Addition to Hangar 883

Hangar 883

A minimum of one Fuel Systems Maintenance Hangar is required to support the maintenance and operations of KC-46A. The Fuel Systems Maintenance Hangar provides space for covered aircraft maintenance, shop, and administrative functions, and contains utilities and safety systems required to perform fuel systems maintenance to include pressure checks and inspections. Aircraft hangar space is required for on-aircraft open fuel cell maintenance. The KC-46A is a military derivative of a commercial Boeing 767 aircraft and has a slightly larger footprint than the KC-135. Therefore, a 17,290 SF addition to Hangar 885 would need to be added in order to accommodate the larger aircraft inside the maintenance hangar.

Internal Renovations to Hangar 888

Internal renovations to Hangar 888 would be made in order to house the KC-46A Fuselage Trainer.

Modifications to Existing Parking Ramp

Existing Parking Apron

The proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. The correct pavement thickness and strength of the parking ramps and taxiways is also important to avoid damage to the KC-46A and/or to the airfield pavement. During landing, the aircraft is light on fuel and the weight is transferred from the wings to the landing gear as the nose landing gear touches down and the aircraft decelerates. During takeoff the aircraft is heavy, but as the aircraft accelerates the weight is gradually transferred from the wheels to the wings. Thus, the majority of the damage to the pavement occurs during loading and taxiing prior to departure. Additional concrete would need to be added to the parking ramp and taxilane at Rickenbacker IAP in order to satisfy the thickness and strength requirements for the KC-46A aircraft. In addition, the taxilanes would need to be wide enough to support the turning radii of the KC-46A. Therefore, under Alternative #5, the renovation of 338,877 SF of concrete would be added to the existing parking ramp and the taxilane that leads to the hangars from the parking ramp. Following the construction, there would be an increase of approximately 14,660 SF of impervious surface as a result of this project.

New Hydrants and Fuel Lines and Demolition of Existing Hydrants

As stated above, the proposed beddown of 12 PAA KC-46A aircraft requires a minimum of 8 KC-46A parking spots with a fuel hydrant at each location. A fuel hydrant system provides all the equipment and controls to provide clean fuel to fueling points in the aircraft parking apron. The system reduces the amount of physical movement of fuel around an airfield. Under Alternative #5, seven new fuel hydrants would be added to the existing parking ramp. New fuel lines will be added to two of these, while five will be re-piped from the existing spurs. In addition, demolition of seven hydrants would occur. Approximately 8,163 SF of disturbance would occur as a result of the new hydrants and fuel lines, while an additional 1,206 SF of disturbance would occur as a result of the demolition of existing hydrants and fuel lines. Approximately 1,198 SF of the total disturbance occurring would be temporary disturbance occurring on grassland areas; however, this area would remain a pervious surface following construction.

2.3.5.7 Personnel Changes

The 121 ARW currently is authorized 1,497 personnel. Under Alternative #5, the KC-46A mission would add an additional 197 military positions to the authorized manning requirement

(approximately a 13 percent increase in total personnel). Changes to authorized personnel under this alternative are shown in Table 2.3-30.

Table 2.3-30. Comparison of Currently Authorized and Proposed 121 ARW Personnel

Personnel	*Authorized*	*Proposed*	*Change*
Full Time			
Active Associate (USAF)	0	199	199
Active Guard and Reserve	119	119	0
Dual Status Technician (Guard civilians, federal)[1]	323	336	13
Non-Dual Status (DoD civilians, Air Traffic Control)	0	0	0
Subtotal	*442*	*654*	*212*
Part Time			
Drill Status Guardsmen	1,055	1,040	-15
Total Personnel Assignments[2]	**1,497**	**1,694**	**197**
Total Personnel On Base	**1,174**	**1,358**	**184**

Note: 1. Total personnel on base is the sum of all categories minus the number of people with two assignments.
2. Some personnel work off-site but are assigned to the unit.

2.4 NO ACTION ALTERNATIVE

The CEQ regulation 40 CFR § 1502.14(d) specifically requires analysis of the "No Action" alternative in all NEPA documents. Under the No Action Alternative, the proposed aircraft beddown would not occur, and the NGB would not implement the components described above under the five Action Alternatives. There would be no change in based aircraft; use of the airfield at the proposed locations; or use of Special Use Airspace (SUA), construction, or personnel assigned to the KC-46A aircraft squadron. Under the No Action Alternative, the NGB would continue to conduct their current mission using the existing KC-135 aircraft with multiple configurations and crews that are not trained to accomplish every mission. This lack of standardized equipment and training throughout the fleet would continue to negatively impact the ability for KC-135 aircrews to support, on a large scale, multi-role missions or exploit new tactics and procedures. The continued use of the KC-135 aircraft would not meet the identified needs of the NGB or the USAF; however, this alternative is carried forward for analysis in this EIS per CEQ regulations, and as a baseline from which to compare the potential impacts of the Proposed Action and alternatives.

2.5 IDENTIFICATION OF PREFERRED ALTERNATIVE

The USAF has identified Pease ANGS as the preferred alternative for the MOB 2 KC-46A beddown. The USAF selected Pease ANGS based on an operational analysis, results of site surveys, and military judgment factors.

2.6 SUMMARY OF ANTICIPATED IMPACTS AMONG ALTERNATIVES

Comparing and differentiating among alternatives comprises a fundamental premise of NEPA. A summary of each alternative, including the No Action Alternative, is presented in

Table 2.6-1, which can then be used to compare the anticipated impacts of each alternative. A summary and comparison of the anticipated impacts associated with implementation of each alternative for this action is presented in Table 2.6-2.

Table 2.6-1. Summary of Alternatives (Current/Proposed)

	Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Refueler Aircraft Type	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-46A	KC-135 / KC-135
Number of Refueler Aircraft (PAA)	12 / 12	8 / 12	8 / 12	16 /12	18 / 12	Same as current
ARW Refueler Flying Hours	4,868 / 8,040	3,687 / 8,040	6,219 / 8,040	6,016 / 8,040	7,215 / 8,040	Same as current
Annual Sorties	1,478 / 2,010	1,112 / 2,010	1,382 / 2,010	1,569 / 2,010	2,014 / 2,010	Same as current
% Home-Station Operations	64% / 64%	75% / 75%	44% / 44%	59% / 59%	64% / 64%	Same as current
Home-Station Sorties	946 / 1,286	834 / 1,508	614 / 884	926 / 1,186	1,289 / 1,286	Same as current
Annual Airfield Operations Home-Station -- ANG	10,452 / 14,562	8,340 / 17,608	6,140 / 8,840	6,943 / 9,226	6,445 / 6,857	Same as current
Total Actual Airfield Operations (including ANG) based on 2012 FAA/Tower reports	24,630 / 28,740	62,686 / 71,875	37,410 / 40,110	139,217 / 141,500	39,436 / 39,848	Same as current
Total FAR Part 150 (Baseline 2006/2007) Approved Operations (including ANG)	N/A	N/A	N/A	321,436[1] / 317,602	67,160[2] / 60,877	Same as current
Construction -- new	Hangar modifications; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; new simulator building; ramp/taxiway modifications	Hangar modifications; building additions; new fuel hydrants; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; ramp/taxiway modifications	Hangar modifications; new fuel hydrants; ramp/ taxiway modifications	None
Construction -- renovations	Internal building renovations	Internal hangar renovations	Internal building renovations	Internal hangar renovations	Internal hangar renovations	None
Proposed Personnel Change (ANG and active duty)	+194	+287	+171	+59	+197	0

Notes: 1. 2006 Part 150 Study data
2. 2007 Part 150 Study data
ANGS = Air National Guard Station; JB MDL = Joint Base McGuire-Dix-Lakehurst; PAA = ;Primary Aerospace Vehicles Authorized; ARW = Air Refueling Wing; ANG = Air National Guard; FAR = Federal Aviation Regulations

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Noise					
Airfield operations would increase by 4,110 (39 percent increase in 190 ARW operations, 17 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres. Impacts from noise would be negligible.	Airfield operations would increase by 9,268 (111 percent increase in 108 WG operations, 15 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would increase by 1,831 acres. Impacts from noise would be negligible.	Airfield operations would increase by 2,700 (44 percent increase in 157 ARW operations, 7 percent increase in total airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Impacts from noise would be negligible.	Airfield operations would decrease by 3,834 (29 percent decrease from the currently published baseline FAR Part 150 Noise Compatibility Program [2006]; and a 2 percent increase in actual 2012 airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 79 acres. Impacts from noise would be negligible.	Airfield operations would decrease by 6,283 (48 percent decrease from the currently published baseline FAR Part 150 Noise Compatibility Program [2007]; and a 1 percent increase in actual 2012 airfield operations). Acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. Impacts from noise would be negligible.	Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. The noise environment at each of the five alternative airfields would continue to be managed through their existing AICUZ or FAR Part 150 airfield compatibility programs. There would be no additional Noise impacts at any of the alternative installations under the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Air Quality					
Forbes ANGS is located in an attainment area for all criteria pollutants. While there would be increases in operational criteria pollutant emissions, they would be below the PSD threshold, and would not be significant. Impacts from construction emissions and operational HAP emissions would be negligible.	The 108 WG installation is in a nonattainment area for O3 (marginal nonattainment) and maintenance area for PM2.5 and CO, and is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants, except NOx, which would be above the *de minimis* threshold of 100 tpy. A conformity determination will be prepared. Impacts from construction emissions and operational HAP emissions are negligible.	The Pease ANGS installation is in a maintenance area for O3, and is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants. Impacts from construction emissions and operational HAP emissions are negligible.	The Pittsburgh ANGS is located within a non-attainment area for PM2.5, a moderate nonattainment area for the 1997 8-hour O3 standard, and is classified as a marginal nonattainment area for the 2008 8-hour O3 standard, according to 40 CFR 81.339. The Pittsburgh ANGS is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants. Impacts from construction emissions and operational HAP emissions are negligible.	The Rickenbacker ANGS is located in a nonattainment area for the O3 and PM2.5 NAAQS. While there are increases in operational criteria pollutant emissions, they are below the PSD/*de minimis* thresholds for all pollutants and are not significant. Impacts from construction emissions and operational HAP emissions are negligible.	Air Quality at each alternative airfield would remain as it currently is. Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. Emissions at each of the alternative installations would continue to be in compliance with their respective SIPs. There would be no additional impacts to Air Quality at each alternative installation under the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Safety					
There would be a 39 percent increase in actual 190 ARW airfield operations (17 percent increase in total airfield operations) at Forbes Field Airport with commensurate increase in mishap and BASH potential.	There would be a 111 percent increase in actual 108 WG airfield operations (15 percent increase in total airfield operations) at JB MDL with a commensurate increase in mishap and BASH potential.	There would be a 44 percent increase in actual 157 ARW airfield operations (7 percent increase in total airfield operations) at Portsmouth IAP with a commensurate increase in mishap and BASH potential.	There would be a 33 percent increase in actual 2012 171 ARW airfield operations (2 percent increase in total airfield operations) at Pittsburgh IAP with a commensurate increase in mishap and BASH potential.	There would be a 6 percent increase over the actual 2012 121 ARW airfield operations (1 percent increase in total airfield operations) at Rickenbacker IAP with a commensurate increase in mishap and BASH potential.	Both ground and flight safety at each alternative airfield would remain as they currently are. Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. There would be no additional impacts to Safety under the No Action Alternative.
Construction activities would involve no unusual or extraordinary techniques. During construction, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.					
Soils and Water					
There would be approximately 5.9 acres of temporary soil disturbance and no new impervious surface as a result of the proposed construction.	There would be approximately 4.7 acres of temporary soil disturbance and 2.4 acres of new impervious surface as a result of the proposed construction.	There would be approximately 3.0 acres of temporary soil disturbance and 0.5 acres of new impervious surface as a result of the proposed construction.	There would be approximately 4.3 acres of temporary soil disturbance and 2.0 acres of new impervious surface as a result of the proposed construction.	There would be approximately 8.5 acres of temporary soil disturbance and 0.3 acres of new impervious surface as a result of the proposed construction.	Soils and Water Resources at each alternative airfield would remain as they currently are. There would be no additional impacts to Soils and Water Resources as a result of the No Action alternative.
To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. In addition, as the construction is for national defense purposes and the surrounding land is already in urban development, the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.		To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. Proposed construction would not impact prime farmlands; therefore, the Farmland Protection Policy Act does not apply to this alternative. As a result, impacts to soil and water resources would be negligible.			

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Biological Resources					
No impacts to vegetation and wetlands. Impacts to wildlife species from operational noise would be imperceptibly beneficial due to the slight decrease in noise. 39 percent increase in 190 ARW (17 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to wildlife due to construction would be negligible. No special status species or critical habitat is known to occur on Forbes Field Airport; therefore, there would be no impacts to these species.	Impacts to vegetation would be minor. No impacts to wetlands. Impacts to wildlife species from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. 111 percent increase in 108 WG (15 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally listed species or critical habitat is known to occur on McGuire Field. Six state listed species are known to occur on McGuire Field. There would be no impacts to federally listed and impacts to state listed species would be minor.	Impacts to vegetation would be negligible. No impacts to wetlands. Impacts to wildlife species from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. 44 percent increase in 157 ARW (7 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Portsmouth IAP; therefore, there would be no impacts to federally listed species.	Impacts to vegetation would be negligible. No significant impacts to wetlands. Impacts to wildlife species from operational noise would be minor due to the 33 percent increase in 171 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally listed or critical habitat is known to occur on Pittsburgh IAP; therefore, there would be no impacts to federally listed species. There would be no impacts to state listed species.	Impacts to vegetation would be negligible. No impacts to wetlands. Impacts to wildlife species from operational noise would be minor due to the 6 percent increase in 121 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Rickenbacker IAP; therefore, there would be no impacts to federally listed species.	There would be no change to Biological Resources under this alternative. There would be no additional impacts to Biological Resources as a result of the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Cultural Resources					
Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. Minor interior modifications to Building 679 would not affect the NRHP-eligibility of the building. The Kansas SHPO has concurred with these findings. The installation has been intensively surveyed and no known traditional resources are known to occur. Two responses have been received from the Kaw Nation and the Wichita and Affiliated Tribes stating that they have no objection to the Proposed Action. Additional efforts were made to contact non-responsive tribes without success. While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts	Construction activities associated with this alternative would be primarily limited to the developed areas of the installation in the areas of the aircraft hangars and airfield pavements. A small amount of construction (0.15 acre) would occur in forested area near this developed area. Based on previous archaeological surveys at McGuire Field, the area of proposed construction does not contain any known NRHP-eligible sites and is considered to have a low potential for containing buried materials. The New Jersey SHPO has concurred with these findings. No traditional resources have been identified. Responses from the Delaware Tribe of Indians and the Delaware Nation stated that their review indicated no religious or culturally significant sites in the area. SHPO consultation for this EIS has provided concurrence that no historic properties would be	Based on previous archaeological surveys on the installation, the area of proposed construction does not contain any known NRHP-eligible sites or traditional resources. Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. The New Hampshire SHPO has concurred with these findings. The Penobscot Indian Nation is the only federally-recognized tribal entity affiliated with Pease ANGS, and has responded stating that they have no issues with the Proposed Action. No impacts to cultural impacts would be expected to occur.	The installation contains no known traditional resources. Given the extensive development on the installation, it is unlikely that there are traditional resources located at the Pittsburgh ANGS. Construction activities associated with this alternative are limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements and all impacts would be negligible. Correspondence has been received from all tribes consulted including the Seneca Nation of Indians, the Cayuga Nation of New York, the Tonowanda Band of Seneca, Tuscarora Nation of New York, and the Onondaga Nation of New York stating that they have no objection to the Proposed Action	Construction activities at Rickenbacker ANGS would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements. The installation has been intensively surveyed for cultural resources and no traditional cultural resources are known to exist in the area. The one significant archaeological resource that is located within the installation is not within the proposed construction areas and would not be impacted. Two NRHP-eligible hangars (883 and 885) could be adversely impacted by construction under this alternative. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, additional consultation would be conducted to minimize and mitigate	Under the No Action Alternative, Cultural Resources at each alternative installation would remain as they currently are. None of the proposed facility construction/renovations would occur at any of the installations, and thus, there would be no potential impacts to facilities that are eligible for listing on the NRHP. There would be no surface disturbance from construction activities, and thus no potential to impact unknown archaeological resources. There would be no additional impacts to Cultural Resources as a result of the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Forbes ANGS is now complete.	affected under the proposed action.			adverse effects to these buildings. Correspondence has been received from the Peoria Tribe of Indians, the Pokagon Band of Potawatomi Indians, the Turtle Mountain Band of Chippewa Indians of North Dakota, the Delaware Nation, and the Shawnee Tribe who indicated that they had no objection to the proposed project. Additional efforts were made to contact non-responsive tribes without success. While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Rickenbacker ANGS is now complete.	
Land Use					
Total annual airfield operations would increase by 4,110 (17 percent).	Total annual airfield operations would increase by 9,268 (15 percent).	Total annual airfield operations would increase by 2,700 (44 percent).	Airfield operations would decrease by 3,834 (29 percent decrease) from the currently	The number of airfield operations would decrease by 6,283 (48 percent decrease) from the	Land Use at each alternative airfield would remain as it currently is. Each of the five installations would retain the

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres (55 acres off airport-controlled property). Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would be compatible with current land use and zoning designations and would result in imperceptibly beneficial impacts by reducing the off-airport areas currently exposed to a DNL between 65 dB and 70 dB. Airport Hazard Areas would not be affected.	Acreage within the 65 dB DNL (and greater) noise contour off DoD-controlled property would increase by 419 acres. An additional 8 acres of residential use areas would be exposed to greater than 65 dB DNL. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in minor adverse impacts due to an increase in off-airport areas (including residential areas) exposed to a DNL between 65 dB and 75 dB. Airport Hazard Areas would not be affected.	Acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Of this increase in acreage, 4 acres would be off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts due to an increase in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	published FAR Part 150 Noise Compatibility Program (2006), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 79 acres. There would be a decrease of approximately 23 acres within the 65 dB DNL noise contour that are off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	currently published FAR Part 150 Noise Compatibility Program (2007), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. Decrease of 72 acres within the 65 dB DNL noise contour that are off airport-controlled property, resulting in 345 acres off airport-controlled property that lie within the 65 dB contour. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to a DNL above 65 dB. Airport Hazard Areas would not be affected.	KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as they currently do. There would be no additional impacts to Land Use under the No Action Alternative at any of the alternative locations.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Infrastructure and Transportation					
Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increased demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.					Infrastructure and Transportation at each alternative installation would remain as they currently are. There would be no change to the based personnel at any of the alternative locations. There would be no increase in use of various utilities or roadway systems under this alternative. There would be no additional impacts under the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Hazardous Materials and Waste					
There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media were encountered during the course of site preparation or site development, work would cease until 190 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	One of the ERP Sites, SS-39, overlaps with a portion of the existing fuel hydrants that would be capped, as well as the proposed addition to Hangar 3336. Remedial investigation is on-going with this site. It is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations. If contaminated media were encountered during the course of site preparation or site development, work would cease until 108 WG Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media were encountered during the course of site preparation or site development, work would cease until 171 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media are encountered during the course of site preparation or site development, work would cease until 121 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.	Hazardous Materials and Wastes at each alternative installation would remain as described in the baseline section for each alternative location. The benefit of eliminating ozone depleting substances with the KC-46A would not be realized. The throughput and management of hazardous materials and wastes would not change from baseline conditions. There would be no additional impacts to Hazardous Materials and Wastes under the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
There would not be an increased risk of hazardous waste releases or exposure from this alternative. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations.					
Socioeconomics					
Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.					Socioeconomics at each alternative installation would remain as described in the baseline section for each alternative. The minor economic benefit of additional based personnel and construction activity would not occur at any of the alternative installations. There would be no additional impacts to Socioeconomics under the No Action Alternative.

Table 2.6-2. Summary of Impacts

Forbes ANGS	*JB MDL*	*Pease ANGS*	*Pittsburgh ANGS*	*Rickenbacker ANGS*	*No Action Alternative*
Environmental Justice and the Protection of Children					
There would be no residential populations, including no minority or low-income populations, and no additional schools located within the vicinity of Forbes Field Airport exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	The percentage of minority and low-income persons affected would remain approximately the same as baseline. There would be no disproportionate impacts to minority or low-income populations. The child development center that is currently under the 65 dB contour would be located under the 70 dB contour. There would be no special health or safety risks to children.	There are no residential areas within the noise contours. No additional schools would be located within the vicinity of Portsmouth IAP exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations and no special health or safety risks to children.	There would be no residential populations, including no minority or low-income populations, and no additional schools located within the vicinity of Pittsburgh IAP exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	There would be no residential populations, including no minority or low-income populations, and no additional schools exposed to a DNL of 65 dB or above. There would be no disproportionate impacts to minority or low-income populations. There would be no special health or safety risks to children.	Under the No Action Alternative, Environmental Justice and the Protection of Children at each alternative installation would remain as described in the baseline section for each alternative. There were no disproportionate impacts to low-income, minority, or children identified under any of the action alternatives. There would be no additional impacts as a result of the No Action Alternative.

Notes: 190 ARW = 190th Air Refueling Wing; dB = decibel; DNL = Day-Night Average Sound Level; DoD = Department of Defense; 108 WG = 108th Wing; 157 ARW = 157th Air Refueling Wing; FAR = Federal Aviation Regulations; AICUZ = Air Installation Compatible Use Zone; ANGS = Air National Guard Station; PSD = Prevention of Significant Deterioration; HAP = hazardous air pollutant; O_3 = ozone; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO = carbon monoxide; NO_x = oxides of nitrogen; tpy = tons per year; CFR = Code of Federal Regulations; SIP = State Implementation Plan; BASH = Bird/Wildlife Aircraft Strike Hazard; JB MDL = Joint Base McGuire-Dix-Lakehurst; IAP = International Airport; 171 ARW = 171st Air Refueling Wing; 121 ARW = 121st Air Refueling Wing; NRHP = National Register of Historic Places; SHPO = State Historic Preservation Office; ERP = Environmental Restoration Program; LBP = lead-based paint; ACM = asbestos-containing material; USAF = United States Air Force

2.7 MITIGATION

Mitigation measures avoid, minimize, remediate, or compensate for environmental impacts. CEQ regulations (40 CFR 1508.20) define mitigation to include the following:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action, and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

Avoiding, minimizing, or reducing potential impacts has been a priority guiding the development of the KC-46A alternatives and the proposed aircraft operations associated with each. Measures to minimize impacts are designed into the alternatives; applied to construction, operation, or maintenance involved in the action; or implemented as compensatory measures.

Depending on which base is eventually selected to host the MOB 2 KC-46A beddown, there are potential mitigation actions that will be required. These mitigation actions would be carried forward in implementing the selected alternative . Listed below are the potential mitigations that could be required at JB MDL and Rickenbacker ANGS. The proponent of the action is responsible for ensuring that mitigations are carried forward. No mitigation actions have been identified for Forbes ANGS, Pease ANGS, and Pittsburgh ANGS.

If JB MDL is selected to host the MOB 2 KC-46A beddown, mitigation for air quality would be required. The 108 WG installation is in a nonattainment area for O_3 (marginal nonattainment), and maintenance area for CO and $PM_{2.5}$, and is therefore subject to *de minimis* thresholds (see Section 4.2.2 and Appendix F). Impacts from proposed operational emissions would be less than significant for all criteria pollutants, except NO_x, which would be above the *de minimis* threshold of 100 tpy. If JB MDL is selected to host the MOB 2 KC-46A beddown, a conformity determination must be completed, demonstrating compliance with the SIP, prior to signature of the ROD.

If Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, mitigation for adverse impacts to cultural resources could be required (see Section 4.5.6). Two of the hangars (885 and 888) proposed for additions, modifications, and renovations are eligible to the NRHP. The Ohio SHPO concurred with the eligibility determination. Hangar 885 would have an addition and renovations inside to house the new aircraft and support facilities. Because these renovations

would alter a structure that is considered eligible for the NRHP, the construction would have an adverse effect on a historic property. Modification to Hangar 888 would all be interior; however, they could have an adverse effect to this NRHP-eligible resource. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, further consultation would be conducted to minimize and mitigate adverse effects (see Appendix B, Section B3).

Following signature of the ROD, a Mitigation Plan will be prepared in accordance with 32 CFR 989.22(d). The Mitigation Plan will address specific mitigations identified for the selected alternative and agreed to during the environmental impact analysis process.

CHAPTER 3 EXISTING CONDITIONS

This section describes the natural and human environment that would be affected by implementation of the various alternatives described in Chapter 2. In describing the affected environment, a framework for understanding the potential direct, indirect, and cumulative effects of each alternative, including the No Action Alternative is provided.

As directed by guidelines contained in NEPA, CEQ regulations, and 32 CFR 989, *Environmental Impact Analysis Process*, the description of the affected environment focuses only on those resource areas potentially subject to impacts and should be commensurate with the anticipated level of environmental impact.

The affected environment is described for 11 resource topics: Noise, Air Quality, Safety, Soils and Water, Biological Resources, Cultural Resources, Land Use, Infrastructure and Transportation, Hazardous Materials and Waste, Socioeconomics, and Environmental Justice and the Protection of Children. The following sections reference Appendix A, which presents an introduction that defines each of the resources addressed in the section, summarizes applicable laws and regulations that apply to all installations, defines key terms as necessary, and describes the general ROI within which the effects from implementation of the various alternatives are anticipated to occur. The ROI varies from resource to resource, but in general, effects from the proposed activities are expected to be concentrated around each of the alternative installations. A more specific ROI for each installation/resource is described within each Chapter 3 section that follows, as are any local/regional regulations.

3.1 FORBES AIR NATIONAL GUARD STATION

Forbes ANGS, home of the 190 ARW of KS ANG, is located approximately 5 miles south of Topeka in Shawnee County, Kansas. The 190 ARW base is situated on the northwest side of Forbes Field Airport, a municipal airport owned and operated by MTAA.

3.1.1 Noise

To evaluate noise impacts in the vicinity of a military installation located within a commercial airport with a published Federal Aviation Regulations (FAR) Part 150 Airport Noise Compatibility Study, the USAF allows for use of the Federal Aviation Administration's (FAA's) Integrated Noise Model (INM) to generate DNL noise contours; however, if the primary noise generator are military aircraft, NOISEMAP may also be used. For this noise analysis, the USAF generated DNL noise files reflecting 2012 airport operations using NOISEMAP, a computer program used to model noise exposure in the vicinity of military airfields. For commercial

airfields, the most current and approved FAR Part 150 noise files were used for the baseline conditions and airfield operations and for noise impacts, these baselines were used for analysis. For other resource areas, the most current 2012 FAA/airport airfield operational data was used. For more detailed information on the noise modeling methods, see Appendix A, Section A.1.2.

3.1.1.1 Baseline Operations

In 1984, the MTAA published a noise study in support of the 1984 Airport Master Plan Update (Johnson 2013) and represents 1982 operational levels (Forbes Field Airport 1984). Due to the age of the data, and because the military aircraft (KC-135 and Army National Guard HH-60's) are the prominent aircraft based at Forbes Field Airport, the USAF completed a new study to estimate baseline noise exposure using the NOISEMAP computer program. The new study was completed to reflect 2012 airport operations and is used as the baseline for this analysis.

Based on aircraft operations data validated in May 2013, approximately 24,630 total aircraft operations occurred at Forbes Field Airport during the 12-month period ending December 2012 (Forbes ANGS 2013). An aircraft operation is counted each time an aircraft departs from the runway and each time they approach the runway. Table 3.1.1-1 summarizes the frequency of aircraft operations for Forbes Field Airport based on information provided by base staff, flying organizations, and air traffic control personnel. The majority of aircraft traffic includes air cargo, commercial regional jets (air taxi), and larger commercial aircraft and other based military aircraft, along with based ANG KC-135 aircraft. Although the number of aircraft operations at an installation varies from day to day, for Forbes Field Airport, operations were calculated for an average busy day for military aircraft and an average annual day (AAD) for civilian aircraft. Yearly operations were averaged over the number of flying days flown (260 days) for military aircraft and across all 365 days of the year for civilian aircraft. Table 3.1.1-1 reflects a total of approximately 79 total aircraft operations on an AAD (10,452 divided by 260 days plus 14,178 divided by 365 days) flown at Forbes Field Airport. Approximately 8 percent of the total operations at Forbes Field Airport occur during environmental night (10:00 p.m. through 7:00 a.m.).

Table 3.1.1-1. Current Forbes Field Airport Annual Aircraft Operations

	Departures		Arrivals		Total[1]		Grand
Aircraft	*Day*	*Night*[2]	*Day*	Night[2]	*Day*	*Night*[2]	*Total*[1]
KC-135	4,541	685	4,390	836	8,931	1,521	10,452
Other Aircraft[3]	6,848	241	6,848	241	13,696	482	14,178
Total	**11,389**	**926**	**11,238**	**1,077**	**22,627**	**2,003**	**24,630**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night – Between 10 p.m. and 7 a.m. for environmental night.
3. Other based military and civilian aircraft and transient aircraft (multiple type aircraft); example aircraft include: L-1011, MD-80, Lear 35, and HH-60.

Source: Forbes ANGS 2013.

Using the 2012 baseline data, the 190 ARW KC-135 aircraft flew a total of 10,452 annual airfield operations, or an average of 40 airfield operations a day. Approximately 15 percent of the total KC-135 operations occur during environmental night. Approximately 42 percent of total operations at Forbes Field Airport are accomplished by the 190 ARW KC-135 aircraft.

3.1.1.2 Runway and Flight Profiles

Forbes Field Airport aircraft use straight out departures, straight in approaches, Instrument Flight Rule (IFR) or radar closed patterns, and Visual Flight Rule (VFR) closed patterns as the basic flight patterns for training, local arrival, and departures. Detailed representative arrival, departure, and closed pattern flight tracks are found in Appendix C, *Noise*.

3.1.1.3 Existing Noise Environment

Noise contours developed for the baseline conditions at Forbes Field Airport are shown in Figure 3.1.1-1. The acreage within each DNL contour on and off Forbes Field Airport property is shown in Table 3.1.1-2 for the baseline condition. Approximately 971 acres are exposed to DNL greater than or equal to 65 dB. Detailed information on off-airport land use that lies within a DNL greater than 65 dB can be found in Section 3.1.7, *Land Use*.

Table 3.1.1-2. Acres within Baseline Noise Contours, Forbes Field Airport

Noise Level (dB)	*On-Airport (acres)*	*Off-Airport (acres)*	*Total (acres)*
65-70	448	165	613
70-75	308	0	308
75-80	50	0	50
80-85	0	0	0
Greater than 85	0	0	0
Total	**806**	**165**	**971**

Note: dB = decibel

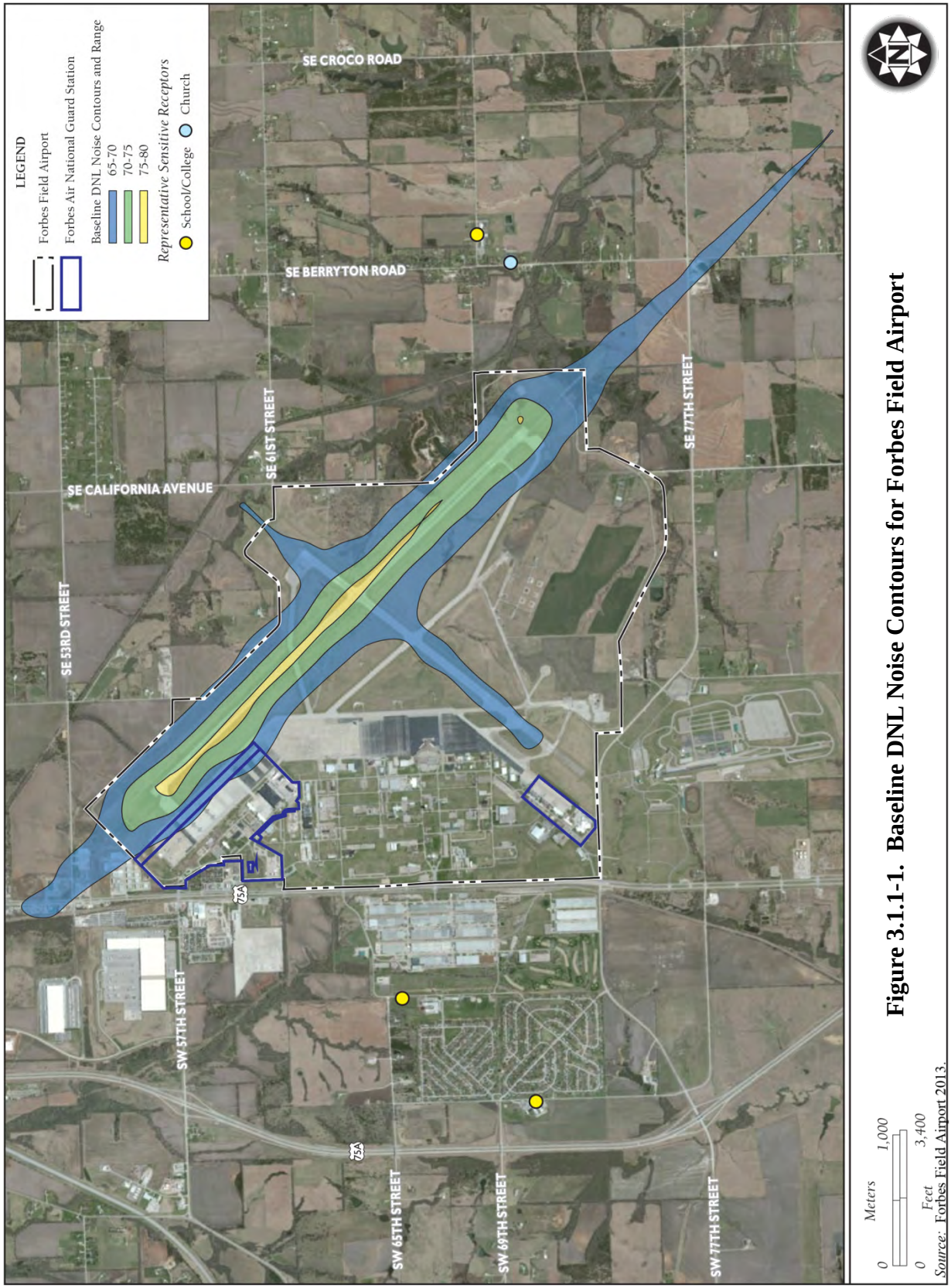


Figure 3.1.1-1. Baseline DNL Noise Contours for Forbes Field Airport

Potential Hearing Loss

There is no property off the Forbes Field Airport that falls within the baseline 80+ dB DNL noise contour; therefore, no potential hearing loss risk is currently associated with these areas.

3.1.1.4 Forbes Field Airport Noise Abatement Procedures

Forbes Field Airport has no published noise abatement procedures. The 117th Air Refueling Squadron (117 ARS) (a squadron of the 190 ARW) has one noise abatement procedure published in their In-Flight Guide (117 ARS 2011) that requires pilots to avoid overflight of a housing area located 2 nautical miles (nm) west of Runway 13. This published procedure minimizes flying activities of the 117 ARS that could adversely affect its neighbors in an effort to reduce noise impacts while maintaining safe operations.

3.1.1.5 Forbes Air National Guard Station Noise Complaint Procedures

Currently, noise complaints are handled through the MTAA. There have been no recent noise complaints (Johnson 2013).

3.1.2 Air Quality

3.1.2.1 Regulatory Setting

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. The Kansas Department of Health and Environment Bureau of Air is the agency responsible for the regulation of air quality within the state of Kansas. The state of Kansas regulates air quality through the Kansas Air Quality Act, Section 65.3001 through 65.3030 of the Kansas Air Quality Statues, and the Kansas Air Quality Regulations, Section 28, Article 19 of the Kansas Administrative Regulations. The state of Kansas has not adopted separate ambient air quality standards from the NAAQS. The NAAQS are summarized in Table 3.1.2-1.

Table 3.1.2-1. Ambient Air Quality Standards

Pollutant	*Averaging Time*	NATIONAL STANDARDS [a]	
		Primary [b,c]	*Secondary* [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	—	—
CO	8-hour	9 ppm (10 mg/m^3)	—
	1-hour	35 ppm (40 mg/m^3)	—
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—
SO_2	24-hour	—	—
	3-hour	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—
PM_{10}	Annual	—	Same as primary
	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
	24-hour	35 µg/m^3	Same as primary
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary
	30-Day Average	—	—

Notes: a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.

b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.

c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.

d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide

Source: USEPA 2012.

Forbes ANGS, home of the 190 ARW of the KS ANG, is located on Forbes Field Airport, approximately 5 miles south of Topeka in Shawnee County, Kansas. The U.S. Environmental Protection Agency (USEPA) has classified the state of Kansas as an attainment/unclassified area for all criteria pollutants. The Proposed Action is therefore not subject to the requirements of Section 176(c) of the Clean Air Act (CAA), as articulated in the USEPA General Conformity Rule.

The USEPA recently promulgated a more stringent standard for lead, and has redesigned its monitoring program to address lead and identified airports for monitoring because aviation gas

used in piston aircraft still contains lead. The project area is considered attainment/unclassified for lead, and lead is not used in aviation fuel used in the KC-135 or KC-46A aircraft.

3.1.2.2 Climate and Meteorology

The state of Kansas has a continental climate, meaning that it is not influenced by any major bodies of water. Summers are warm with the majority of annual precipitation occurring from April through September. Winters tend to be cold with an occasional mild period and moderate snowfall amounts. Much of the severe weather for which Kansas is often noted is due to weather patterns that bring cold dry air into contact with warm moist air over the state. There are many severe thunderstorms each year with an average of 111 tornadoes per year in the state (High Plains Regional Climate Center 2013).

Annual average temperatures in Topeka range from an average minimum temperature of 43.5 degrees Fahrenheit (ºF) to an average maximum temperature of 65.8ºF, with a yearly average of 54.6ºF (Western Regional Climate Center 2013). January is the coldest month, with average minimum temperatures of 17.6°F. July is the hottest month in the area, with average maximum temperatures reaching 89.7°F. In the Topeka area, average annual precipitation (1948-2012) was 34.77 inches (High Plains Regional Climate Center 2013).

The prevailing wind direction for the state of Kansas is from the south. The average annual wind speed for Topeka is 10.4 miles per hour (High Plains Regional Climate Center 2013).

3.1.2.3 Regional and Local Air Pollutant Sources

The area surrounding Forbes Field Airport is mainly used for agriculture, with some development in the surrounding areas to the north, west, and south. The USEPA's National Emissions Inventory includes data for the year 2008 for Shawnee County. Table 3.1.2-2 summarizes the regional emissions (stationary, area-wide sources, and mobile) of criteria pollutants and precursor emissions for the affected areas.

Table 3.1.2-2. Regional Emissions for Shawnee County, Kansas

	EMISSIONS, TONS/YEAR					
	CO	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Regional Emissions						
Stationary Sources	2,143	2,009	3,853	6,036	635	342
Area-Wide Source	3,866	7,543	410	34	17,149	2,117
Mobile Sources	31,885	6,840	2,902	77	348	280
Total	**37,894**	**16,392**	**7,165**	**6,147**	**18,132**	**2,739**

Notes: Numbers may not add precisely due to rounding.
Emissions of Pb are not included because the affected region contains no significant sources of this criteria pollutant.
CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: USEPA 2008.

3.1.2.4 Baseline Air Quality

Representative background air monitoring data for the 190 ARW for the period 2008-2012 are shown in Table 3.1.2-3. The closest monitoring station to the Forbes Field Airport is located in Topeka, and monitors ozone (O_3), particulate matter less than or equal to 10 microns in diameter (PM_{10}), and particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$). The closest monitoring station to the Forbes Field Airport that monitors carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) is located in Kansas City. Values measured at the Kansas City monitoring station are likely to be conservative because Kansas City is more developed than the Forbes Field Airport area.

As shown in Table 3.1.2-3, some O_3 exceedances have been measured in Topeka during the recent 5-year period; however, the area has not been designated as a nonattainment area for O_3. One exceedance of the 24-hour $PM_{2.5}$ standard was measured in 2011; however, that exceedance was attributed to an exceptional event. The 1-hour SO_2 standard was exceeded in 2008 and 2010; however, the 99th percentile did not exceed the standard. The data show that the area did not experience violations of all other NAAQS.

Table 3.1.2-3. Ambient Air Monitoring Data for Topeka and Kansas City, Kansas

Air Quality Indicator	*2008*	*2009*	*2010*	*2011*	*2012*
Ozone (O_3)					
Peak 8-hour value (ppm)	0.068	0.068	0.082	0.084	0.085
Days above federal standard (0.075 ppm)	0	0	2	4	8
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)					
Peak 24-hour value ($\mu g/m^3$)	26.6	35.6	29.1	40.8	35.2
Days above federal standard (35 $\mu g/m^3$)	0	0	0	1	0
Annual Average value ($\mu g/m^3$)	10	8.7	9	9.9	8.6
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	51	78	72	76	67
Days above federal standard (150 $\mu g/m^3$)	0	0	0	0	0
Carbon Monoxide (CO)					
Peak 1-hour value (ppm)	2.2	2.4	2.1	2.3	3.3
Days above federal standard (9 ppm)	0	0	0	0	0
Peak 8-hour value (ppm)	1.8	1.6	1.6	1.6	2.0
Days above federal standard (35 ppm)	0	0	0	0	0
Nitrogen Dioxide (NO_2)					
Peak 1-hour value (ppm)	0.066	0.062	0.077	0.061	0.064
98th Percentile (ppm)	0.062	0.045	0.054	0.053	0.052
Days above federal standard (0.100 ppm)	0	0	0	0	0
Sulfur Dioxide (SO_2)					
Peak 1-hour value (ppm)	0.090	0.050	0.081	0.065	0.071
99th Percentile (ppm)	0.043	0.043	0.049	0.048	0.050
Days above federal standard (0.075 ppm)[1]	1	0	1	0	0
Peak 24-hour value (ppm)	0.017	0.015	0.013	0.012	0.013

Notes: 1. The federal 1-hour SO_2 standard was adopted in 2010.
Numbers may not add precisely due to rounding.
$\mu g/m^3$ = micrograms per cubic meter; NA = data not available; ppm = parts per million
Source: USEPA 2013a.

3.1.2.5 190th Air Refueling Wing Emissions

The 190 ARW currently flies and maintains 12 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 190 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

Emissions for the 190 ARW have been quantified in the *Final 2006 Air Emissions Inventory* (190 ARW 2008a). The inventory evaluated the emissions from the 190 ARW to determine its status under the Title V Federal Operating Permits program. Based on the major source thresholds for the area, the major source thresholds are 100 tons per year (tpy) for all criteria pollutants and less than 10 tpy of any single hazardous air pollutant (HAP) or 25 tpy of any combination of HAPs. The 190 ARW does not currently hold a Federal Operating Permit as its emissions are below the major source thresholds, and is not required to hold Class I or Class II

Operating Permits under the Title V permitting requirements or the requirements of the Kansas Department of Health and Environment.

Stationary source emissions at the 190 ARW include emissions from natural gas-fired heating units, waste oil boilers, diesel generators, and open detonation of ordnance. Mobile source emissions include emissions from aircraft operations (take-offs and landings), AGE, ground vehicle operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft operations at the 190 ARW installation considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the default mixing height (3,000 feet above ground level [AGL]). Baseline emissions also include stationary sources and emissions associated with vehicle trips associated with existing personnel and dependents. These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the installation.

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #1, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related AGE, and privately owned vehicles (POVs) associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations identified in Table 2.3-1, utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet AGL. A discussion of the methodology for quantifying emissions is provided in Appendix A, Section A.2.3. Emissions for the baseline emissions associated with baseline operations of the KC-135 aircraft are provided in Table 3.1.2-4.

Table 3.1.2-4. 190 ARW Baseline Emissions at Forbes ANGS

	EMISSIONS, TONS/YEAR						
Emission Source	***VOCs***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***	***CO_2e***
KC-135 Baseline Aircraft Operations	3.63	54.09	99.23	8.48	0.45	0.45	23,585
AGE	0.01	0.02	0.02	0.00	0.00	0.00	2,446
Engine Testing	0.17	2.52	0.69	0.11	0.01	0.01	299
POVs	1.94	26.38	1.46	0.02	0.06	0.03	993
Total Baseline Emissions	**5.75**	**83.00**	**101.39**	**8.61**	**0.53**	**0.49**	**27,324**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle
Source: 190 ARW 2008a.

3.1.3 Safety

This section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, APZs/Runway Protection Zones (RPZs), explosive safety, and AT/FP. Flight safety includes discussions on flight safety procedures,

aircraft mishaps, bird/wildlife aircraft strike hazards (BASH), and fuel jettison requirements. The affected environment includes the airfield and local airspace surrounding Forbes Field Airport.

3.1.3.1 Ground Safety

Fire/Crash Response

Day-to-day operations and maintenance activities conducted by the 190 ARW are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders, and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements. The 190 ARW provides fire, crash, rescue, and structural fire protection for the installation and its aircraft. The 190 ARW has a cooperative response agreement with the local Metropolitan Topeka Airport fire department for mutual aid in fire protection, first responder and lifesaving services, and hazardous materials incident response.

Accident Potential Zone/Runway Protection Zone

Development restrictions associated with RPZs are intended to preclude incompatible land use activities from being established in these areas (see Appendix A, Section A.3, for specific RPZ discussion and Section 3.1.7 for land use compatibilities). The city of Topeka, Kansas utilizes the FAA's airport land use compatibility guidelines, and as such, the RPZs have allowed development to be compatible with airport operations.

Explosive Safety

The 190 ARW stores, maintains, and uses a small range of munitions required for performance of their mission. Ordnance for the 190 ARW is currently stored in an aboveground storage magazine, with an operating location in a nearby Munitions Inspection Building. Both facilities are located on the north end of the flightline near the engine test cell and have limits of 4,000 pounds and 1,000 pounds of Hazard Division explosives 1.3 and 1.4, respectively.

Anti-Terrorism/Force Protection

Many of the military facilities at the 190 ARW installation at Forbes Field Airport were constructed before AT/FP considerations became a critical concern. Thus, under current conditions, many facilities do not comply with all current AT/FP standards. However, as new construction occurs and as facilities are modified, the 190 ARW would incorporate these standards to the maximum extent practicable.

3.1.3.2 Flight Safety

Flight Safety Procedures

Aircraft flight operations from Forbes Field Airport are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2KC-135V3, *Flying Operations, C/KC-135 Operations Procedures* 2010) to ensure flight safety. While having aircraft in close proximity during air refueling is inherently dangerous, refueling mishaps are rare. Emergency separation procedures are established and practiced by both tanker and receiver aircrews.

Aircraft Mishaps

KC-135 aircraft (all models) have flown more than 14,750,000 hours since the aircraft entered the USAF inventory in 1957. Over that period, 83 Class A mishaps have occurred and 64 aircraft have been destroyed (specific statistics for mishaps during refueling are not recorded). This results in a Class A mishap rate of 0.56 per 100,000 flight-hours, and an aircraft destroyed rate of 0.43 per 100,000 flight-hours (Air Force Safety Center [AFSEC] 2012). The 190 ARW has not experienced a Class A mishap in the past 11 years (190 ARW 2013b). Together, the low KC-135 mishap rate and the lack of 190 ARW mishap history would make the chances of a Class A accident involving a KC-135 aircraft at Forbes Field Airport an unlikely event.

Bird/Wildlife Aircraft Strike Hazard

USAF BASH Team maintains a database that documents all reported bird/wildlife aircraft strikes. Historic information across the USAF for the past 40 years indicates that 39 USAF KC-135 aircraft have been destroyed and 33 fatalities have occurred from bird/wildlife aircraft strikes, with the last Class A mishap occurring in 2010 (AFSEC 2013).

The 190 ARW of the KS ANG has an on-going BASH program through which information and assistance is freely shared between airfield users, the Forbes Field Airport staff, and the local air traffic controllers. Serious BASH-related accidents within the immediate Forbes Field Airport area are unusual and have never resulted in a Class A mishap (190 ARW 2013a). The 190 ARW has recorded 63 minor BASH incidents from 2002 to 2012, with an average of fewer than six per year (190 ARW 2013a).

Fuel Jettison

For use in emergency situations, the KC-135 aircraft have the capability to jettison fuel and reduce aircraft gross weight for flight safety. Airbases must establish jettison areas and

procedures to minimize the impact of fuel jettisoning. Ideally, jettison areas are established at altitudes above 20,000 feet AGL, off published federal airways, avoiding urban areas, agricultural regions, and water supply sources. AFIs cover the fuel jettison procedures, and local operating policies define specific fuel ejection areas for each base.

After receiving approval from the Operations Group Commander and coordinating with Kansas City Air Route Traffic Control Center, the primary fuel jettison area for the 190 ARW is a holding pattern between 20 and 30 miles southwest of the field at 21,000 feet MSL. The aircrew would follow fuel jettisoning procedures in AFI 11-2KC135, *C/KC-135 Operations Procedures* (2010).

3.1.4 Soils and Water

3.1.4.1 Soils

This area of Kansas is within the Interior Plains on a glacial drift plain with broad, smooth ridgetops and slopes that are nearly level to strongly sloping. Loess covers the surface of almost all of the uplands in this area underlying glacial drift (U.S. Department of Agriculture [USDA] 2006). The 190 ARW installation is located on relatively flat improved land with an elevation of approximately 1,080 feet MSL (Kansas Army National Guard 2010).

The Natural Resources Conservation Service (NRCS) Soil Survey for Pawnee County, Kansas identifies the following three individual soil types at the installation:

Ladysmith silty clay loam, 0 to 1 percent slopes: This soil is typically found on summits and uplands from weathered limestone and shale. This soil type displays properties that would potentially limit building site development due to high shrink-swell potential, low strength, and depth to saturated zone. In addition, this soil type is designated as Prime Farmland (NRCS 2013a). Approximately 70 percent of the installation is composed of this soil type.

Ladysmith silty clay loam, 1 to 3 percent slopes: This soil is identical to the soil type above; however, the slopes are slightly steeper. This soil type is also designated as Prime Farmland (NRCS 2013a). Approximately 28 percent of the installation is composed of this soil type.

Pawnee clay loam, 4 to 8 percent slopes, eroded: This soil type is often found on side slopes of till plains. The rating class for building site development is considered very limited due to high shrink-swell potential, low strength, and depth to saturated zone. In addition, this soil type is considered a Farmland of Statewide Importance (NRCS 2013a). Approximately 2 percent, located in the northwestern corner of the installation, is composed of this soil type.

3.1.4.2 Surface Water

The 190 ARW installation is located within the Shunganunga Creek Watershed, a sub-basin of the Middle Kansas Watershed that encompasses over 5,684 square miles within the state of Kansas (USEPA 2013b). The Kansas River valley is 138 miles long; this course roughly follows the maximum extent of the Kansan glaciation, and the river likely began as a path of glacial meltwater drain (Kansas Center for Agricultural Resources and the Environment 2011). The Shunganunga Creek Watershed drains the Shunganunga Creek until it joins the Kansas River further downstream.

Surface water features within the vicinity of the 190 ARW installation include Lynn Creek to the east and South Branch Shunganunga Creek to the west (Figure 3.1.4-1). The Kansas River is approximately 6 miles north of the installation and the Wakarusa River is approximately 3 miles south. Forbes Field Airport is located on a drainage divide between Lynn Creek to the east and the South Branch of Shunganunga Creek to the west. Lynn Creek flows southeasterly into the Wakarusa River approximately 5 miles from the installation. The South Branch Shunganunga Creek flows north into the Kansas River about 6.5 miles from the installation (190 ARW 2008b).

Surface water within the installation primarily consists of a series of manmade ditches, storm sewers, and drainage swales. Drainage of the developed area is typified by overland flow to storm drain inlets and basins connected by a network of underground pipes. There are three primary drainage basins on the installation: SDO-001, -002, and -003. All three outfalls ultimately join the South Branch Shunganunga Creek. The two outfalls associated with industrial activity (SDO-001 and -002) are regulated under the Kansas General Permit for Stormwater Runoff Associated with Industrial Activity (S-ISWA-1111-1). The permit is administered by the Kansas Department of Health and the Environment under the auspice of the USEPA (190 ARW 2012a).

3.1.4.3 Groundwater

Groundwater in this area often occurs in valley-fill of alluvium and terrace deposits associated with the Kansas River Valley. There is no regional circulation of groundwater in this area due to the highly dissected nature of the upland topography. Therefore, water level fluctuations in upland wells are a direct result of local additions or withdrawals of groundwater. Water-level fluctuations in wells in the valley alluvium are somewhat more complex owing to the influence of the Kansas River and its tributaries which tend to reverse normal groundwater gradients (Kansas Geological Survey 2012).

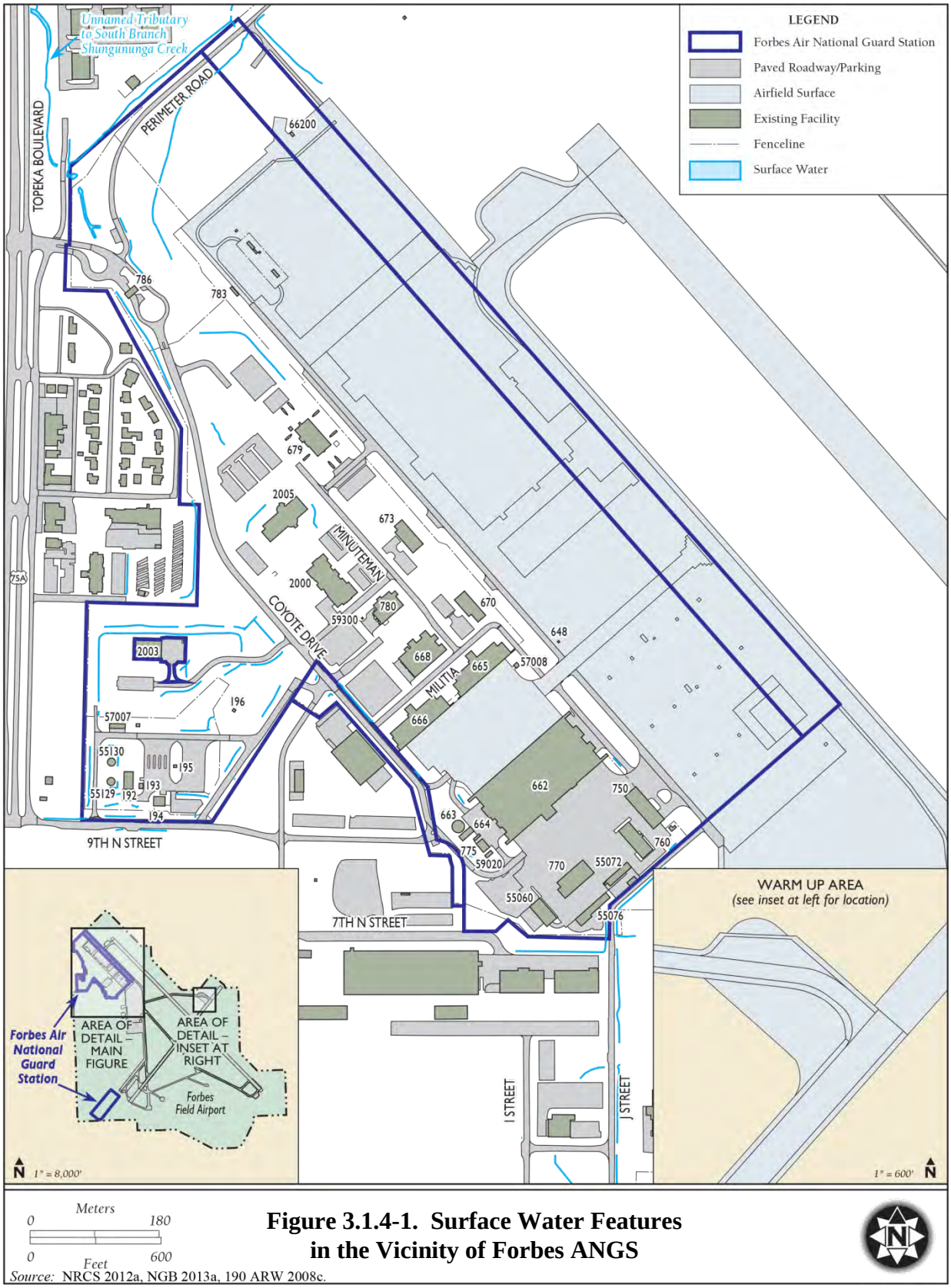


Figure 3.1.4-1. Surface Water Features in the Vicinity of Forbes ANGS

Source: NRCS 2012a, NGB 2013a, 190 ARW 2008c.

Groundwater resources underlying the 190 ARW are found in two distinct units: the Nodaway Coal underlying bedrock and the unconsolidated material overlying the bedrock. The water table occurs at 10 feet below ground surface beneath most of the installation but ranges from 2 to 24 feet in portions of the installation. Groundwater flow is generally to the northwest. Due to lack of hydraulic connectivity of groundwater underlying the installation, groundwater does not flow from one end of the installation to the other, but occurs as isolated pockets. The potential for contaminant migration in groundwater underlying the installation is low due to the lack of hydraulic connectivity (190 ARW 2008b).

3.1.4.4 Floodplains

Per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Shawnee County, Kansas, Panel 310 (Map Number 20177C0310E, Effective September 29, 2011), the 190 ARW installation is located within an area designated as Zone X. The designation Zone X are areas determined to be outside the 0.2 percent annual chance flood (500 year flood), indicating areas of minimal flooding (FEMA 2011).

3.1.5 Biological Resources

3.1.5.1 Vegetation

Forbes Field Airport occurs within the Prairie Parkland (Temperate) Province. Vegetation in this region typically is forest-steppe characterized by intermixed prairie, groves, and bands of deciduous trees. Prairies are dominated by grasses such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*). Upland forests are dominated by oak (*Quercus* spp.) and hickory (*Carya* spp.) (Bailey 1995). The majority of the airport is developed or actively landscaped, with little natural vegetation or habitat remaining.

3.1.5.2 Wildlife

Due to the lack of substantial pockets of native vegetation, high noise levels, and human activities at and surrounding the airport, wildlife habitat is limited. As a result, the majority of wildlife present at the airport and the 190 ARW installation consists of species that are highly adapted to developed and disturbed areas. Forbes ANGS is located within the Central Flyway, one of four major North American corridors for migratory birds. The majority of the bird species found at Forbes Field Airport or its vicinity are protected under the Migratory Bird Treaty Act of 1918 (MBTA). Common bird species observed on the installation include Killdeer (*Charadrius vociferous*), Barn Swallow (*Hirundo rustica*), Great Horned Owl (*Bubo virgianus*), European Starling (*Sturnus vulgaris*), Chimney Swift (*Chaetura pelagica*), Western Meadowlark

(*Sturnella neglecta*), Mourning Dove (*Zenaida macroura*), American Kestrel (*Falco sparverius*), American Robin (*Turdus migratorius*), Broad-winged Hawk (*Buteo platypterus*), Franklin's Gull (*Spermophilus franklinii*), Rock Pigeon (*Columbia livia*), Lesser Scaup (*Aythya affinis*), Horned Lark (*Eremophila alpestris*), and Eastern Meadowlark (*Sturnella magna*). Other common wildlife include the white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), and eastern cottontail (*Sylvilagus floridanus*) (190 ARW 2004, 2012b).

3.1.5.3 Special Status Species

No federally or state listed species have been observed at Forbes Field Airport. The potential for several federally and state listed species to occur within Shawnee County within the vicinity of the airport exists; however, there is little to no habitat for these species within the airport or the installation. A list of these species can be found in Appendix E. There is no critical habitat located on the installation.

3.1.5.4 Wetlands

No wetland delineation has been conducted on the 190 ARW installation (190 ARW 2004). In addition, no National Wetland Inventory wetlands occur on the installation (U.S. Fish and Wildlife Service [USFWS] 2013). A general survey of the proposed construction sites conducted in March 2013 showed no signs of wetlands.

3.1.6 Cultural Resources

3.1.6.1 Archaeological Resources

All undeveloped and relatively undisturbed areas of the 190 ARW installation have been intensively surveyed for archaeological resources and no archaeological resources have been identified at the 190 ARW installation (KS ANG 2008).

The 2008 cultural resources survey verified that the entire installation has low to no probability for archaeological resources due to past disturbances from construction and the high level of development. Additionally, the installation lacks the types of landforms associated with previously recorded cultural resources on adjacent lands (KS ANG 2008, 2010). The Kansas SHPO concurred with these findings (Zollner 2008).

3.1.6.2 Architectural Resources

All of the 190 ARW installation's 24 buildings pre-dating the end of the Cold War (pre-1990) have been inventoried and evaluated for NRHP eligibility (KS ANG 2008). One building

(Building 679) was determined eligible by the Kansas SHPO for listing in the NRHP. The remaining 23 buildings were determined not eligible for listing in the NRHP. The Kansas SHPO concurred with these determinations (see Zollner 2008 in Appendix B4). Building 679 is eligible for listing in the NRHP under criterion A for having contributed to events important in history (the U.S. defensive military response during the Cold War) and under criterion C as a prime example of a particular type of architecture. It was one of only ten 150-men alert readiness structures constructed in the U.S., and one of approximately 40 alert crew dormitories of the various sizes nationwide that are extant today. In May of 2008, the Kansas SHPO received notice of a proposed major renovation of Building 679. Subsequently, a Memorandum of Agreement was signed among the Kansas SHPO, the KS ANG, and the 190 ARW that outlined procedures to mitigate the adverse effects the renovations would have to this NRHP-eligible building (see Appendix B4). The building was demolished to the foundation and entirely rebuilt the following year.

3.1.6.3 Traditional Resources

The 190 ARW contains no known traditional resources; however, eight federally-recognized Tribes that are historically, culturally, and linguistically affiliated with the area have been identified including: Citizen Potawatomi Nation, Delaware Nation, Kaw Nation, Osage Nation of Oklahoma, the Prairie Band Potawatomi Tribe, Absentee Shawnee Tribe of Oklahoma, East Shawnee Tribe of Oklahoma, and the Wichita and Affiliated Tribes.

3.1.7 Land Use

Forbes ANGS is located on Forbes Field Airport, a public use airport owned by the MTAA. The airfield is located in Topeka, Shawnee County, Kansas, about 10 miles south of the city center. The 190 ARW installation consists of approximately 160 acres on the northwest corner of Forbes Field Airport, adjacent to the runway.

Land adjacent to the airfield in unincorporated Shawnee County is traditionally agricultural and remains sparsely populated and rural in character. On the west side of the airfield within the city limits of Topeka, industrial uses have developed along U.S. Highway 75. Long-term land use for the city is guided by a comprehensive plan. Short-term actions are regulated by zoning ordinances implemented through the Topeka Municipal Code and Shawnee County (City of Topeka 2011, Shawnee County 2013)

Zoning surrounding the airport generally supports compatible land use planning and provides for protection of the areas surrounding Forbes Field Airport. The Topeka Municipal Code 1981 § 4-55 defines and establishes airport hazard zones, height limitations, and land use restrictions

within these zones. This zoning protects RPZs. Detailed descriptions of RPZs can be found in Section A.3.1.1 of Appendix A. The City of Topeka has zoned the areas to the west of the airfield for industrial use. A triangular area, north of the airport boundary and between U.S. Highway 75 and S.E. 53rd Street, is a Planned Unit Development (PUD) district, which allows more flexibility in the use of land and structures to account for specific site features than standard land use categories. The PUD north of the airport currently includes industrial uses and vacant land, but also accommodates streets and commercial use (City of Topeka 2011). The unincorporated areas to the east of the airfield are zoned as Residential Reserve District, where the maximum density permitted is one single-family dwelling per 3 acres minimum. This designation provides a transitional area between urbanized development and rural-agricultural areas where increased urbanization occurs if municipal services and facilities were to become available (Shawnee County 2013).

Currently, aircraft noise from Forbes Field Airport exposes approximately 166 acres of off-airport areas of land zoned as industrial, residential reserve, and PUD to noise levels between 65 dB and 70 dB DNL. No houses, churches, schools or other sensitive noise receptors are located within the 65 dB and 70 dB DNL off-airport noise contour areas. Figure 3.1.7-1 shows an overlay of the baseline noise contours onto a map displaying the existing land use in the vicinity of Forbes Field Airport.

Meters 0 900
Feet 0 3,000

Figure 3.1.7-1. DNL Noise Contours and Land Use at Forbes Field Airport

Source: Shawnee County Zoning 2007, Forbes Field Airport 2013.

3.1.8 Infrastructure and Transportation

3.1.8.1 Potable Water System

Potable water for the 190 ARW installation is provided by the City of Topeka. Potable water in the area is supplied primarily from the Kansas River. The City of Topeka Water Division pumps an average of approximately 8 trillion gallons of water per year to its customers (City of Topeka 2013a). In calendar year (CY) 2012, 2,424,824 gallons of potable water were supplied to the 190 ARW installation (190 ARW 2013b).

3.1.8.2 Wastewater

The 190 ARW installation generates wastewater from sanitary, stormwater, and industrial processes, including oil/water separator discharge (OWS), wash rack discharge, floor wash-down, latrines, sinks, and showers. Wastewater generated within the 190 ARW installation is conveyed into the municipal sewage system to the City of Topeka Wastewater Treatment Plant. The City owns two wastewater treatment plans, The Oakland and the North Topeka Wastewater Treatment Plants, which have a combined capacity to treat 28 million gallons of wastewater daily (City of Topeka 2010).

3.1.8.3 Stormwater

A high percentage of the active administrative and industrial areas of the installation are paved or roofed, resulting in high runoff rates during precipitation events. As described in the 190 ARW Stormwater Pollution Prevention Plan (SWPPP) (2012), the 190 ARW installation has a stormwater drainage conveyance system typified by overland flow to catch basins, inlets, surface drains, underground pipes, culverts, ditches, and swales that discharge to receiving waters (see Section 3.1.4, *Soils and Water*) or other municipal separate storm sewer systems. The stormwater drainage system has been designed to safely collect and transport surface water runoff from storm events to prevent flooding within the installation and is a separate system from the wastewater (sewage) system.

3.1.8.4 Electrical and Natural Gas Systems

Electricity is supplied to the 190 ARW installation by West Star Energy via an underground powerline. Natural gas is supplied by Kansas Gas Service via an 8-inch main line. Electricity consumption for CY 2012 at the 190 ARW installation was 6,144,451 kilowatt-hours. Natural gas consumption for CY 2012 at the 190 ARW installation was 152,900 cubic feet (190 ARW 2013b).

3.1.8.5 Solid Waste Management

Municipal solid waste at the 190 ARW installation is managed in accordance with the 190 ARW Solid Waste Management Plan (190 ARW 2009a) and guidelines specified in AFI 32-7042, *Waste Management* (2009). This AFI incorporates, by reference, the federal standard for solid waste regulations contained within 40 CFR, Subtitle D, *Non-hazardous Waste,* and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for recycling, diversion, handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

The 190 ARW installation generates solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These nonhazardous solid wastes are collected in dumpsters located throughout the 190 ARW installation and transported by contractor to the Rolling Meadows Waste Management facility in Topeka, Kansas.

3.1.8.6 Transportation

The 190 ARW installation is located within close proximity to several major highways. Interstate (I-) 70 and I-470 lie to the north of the installation and run primarily east and west. In addition, I-335 intersects with I-470 and runs north and south, to the west of the installation. The installation's main gate is accessed from SW Topeka Boulevard, which can be accessed from I-470 or U.S. Highway 75.

3.1.9 Hazardous Materials and Waste

3.1.9.1 Hazardous Materials

Hazardous materials are used at the 190 ARW installation for aircraft operations support and maintenance, including petroleum, oil, and lubricant (POL) management and distribution, liquid fuels maintenance, transportation maintenance, vehicle paint, power production, machine shop operations, and flight simulation. Types of hazardous substances found on the 190 ARW installation include hydraulic fluid, waste oils, recovered fuels, spent cleaners, strippers, solvents, flammable and combustible liquids, acids, aerosols, batteries, corrosives, and paints (190 ARW 2009b).

There is currently one 1,500-gallon aboveground storage tank (AST) on the 190 ARW installation in Building 176 that stores polyvinyl chloride. There are currently two underground storage tanks (USTs) located on the 190 ARW installation. One is located at Building 775 and is

used for capturing an accidental release of pesticide. The other is an 8,000-gallon UST in the POL (ANG 2008).

Toxic Substances

Regulated toxic substances typically associated with buildings and facilities include asbestos, lead-based paint (LBP), and polychlorinated biphenyls (PCBs). Asbestos-containing material (ACM) is known to occur in Buildings/Hangars 665, 666, 673, 679, 692, 770, and 780. ACM was removed from Buildings 151 and 167 prior to a recent renovation that was completed. In addition, ACM was removed from Buildings 656 and 659 prior to their demolition in the early 1990s (190 ARW 2005).

An LBP survey has not been conducted at the 190 ARW installation. Any buildings on the installation constructed prior to 1978 are presumed to contain LBP and would be tested for LBP prior to demolition or renovation.

The installation is considered PCB free. PCBs may still be present in older light ballasts; however, these are not regulated as PCB equipment or PCB-contaminated equipment (ANG 2008).

3.1.9.2 Hazardous Waste Management

The 190 ARW Oil and Hazardous Substances Spill Prevention and Response Plan contains the governing regulations for spill prevention and describes specific protocols for preventing and responding to releases, accidents, and spills involving oils and hazardous materials (190 ARW 2012c). The 190 ARW Hazardous Waste Management Plan outlines procedures for controlling and managing hazardous wastes from the point where they are generated until they are disposed. In addition, it includes guidance for compliance with all federal, state, and local regulations pertaining to hazardous waste (190 ARW 2009b).

The 190 ARW is regulated as a Small Quantity Generator of hazardous waste and maintains USEPA Identification Number KS0572824043. A hazardous waste generation point is where the waste is initially created or generated. A satellite accumulation point (SAP) is an area where hazardous waste is initially accumulated at the point of generation and is under the control of the SAP manager. Hazardous wastes initially accumulated at an SAP are accumulated in appropriate containers before being transferred to the installation central accumulation point (CAP). There are six SAPs (where a waste is initially accumulated) identified at the installation in Buildings/Hangars 662, 668, and 770. The installation CAP is located in Building 57008 (190 ARW 2009b).

OWSs are used to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and stormwater drainage systems. Two former OWSs were located on the installation but were removed in the 1990s. Currently there are no active OWSs located within the 190 ARW installation (190 ARW 2005).

3.1.9.3 Environmental Restoration Program

Ten potentially contaminated Environmental Restoration Program (ERP) sites were identified in 1986 for closure at the 190 ARW.

For all except three sites, Decision Documents for no further action were recorded due to a determination to have little or no threat for contaminant migration. For the remaining three sites, Decision Documents for no further action but periodic groundwater monitoring were recorded (190 ARW 2005). Table 3.1.9-1 provides details for each of these sites and Figure 3.1.9-1 shows the locations.

Table 3.1.9-1. ERP Sites within the 190 ARW Installation

ERP Site	*Materials of Concern*	*Status*
1	This site is adjacent to the JP-4 storage area where contamination was judged to be minimal. Monitoring conducted during 1990-1993 at these three sites were completed with no contaminants reported above detection limits.	Closed
6	This site is a surface drainage ditch and storm sewer overflow. Low contaminant concentrations and relative immobility of contaminants cause the risk to the public or the environment to be judged minimal. Monitoring conducted during 1990-1993 at these three sites were completed with no contaminants reported above detection limits.	Closed
8	This site is the refueling hydrant C, where Total Petroleum Hydrocarbon was reported in groundwater and soil gas samples. No evidence of contaminant migration was indicated. Monitoring conducted during 1990-1993 at these three sites were completed with no contaminants reported above detection limits.	Closed

Notes: ERP = Environmental Restoration Program
Source: 190 ARW 2005.

3.1.10 Socioeconomics

3.1.10.1 Population and Employment

Population

Forbes ANGS is located approximately 5 miles south of Topeka in Shawnee County, Kansas. Current population data and estimates for the state of Kansas, Shawnee County, and the city of Topeka are provided in Table 3.1.10-1. From 1990 to 2010, Shawnee County's population increased by 16,958, an increase of approximately 11 percent (U.S. Census Bureau [USCB] 1990a, 2000a, 2010a).

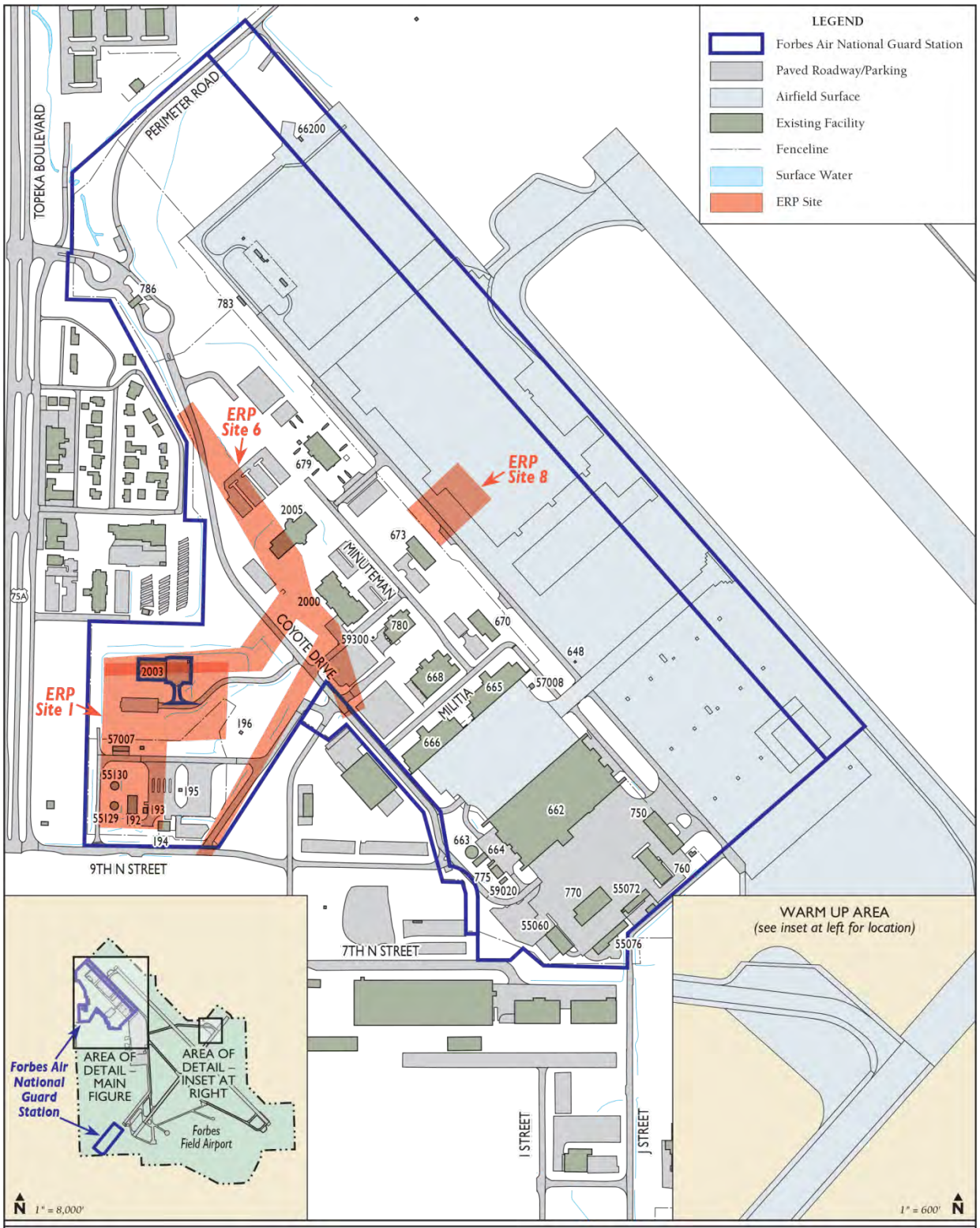


Figure 3.1.9-1. Environmental Restoration Program Sites at the 190 ARW Installation, Forbes Field Airport

Source: 190 ARW 2005.

Table 3.1.10-1. Population Growth within the Vicinity of Forbes ANGS

Area	*1990 Census*	*2000 Census*	*2010 Census*
Kansas	2,477,574	2,688,418	2,853,118
Shawnee County	160,976	169,871	177,934
City of Topeka	119,883	122,377	127,473

Source: USCB 1990a, 2000a, 2010a.

The 190 ARW currently supports a workforce authorization of 1,242, including 403 full-time and 839 part-time personnel (see Table 2.3-6).

Employment and Earnings

Table 3.1.10-2 presents total labor force and employment rates for Kansas, Shawnee County, and the city of Topeka. Based on 2007-2011 American Community Survey (ACS) 5-year estimates, there were 92,855 persons in the labor force (able to work) and 86,188 employed within Shawnee County, resulting in an unemployment rate of approximately 7 percent. Top employment industries in Shawnee County include 1) educational services, and health care and social assistance; 2) retail; and 3) public administration (USCB 2011a). Principal employers include State of Kansas, Storemont-Vail Healthcare, Topeka School District, Blue Cross Blue Shield, and St. Francis Health Center (City of Topeka 2013b).

Table 3.1.10-2. Employment Data (2011) within the Vicinity of Forbes ANGS

Area	*Labor Force*	*Employed*	*Unemployed*	*Unemployment Rate (%)*
Kansas	1,506,400	1,410,911	95,489	6.3
Shawnee County	92,855	86,188	6,667	7.2
City of Topeka	66,056	60,550	5,506	8.3

Note: Employment numbers include individuals in the Armed Forces.
Source: USCB 2011a.

3.1.10.2 Schools

According to the 2011 ACS enrollment 5-year estimates, 31,296 students were enrolled in schools from Kindergarten through Grade 12 in Shawnee County (USCB 2011a).

3.1.10.3 Housing

In 2010, the number of housing units in Shawnee County was 79,140 with a vacancy rate of approximately 8 percent (USCB 2010a).

3.1.11 Environmental Justice and the Protection of Children

3.1.11.1 Minority and Low-Income Populations

Table 3.1.11-1 displays the minority, low-income, and children under age 18 within the state of Kansas, as well as the city and county within the vicinity of Forbes Field Airport. Approximately 19 percent of the population of Shawnee County is composed of minorities (i.e., an ethnic or racial group with a distinctive presence in a community), compared to approximately 16 percent for the state of Kansas. The percentage of population living below the poverty level for the state of Kansas (approximately 13 percent) is the lower than Shawnee County (approximately 15 percent) (USCB 2010a).

Table 3.1.11-1. Population within the Vicinity of Forbes ANGS[1]

Geographic Area	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*	*Children Under Age 18*	*Percent Children*
Kansas	2,853,118	462,074	16.2	359,493	12.6	726,939	25.5
Shawnee County	177,934	33,522	18.8	26,156	14.7	44,171	24.8
City of Topeka	127,473	30,301	23.8	24,092	18.9	31,093	24.4

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low-income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010a, 2011a.

Currently there are no populations, including minority or low-income populations, located in the vicinity of Forbes Field Airport within the baseline DNL greater than 65 dB.

3.1.11.2 Protection of Children

In 2010, the number of children under the age of 18 living in Shawnee County was approximately 44,171 (approximately 25 percent of the population) (Table 3.1.11-1). The state of Kansas has a slightly higher percentage population of children compared to the county (approximately 26 percent) (USCB 2010a). There are no on-installation housing or facilities for children located at the 190 ARW installation. Currently, there are no Kindergarten through Grade 12 off-installation schools that are exposed to DNL of 65 dB or above.

3.2 JOINT BASE MCGUIRE-DIX-LAKEHURST

JB MDL, home of the 108 WG of the NJ ANG, is located in central New Jersey, spanning more than 20 miles with more than 42,000 contiguous acres. The base is located 18 miles southeast of Trenton, 45 miles east of Philadelphia, 50 miles south of New York City, and 14 miles inland from the Atlantic Ocean.

3.2.1 Noise

To evaluate noise impacts in the vicinity of a military installation, the USAF uses NOISEMAP, a computer program used to model noise exposure in the vicinity of military airfields. Noise contours were generated for JB MDL (McGuire Field) in 2012. For more detailed information on the noise modeling methods, see Appendix A, Section A.1.2.

3.2.1.1 Baseline Operations

In 2012, JB MDL initiated an update to their 2009 McGuire AFB Air Installation Compatible Use Zone (AICUZ) study that included noise modeling for current McGuire Field aircraft operations. The aircraft operations included in the 2012 NOISEMAP update form the baseline for this analysis.

Based on aircraft operations data validated in March 2013, approximately 62,686 total aircraft operations occurred at McGuire Field during the 12-month period ending October 2011 (JB MDL 2013a). An aircraft operation is counted each time an aircraft departs from the runway and each time they approach the runway. Table 3.2.1-1 summarizes the frequency of aircraft operations for McGuire Field based on information provided by base staff, flying organizations, and air traffic control personnel. The majority of active USAF and ANG flying units currently at McGuire Field operate the C-17, KC-10, KC-135, and the C-32 aircraft. Although the number of aircraft operations at an installation varies from day to day, for McGuire Field, operations were calculated for an AAD, meaning that yearly operations were averaged across all 365 days of the year. Table 3.2.1-1 reflects a total of approximately 172 aircraft operations on an AAD (62,686 divided by 365 days). Approximately 34 percent of the total operations at McGuire Field occur during environmental night (10:00 p.m. through 7:00 a.m.).

Based on the 2012 baseline data, the 108 WG KC-135 aircraft flew a total of 8,340 annual airfield operations, or an average of 23 airfield operations a day. Approximately 20 percent of the total KC-135 operations occur during environmental night. Approximately 13 percent of total operations at McGuire Field are accomplished by the 108 ARW KC-135 aircraft.

Table 3.2.1-1. Current McGuire Field Annual Aircraft Operations

Aircraft	Departures		Arrivals		Total[1]		Grand Total[1]
	Day	Night[2]	Day	Night[2]	Day	Night[2]	
KC-135	3,348	822	3,308	862	6,656	1,684	8,340
Other Aircraft[3]	18,842	8,316	15,895	11,293	34,737	19,609	54,346
Total	**22,190**	**9,138**	**19,203**	**12,155**	**41,393**	**21,293**	**62,686**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other based military and civilian aircraft, and transient aircraft (multiple type aircraft); example aircraft include: KC-10, C-17, and C-32.

Source: JB MDL 2013a, Lamar 2013.

3.2.1.2 Runway and Flight Profiles

McGuire Field aircraft use straight in approaches, overhead approaches, IFR or radar closed patterns, and VFR closed patterns along with re-entry VFR patterns as the basic flight patterns for training, local arrival, and departures. Detailed representative arrival, departure, and closed pattern flight tracks are found in Appendix C, *Noise* (JB MDL 2013a).

3.2.1.3 Existing Noise Environment

Noise contours developed for the baseline conditions at JB MDL are shown in Figure 3.2.1-1. The acreage within each DNL contour on and off JB MDL property is shown in Table 3.2.1-2. Approximately 3,561 acres are exposed to DNL greater than or equal to 65 dB. Detailed information on off-airport land use that lies within a DNL greater than 65 dB can be found in Section 3.2.7, *Land Use*.

Table 3.2.1-2. Acres within Baseline Noise Contours, McGuire Field

Noise Level (dB)	On-Base (acres)	Off-Base (acres)	Total (acres)
65-70	1,375	311	1,686
70-75	1,186	21	1,207
75-80	370	0	370
80-85	222	0	222
Greater than 85	76	0	76
Total	**3,229**	**332**	**3,561**

Note: dB = decibel

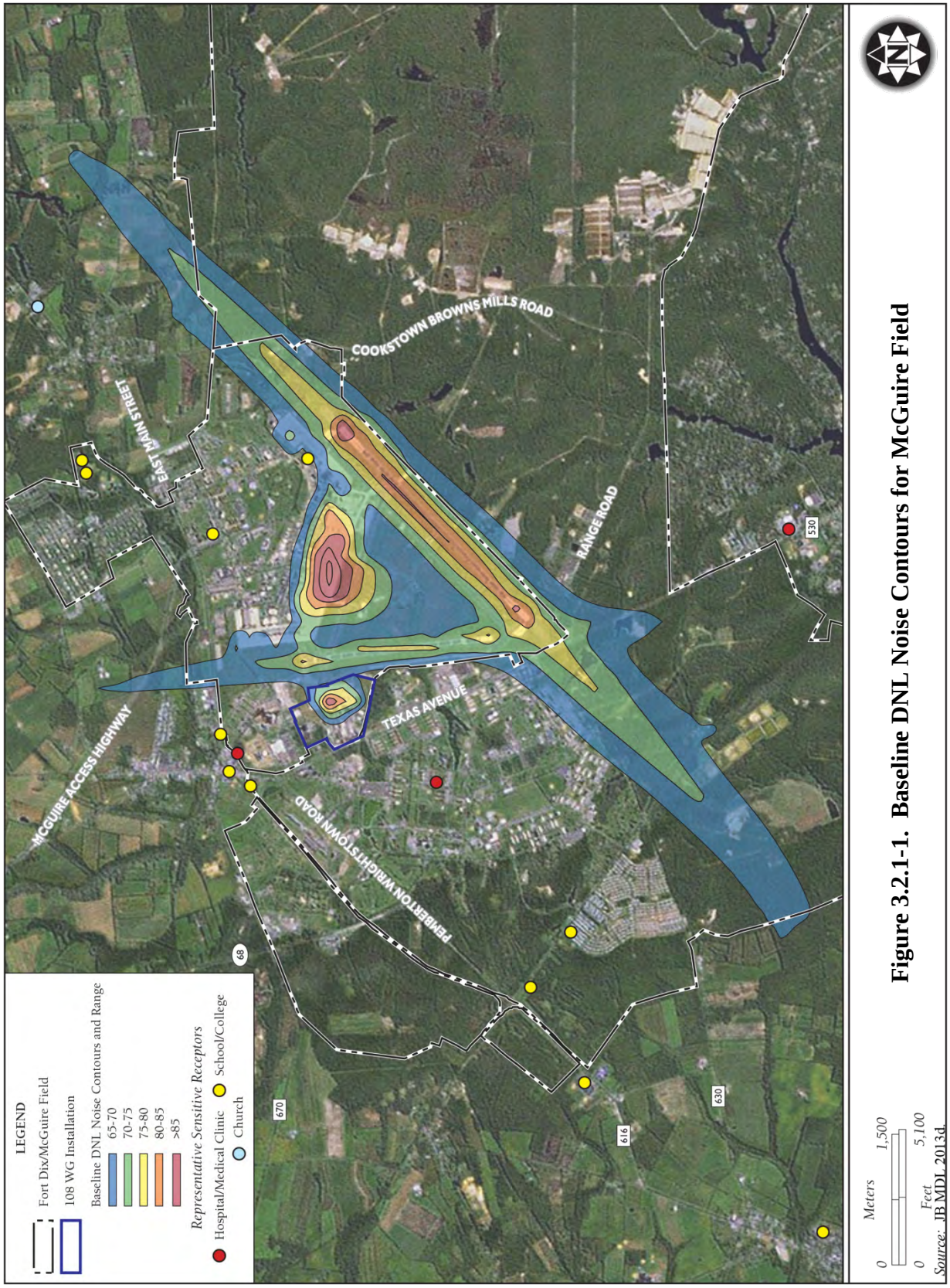


Figure 3.2.1-1. Baseline DNL Noise Contours for McGuire Field

Potential Hearing Loss

As shown in Table 3.2.1-2, there is no property off the JB MDL that falls within the baseline 80+ dB DNL noise contour; therefore, no potential hearing loss risk is currently associated with these areas.

3.2.1.4 Joint Base McGuire-Dix-Lakehurst Noise Abatement Procedures

JB MDL has placed certain restrictions on flying activities that could adversely affect its neighbors in an effort to reduce noise impacts while maintaining safe operations. Local noise abatement procedures are published in AFI 11-2KC135 V3, *108 ARW Supplement* (2009).

For McGuire Field, noise abatement procedures include, but are not limited to, restrictions on rolling and intersection take-offs, and maximum gross weights for practice landings (i.e., closed patterns). Additional McGuire Field local restrictions provide additional protection in housing areas by requiring aircraft to avoid overflight of the housing areas by 1,600 feet MSL from 6:00 a.m. to 10:00 p.m. and restricting aircraft overflight between the hours of 10:00 p.m. and 7:00 a.m., and to avoid overflight of Fort Dix housing, McGuire AFB Clinic, and Deborah Hospital at all times (JB MDL 2009).

3.2.1.5 Joint Base McGuire-Dix-Lakehurst Noise Complaints Procedures

Currently, JB MDL receives noise complaints through the 87th Air Base Wing Public Affairs office. In 2012, McGuire Field received a total of nine noise complaints. Each compliant was routed through JB MDL Radar Approach Control to determine what, if any, military aircraft were in the vicinity of the noise complainant. If it is determined that a JB MDL aircraft was in the vicinity of the complainant, the complaint is forwarded to the appropriate operations flying groups for response and appropriate action (McGee 2013a).

3.2.2 Air Quality

3.2.2.1 Regulatory Setting

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. The New Jersey Department of Environmental Protection (NJDEP) is the agency responsible for the regulation of air quality within the state of New Jersey. The state of New Jersey regulates air quality through the New Jersey Administrative Code, Title 7:27A through 7:27D. The state of New Jersey has adopted additional ambient air quality standards that apply within the state. The NAAQS and state AAQS are summarized in Table 3.2.2-1.

Table 3.2.2-1. Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards [a]		New Jersey Standards	
		Primary [b,c]	Secondary [b,d]	Primary [b,c]	Secondary [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary	—	—
	1-hour	—	—	0.12 ppm (235 µg/m^3)	0.08 ppm (160 µg/m^3)
CO	8-hour	9 ppm (10 mg/m^3)	—	9 ppm (10 mg/m^3)	Same as primary
	1-hour	35 ppm (40 mg/m^3)	—	35 ppm (40 mg/m^3)	Same as primary
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—	—	—
SO_2	Annual	—	—	0.03 ppm (80 µg/m^3)	0.02 ppm (60 µg/m^3)
	24-hour	—	—	0.14 ppm (365 µg/m^3)	0.1 ppm (260 µg/m^3)
	3-hour	—	0.5 ppm (1,300 µg/m^3)	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—	—	—
Total Suspended Particulate	Annual	—	—	75 µg/m^3	60 µg/m^3
	24-hour	—	—	260 µg/m^3	150 µg/m^3
PM_{10}	Annual	—	Same as primary	—	—
	24-hour	150 µg/m^3	Same as primary	—	—
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	—	—
	24-hour	35 µg/m^3	Same as primary	—	—
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary	1.5 µg/m^3	Same as primary

Notes:
a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.
b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide

Source: USEPA 2012.

JB MDL is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. The USEPA has classified the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey as nonattainment for the O_3 (marginal nonattainment) NAAQS, and a maintenance area for $PM_{2.5}$ and CO. The region is designated attainment/unclassified area for all other criteria pollutants. The Proposed Action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (oxides of nitrogen [NO_x] and volatile organic compounds [VOCs]) is 100 tpy, and the *de minimis* emission thresholds for $PM_{2.5}$ and CO emissions are also 100 tpy.

The USEPA recently promulgated a more stringent standard for lead, and has redesigned its monitoring program to address lead and identified airports for monitoring because aviation gas used in piston aircraft still contains lead. The project area is considered attainment/unclassified for lead, and lead is not used in aviation fuel used in the KC-135 or KC-46A aircraft.

3.2.2.2 Climate and Meteorology

JB MDL is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. The climate in the central portion of New Jersey is influenced by its vegetation, with moderation due to its proximity to the Atlantic Ocean. Scrub pine and oak forests dominate the interior southern portion of New Jersey, hence the name, Pine Barrens. Sandy soils, which are porous and not very fertile, have a major effect on the climate of this region. On clear nights, solar radiation absorbed during the day is quickly radiated back into space, resulting in surprisingly low minimum temperatures. The porous soil permits any precipitation to rapidly infiltrate and leave surfaces quite dry. Drier conditions allow for a wider range between the daily maximum and minimum temperatures, and make the area vulnerable to forest fires.

The warmest month of the year is July with an average maximum temperature of 87.10ºF, while the coldest month of the year is January with an average minimum temperature of 22.50ºF. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 24ºF, and moderate during winter with an average difference of 20ºF. The annual average precipitation at Fort Dix is 47.12 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is August with an average rainfall of 5.16 inches (Northeast Regional Climate Center 2013a). Prevailing winds in New Jersey are from the southwest in summer and from the northwest in winter.

3.2.2.3 Regional and Local Air Pollutant Sources

The 108 WG of the NJ ANG is based at McGuire Field in New Jersey. The area surrounding JB MDL is a mix of agricultural uses, developed areas, and undeveloped areas and includes Fort Dix to the west.

The USEPA's National Emissions Inventory includes data for the year 2008 for Burlington and Ocean counties. Table 3.2.2-2 summarizes the regional emissions (stationary, area-wide, and mobile) of criteria pollutants and precursor emissions for the affected areas.

Table 3.2.2-2. Regional Emissions for Burlington and Ocean Counties, New Jersey

	EMISSIONS, TONS/YEAR					
	CO	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Regional Emissions – Burlington County						
Stationary Sources	6,767	1,882	2,935	500	1,010	940
Area-Wide Sources	12,110	24,564	311	73	4,191	1,066
Mobile Sources	60,287	6,056	9,594	122	592	487
Total	**79,164**	**32,502**	**12,840**	**695**	**5,793**	**2,493**
Regional Emissions – Ocean County						
Stationary Sources	5,078	1,277	2,881	582	883	666
Area-Wide Sources	6,369	19,656	339	36	2,740	583
Mobile Sources	70,288	12,765	8,415	109	656	516
Total	**81,735**	**33,698**	**11,635**	**727**	**4,279**	**1,765**

Notes: Emissions of Pb are not included because the affected region contains no significant sources of this criteria pollutant
Numbers may not add precisely due to rounding,
CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: USEPA 2008.

3.2.2.4 Baseline Air Quality

Representative background air monitoring data for the 108 WG for the period 2008-2012 are shown in Table 3.2.2-3. The closest monitoring stations to JB MDL are located in Ocean County (Jackson Township), Camden County (Camden and Winslow), Trenton, and Burlington County. Values measured in more developed areas such as Camden and Trenton are likely to be conservative due to the amount of development in those areas.

As shown in Table 3.2.2-3, O_3 exceedances have been measured in the developed areas surrounding JB MDL during the recent 5-year period. The data show that the area did not experience violations of other NAAQS.

Table 3.2.2-3. Ambient Air Monitoring Data for the JB MDL Area

Air Quality Indicator	*2008*	*2009*	*2010*	*2011*	*2012*
Ozone (O_3)					
Peak 8-hour value (ppm)	0.100	0.085	0.094	0.094	0.09
Days above federal standard (0.075 ppm)	15	2	16	11	9
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)					
Peak 24-hour value ($\mu g/m^3$)	36.2	35.8	36.5	33.8	27.7
Days above federal standard (35 $\mu g/m^3$)	1	0	1	0	0
Annual Average value ($\mu g/m^3$)	11.1	9.3	9.5	10.3	8.8
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	56	81	86	77	67
Days above federal standard (150 $\mu g/m^3$)	0	0	0	0	0
Carbon Monoxide (CO)					
Peak 1-hour value (ppm)	3.7	2.5	2.7	0.7	2.2
Days above federal standard (9 ppm)	0	0	0	0	0
Peak 8-hour value (ppm)	1.8	1.4	1.9	0.3	1.7
Days above federal standard (35 ppm)	0	0	0	0	0
Nitrogen Dioxide (NO_2)					
Peak 1-hour value (ppm)	0.090	0.045	0.046	NA	0.051
98th Percentile (ppm)	0.058	0.040	0.040	NA	0.043
Days above federal standard (0.100 ppm)	0	0	0	NA	0
Sulfur Dioxide (SO_2)					
Peak 1-hour value (ppm)	0.040	0.028	0.016	NA	0.017
99th Percentile (ppm)	0.025	0.020	0.010	NA	0.015
Days above federal standard (0.075 ppm)[1]	0	0	0	NA	0
Peak 24-hour value (ppm)	0.013	0.015	0.006	NA	0.008

Notes: 1. The federal 1-hour SO_2 standard was adopted in 2010.
$\mu g/m^3$ = micrograms per cubic meter; NA = data not available; ppm = parts per million
Source: USEPA 2013a.

3.2.2.5 108th Wing Emissions

The 108 WG currently flies and maintains eight KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 108 WG include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

Emissions for the 108 WG have been quantified in the *Final 2009 Air Emissions Inventory* (108 WG 2011a). The inventory evaluated the emissions from the 108 WG to determine its status under the Title V Federal Operating Permits program. Based on the major source thresholds for the area, the major source thresholds are 25 tpy for O_3 precursors NO_x and VOCs, 100 tpy for all other criteria pollutants, and less than 10 tpy of any single HAP or 25 tpy of any combination of HAPs.

In December 2009, the base was issued an air permit from the NJDEP that contains operational limits such that its potential emissions are restricted below the Title V major source thresholds. While the 2009 Air Emissions Inventory also contains fugitive emission calculations, it demonstrates that total base-wide potential emissions from stationary sources are below the major source thresholds.

Stationary source emissions at the 108 WG include emissions from natural gas-fired heating units, emergency generators and pumps, fuel tanks, fuel cell maintenance, and various minor sources such as solvent use, deicing, and welding. Mobile source emissions include emissions from aircraft operations (take-offs and landings), AGE, ground vehicle operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft operations at the 108 WG considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the default mixing height (3,000 feet AGL). Baseline emissions also include stationary sources and emissions associated with vehicle trips associated with existing personnel and dependents. These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the installation.

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #2, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related AGE, and POVs associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations identified in Table 2.3.7 utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet AGL. A discussion of the methodology for quantifying emissions is provided in Appendix A, Section A.2.3. Emissions associated with baseline operations of the KC-135 aircraft are provided in Table 3.2.2-4.

Table 3.2.2-4. 108 WG Baseline Emissions at JB MDL

	EMISSIONS, TONS/YEAR						
Emission Source	***VOCs***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***	***CO_2e***
KC-135 Baseline Aircraft Operations	3.21	49.03	83.34	7.43	0.39	0.39	20,659
AGE	0.01	0.01	0.09	0.00	0.00	0.00	2,157
Engine Testing	0.14	2.01	0.55	0.09	0.01	0.01	239
POVs	5.12	110.72	5.20	0.07	0.21	0.12	3,543
Total Baseline Emissions	**8.48**	**161.78**	**89.18**	**7.59**	**0.61**	**0.53**	**26,597**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle.

Source: 108 WG 2011a.

3.2.3 Safety

This section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, APZs/RPZs, explosive safety, and AT/FP. Flight safety includes discussions on flight safety procedures, aircraft mishaps, BASH, and fuel jettison requirements. The affected environment includes the airfield and local airspace surrounding McGuire Field.

3.2.3.1 Ground Safety

Fire/Crash Response

Day-to-day operations and maintenance activities conducted by the 108 WG are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders, and standards prescribed by AFOSH requirements. The USAF active duty host at JB MDL provides fire, crash, rescue, and structural fire protection for the McGuire Field installation, including the 108 WG, and its aircraft. Aircraft Rescue Fire Fighting (ARFF) services at McGuire Field are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services. ARFF equipment and personnel at McGuire Field meet USAF requirements (JB MDL 2013b).

Accident Potential Zone/Runway Protection Zone

APZs are established to delineate recommended surrounding land uses for the protection of people and property on the ground, as described in Appendix A, Section A.3. At McGuire Field, airfield operations currently has waivers for two buildings, 1931 and 5650, which violate the CZs for Runways 24 and 36 respectively. Both are scheduled for demolition. Details of development and land use in the McGuire Field vicinity are included in Section 3.2.7, *Land Use*.

Explosive Safety

The 108 WG uses a small range of munitions required for performance of their mission. The existing munitions storage capabilities on JB MDL meet the requirement for small arms deployment/training ammunition and other munitions required by the 108 WG.

Anti-Terrorism/Force Protection

Many of the 108 WG military facilities at JB MDL were constructed before AT/FP considerations became a critical concern. Thus, under current conditions, many facilities do not comply with all current AT/FP standards. However, as new construction occurs and as facilities

are modified, the New Jersey 108 WG would incorporate these standards to the maximum extent practicable.

3.2.3.2 Flight Safety

Flight Safety Procedures

Aircraft flight operations from McGuire Field are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2KC-135V3, *Flying Operations, C/KC-135 Operations Procedures* 2010) to ensure flight safety. While having aircraft in close proximity during air refueling is inherently dangerous, air refueling mishaps are rare. Emergency separation procedures are established and practiced by both tanker and receiver aircrews.

Aircraft Mishaps

KC-135 aircraft (all models) have flown more than 14,750,000 hours since the aircraft entered the USAF inventory in 1957. Over that period, 83 Class A mishaps have occurred and 64 aircraft have been destroyed (specific statistics for mishaps during refueling are not recorded). This results in a Class A mishap rate of 0.56 per 100,000 flight-hours, and an aircraft destroyed rate of 0.43 per 100,000 flight-hours (AFSEC 2012). There have been no Class A mishaps involving 108 WG aircraft at McGuire Field. The aircrew members at the 108 WG are highly experienced and have accumulated over 270,000 accident free hours (JB MDL 2013b).

Bird/Wildlife Aircraft Strike Hazard

The USAF BASH Team maintains a database that documents all reported bird/wildlife aircraft strikes. Historic information across the USAF for the past 40 years indicates that 39 USAF KC-135 aircraft have been destroyed and 33 fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2010 (AFSEC 2013).

The 108 WG has an effective, on-going BASH program through which information and assistance is freely shared between airfield users, the McGuire Field staff, and the local air traffic controllers. Serious BASH-related accidents within the immediate JB MDL area are unusual and have never resulted in a Class A mishap (JB MDL 2013c). JB MDL recorded a total of 94 minor BASH incidents and one deer mishap from 2008 to 2013. From this total, the 108 WG experienced 22, for an average of fewer than 2 per year (JB MDL 2013c).

Fuel Jettison

For use in emergency situations, the KC-135 aircraft have the capability to jettison fuel and reduce aircraft gross weight for flight safety. Although fuel jettisoning is not practiced, airbases must establish jettison areas and procedures to minimize the impact of fuel jettisoning should it occur during an emergency situation. Ideally, jettison areas are established at altitudes above 20,000 feet, off published federal airways, avoiding urban areas, agricultural regions, and water supply sources.

The primary emergency fuel jettison area for the 108 WG is the PREPI (charted, mandatory overwater reporting point) overwater intersection, 62 miles southeast of JB MDL. Aircrews enter a holding pattern east of PREPI intersection, flying 7-mile legs, with right hand turns, after notifying the appropriate Air Traffic Control facility of intentions to jettison fuel. Aircrews will request an altitude as high as practical, consistent with the nature of the in-flight emergency; however, 20,000 feet AGL or above is preferred (JB MDL 2009).

3.2.4 Soils and Water

3.2.4.1 Soils

This area of New Jersey is within the Coastal Plain Province, a nearly level to rolling, dissected coastal plain that has been subjected to episodes of rising and falling sea levels. During low sea levels, eroding streams have dissected the area, leaving a series of terraces across the landscape (USDA 2006). The 108 WG installation is located on improved land, and relief ranges from 70 to 90 feet above MSL (JB MDL 2011).

The NRCS Soil Survey for Burlington County, New Jersey identifies eight individual soil types at the 108 WG installation. The following four soil types are located within the project study area:

Adelphia-Urban land complex, 0 to 5 percent slopes: This soil consists of strongly intermingled Urban land and Adelphia soil. Urban land consists of soil from cut/fill sites used for buildings, paved roads, parking lots, and other areas of urban development. The rating class for building site development is considered somewhat limited due to shrink-swell potential and depth to saturated zone (NRCS 2013b). Approximately 54 percent of the installation is composed of this soil type.

Holmdel sandy loam, 0 to 2 percent slopes: This soil is typically found on flats from loamy marine deposits. The rating class for building site development is considered somewhat limited

due to depth to saturated zone. In addition, this soil type is designated as Prime Farmland (NRCS 2013b). Approximately 4 percent of the installation is composed of this soil type.

Sassafras sandy loam, 2 to 5 percent slopes: This soil is typically found on knolls and low hills from loamy or gravelly marine deposits. There are no known limitations to site development associated with this soil type. In addition, this soil type is designated as Prime Farmland (NRCS 2013b). Approximately 18 percent of the installation is composed of this soil type.

Udorthents, wet substratum, 0 to 8 percent slopes: This soil is found in areas that have been excavated and regraded or that have been filled with soil material and graded. This soil type is typically used for urban development or landfills. The suitability of the soils as a site for development varies. The rating class for building site development is not rated for this soil type (NRCS 2013b). Approximately 5 percent of the installation is composed of this soil type.

The remaining 19 percent is comprised of soil types that would not be affected.

3.2.4.2 Surface Water

The 108 WG is located within the Middle Delaware-Musconetcong Watershed that encompasses over 3,480 square miles across New Jersey and Pennsylvania (USEPA 2013c). The Delaware is the longest un-dammed river in the U.S., extending 330 miles from the confluence of its east and west branches at Hancock, New York to the mouth of the Delaware Bay where it meets the Atlantic Ocean. Three-quarters of the Delaware River is now included in the National Wild and Scenic Rivers System. Sections of the Maurice River and the Musconetcong River in New Jersey also have been included in the national system (Delaware River Basin Commission 2013).

Surface water features within the vicinity of the JB MDL include Assiscunk Creek, Crosswicks Creek, Manapaqua Brook, North Ruckles, Rancocas Creek, Ridgeway Brook, and the Toms River which drains southeast into Barnegat Bay (Figure 3.2.4-1). Three of these creeks are tributaries to the Delaware River: Assiscunk Creek, Crosswicks Creek, and Rancocas Creek. The western portion of the installation, including McGuire Field, is in the Rancocas Creek watershed. Smaller streams include Harris Branch, Elisha Branch, Paint Branch, and a number of unnamed tributaries (87th Civil Engineering Squadron 2012).

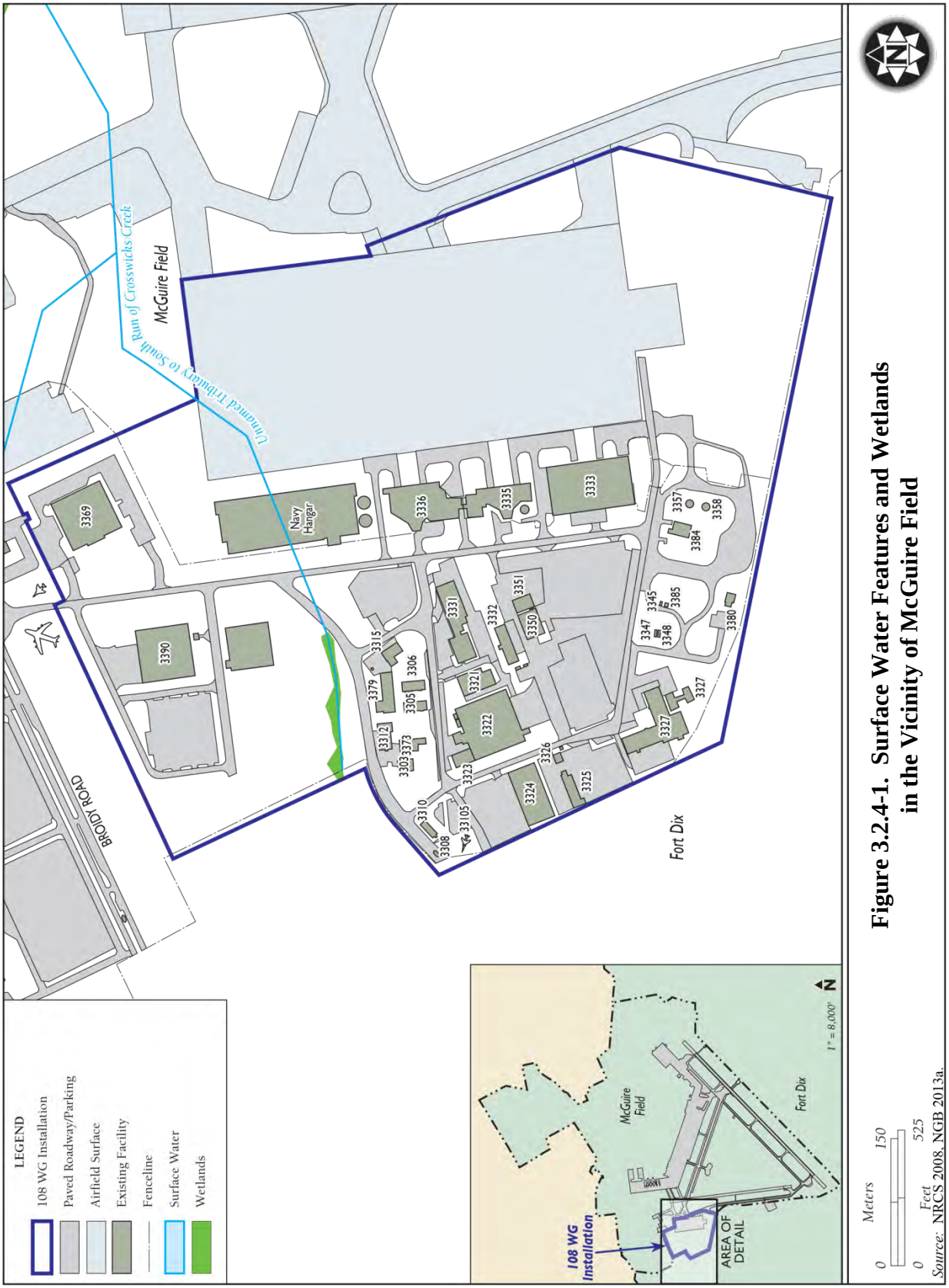


Figure 3.2.4-1. Surface Water Features and Wetlands in the Vicinity of McGuire Field

There are five stormwater outfalls on McGuire Field, Drainage Basins 1 through 5. Drainage basins containing industrial activities include Basins 1, 2, and 3. Drainage Basin 1 directs effluent into the South Run of Crosswicks Creek, while Drainage Basin 2 directs effluent to Jacks Run. Drainage Basin 3 discharges into Larkins Run of the North Branch of Rancocas Creek. Drainage Basin 4 directly discharges stormwater to Drainage Basin 5, which in turn discharges into the North Run of the Crosswicks Creek. The outfalls associated with industrial activity are regulated under a New Jersey Basic Industrial General Stormwater Permit (NJ0088315). The permit is administered by the NJDEP under the auspice of the USEPA (USAF School of Aerospace Medicine 2010).

3.2.4.3 Groundwater

Groundwater in this area is part of the Northern Atlantic Coastal Plain aquifer system consisting of sedimentary deposits that range in age from Early Cretaceous to Holocene (U.S. Geological Survey [USGS] 1995a). The installation lies within the Kirkwood-Cohansey Aquifer present throughout the New Jersey coastal plain and covers approximately 3,000 square miles. The Cohansey Formation is mostly sand with minor lenses of silt, clay, and gravel. The Kirkwood Formation contains both sand and clay beds. The Kirkwood-Chansey water table is highly permeable due to the dominance of well-sorted medium- to coarse-grained sand (New Jersey Geological Survey 2009). Because of the high water table and permeable soils, the underlying groundwater resources are particularly sensitive to contamination making groundwater pollution prevention an important issue on the installation (87th Civil Engineering Squadron 2012).

Immediately below the Cohansey Formation is the Kirkwood Formation. Together, these two aquifers are estimated to contain as much as 17 trillion gallons of water. Underlying the Cohansey and Kirkwood Formations is the Potomac-Raritan-Magothy Formation. The installation's largest capacity well taps into the Potomac-Raritan-Magothy Aquifer at about 1,580 feet (87th Civil Engineering Squadron 2012).

3.2.4.4 Floodplains

Per the FEMA Flood Insurance Rate Map for Burlington County, New Jersey, the 108 WG installation falls within an unmapped area, and no FEMA floodplains have been delineated within this area (FEMA 2013).

A floodplain study was prepared by the U.S. Army Corps of Engineers (USACE) for the Lakehurst area of JB MDL in 1989 and was later revised in 1990. Peak discharges for flood levels that occur with average intervals of 10, 50, 100, and 500 years were determined for Ridgeway Branch, North Ruckles Branch, Manapaqua Brook, Paint Branch, and Harris Branch.

Flood Insurance Studies have also been prepared by FEMA for the Township of Manchester and the Borough of Lakehurst. No floodplain studies have been conducted on the Fort Dix or McGuire areas of JB MDL (87th Civil Engineering Squadron 2012).

3.2.5 Biological Resources

3.2.5.1 Vegetation

The 108 WG installation occurs within the Eastern Broadleaf Forest (Oceanic) Province. Vegetation in this region typically is characterized by a winter deciduous forest dominated by tall broadleaf trees (Bailey 1995). Within this region, the 108 WG installation lies within the Pinelands, a heavily forested area characterized by a mix of pitch pine (*Pinus rigida*), Virginia pine (*Pinus virginiana*), and short leaf pine (*Pinus echinata*). The majority of the JB MDL (69 percent) is forested with pine/oak or oak/pine forests with dense deciduous stands of red maple, sweet gum, and black gum in the wetland forests. However, the majority of McGuire Field and the 108 WG installation is either developed or comprised of turf and landscaped areas (87th Civil Engineering Squadron 2012, Headquarters AMC 2008).

3.2.5.2 Wildlife

Since 69 percent of JB MDL is forested, and the majority of the 108 WG installation is developed, wildlife present within the vicinity includes a mix of species highly adapted to developed and disturbed areas as well as species typical of native forests in the area. Common mammal species found on JB MDL include white-tailed deer, woodchuck (*Marmota marmox*), beaver (*Castor canadensis*), eastern cottontail rabbit (*Sylvilagus floridanus*), red squirrel (*Tamiasciurus hudsonicus*), white-footed mouse (*Peromyscus leucopus*), and meadow vole (*Microtus pennsylvanicus*) (87th Civil Engineering Squadron 2012, Headquarters AMC 2008).

Common reptilian and amphibian species observed within the vicinity of the installation include the milk snake (*Lampropeltis* spp.), northern black racer (*Coluber constrictor*), northern fence lizard (*Sceloporus undulates hyacinthus*), painted turtle (*Chrysemys picta*), American toad (*Bufo americanus*), Fowler's toad (*Bufo woodhousei fowleri*), and northern leopard frog (*Rana pipiens sphenocephala*) (Headquarters AMC 2008).

The 108 WG installation is located within the Atlantic Flyway, one of four major North American corridors for migratory birds. The majority of the bird species found within the 108 WG installation or its vicinity are protected under the MBTA. Grassland areas on the installation, as well as those grassland areas near the airfield, provide habitat for birds such as the Upland Sandpiper (*Bartramia longicauda*), Grasshopper Sparrow (*Ammodramus savannarum*), and Savannah Sparrow (*Passerculus sandwhichensis*). The ecotone between grassland and

forested ecosystems provides excellent habitat for bird species such as the Gray Catbird (*Dumetella carolinensis*), Yellow Warbler (*Dendroica petechia*), Northern Cardinal (*Cardinalis cardinalis*), Indigo Bunting (*Passerina cyanea*), Rufous-sided Towhee (*Pipilo erythrophthalmus*), Song Sparrow (*Melospiza melodia*), Brown-headed Cowbird (*Molothrus ater*), and American Goldfinch (*Carduelis tristis*). Common birds found in the wetlands areas include the Great Blue Heron (*Ardea herodias*), Northern Rough-winged Willow Flycatcher (*Empidonax traillii*), Eastern Kingbird (*Tyrannus tyrannus*), Cedar Waxwing (*Bombycilla cedrorum*), and Red-winged Blackbird (*Agelaius phoeniceus*). Common birds that could be found in the upland forest areas include the Downy Woodpecker (*Picoides pubescens*), Eastern Wood-pewee (*Contopus virens*), Carolina Chickadee (*Parus carolinensis*), Pine Warbler (*Dendroica pinus*) and Chipping Sparrow (*Spizella passerina*). Common raptor species that may be found include the American Kestrel (*Falco sparverius*), Red-tailed Hawk (*Buteo jamaicensis*), Great Horned Owl (*Bubo virginianus*), and the Turkey Vulture (*Cathartes aura*) (Headquarters AMC 2008).

3.2.5.3 Special Status Species

Appendix E lists federally threatened, endangered, candidate, and state listed species observed or potentially occurring in the vicinity of JB MDL. No federally listed species have been observed on McGuire Field or the 108 WG installation. Three federally listed plant species and one candidate plant species have been observed within the vicinity of JB MDL, but have not been observed within the 108 WG installation. An additional 30 state listed species have been observed on JB MDL, while 6 state listed species have been observed within McGuire Field (American Kestrel, Grasshopper Sparrow, Northern Harrier, Pie-billed Grebe, Savannah Sparrow, and Upland Sandpiper). There is no critical habitat located on JB MDL (87th Civil Engineer Squadron 2012, Air Mobility Command 2008, New Jersey Department of Environmental Protection 2013).

3.2.5.4 Wetlands

Approximately 21 percent (8,791 acres) of JB MDL is comprised of emergent, scrub-shrub, and forested wetlands (Figure 3.2.4-1). Approximately 900 acres occur at Lakehurst, 238 acres occur at McGuire, and 7,653 acres occur at Dix (87th Civil Engineer Squadron 2012). There are no wetlands located within the vicinity of the construction projects under Alternative #2.

3.2.6 Cultural Resources

3.2.6.1 Archaeological Resources

A survey of cultural resources including archaeological resources and pre-Cold War era buildings and structures was completed in 1995 for McGuire AFB (now McGuire Field) (Headquarters AMC 1995). This survey included all areas within the 1995 boundary of McGuire AFB and all off-base facilities, except for a 20-acre parcel of leased land (the Boeing Michigan Aerospace Research Center [BOMARC] missile site at Fort Dix). Areas that were highly disturbed from construction or ERP sites were excluded from the survey and five previously designated areas of archaeological sensitivity were included based on geomorphology, the history of land disturbance on base, vegetation, and prehistoric and historic site distribution patterns on surrounding lands. A sixth area of archaeological sensitivity was added in the North Run area of the base due to the potential for buried prehistoric remains in undisturbed alluvial deposits and on locations of historic buildings on historic maps (Headquarters AMC 1995). This survey resulted in the recordation of 11 historic archaeological sites. Following further testing in 1998, three of these sites (site numbers 28BU458, 28BU459, and 28BU473) were determined eligible for listing in the NRHP. The three sites include two mid-eighteenth to early-nineteenth century agricultural households associated with a nearby mill site, which was reported but not identified; and one mid-eighteenth to early nineteenth century domestic site associated with the historic village of Pointville. The remaining eight sites were determined not eligible for listing in the NRHP (Duryee 2013, 87th Civil Engineering Squadron 2013, Headquarters AMC 2008).

3.2.6.2 Architectural Resources

The 1995 survey of McGuire AFB included an inventory and NRHP evaluation of all buildings and structures constructed before 1947, the BOMARC missile complex at Fort Dix, and the 1956 Semi-Automatic Ground Environment complex. Both the Semi-Automatic Ground Environment complex and the BOMARC site were recommended as NRHP-eligible Cold War era resources under the criteria for exceptional significance (Criterion Consideration G). Additionally, as a result of this survey, 18 World War II era temporary structures were found to be eligible for listing in the NRHP. The structures are considered eligible; however, per the 1986 Memorandum of Agreement between the DOD, the Advisory Council on Historic Preservation, and the National Conference of SHPOs, these structures could be demolished without further Section 106 review. All other buildings were found not eligible for listing in the NRHP (Headquarters AMC 2008).

A follow-up survey in 1996 included all Cold War era buildings, which were all less than 50 years old at the time. No buildings were recommended eligible to the NRHP under criteria for exceptional significance (Criterion Consideration G) (Headquarters AMC 1995). In 2013, a

survey was completed for pre-1967 resources that have since become 50 years old. Hangar 3322, built in 1957, was evaluated for NRHP eligibility during this survey. The results of the inventory indicated that Hangar 3322 is not eligible for listing in the NRHP (JB MDL 2013d).

3.2.6.3 Traditional Resources

McGuire Field contains no known traditional resources; however, three federally-recognized Tribes that are historically, culturally, and linguistically affiliated with the area have been identified: Delaware Nation, Delaware Tribe of Indians, and Stockbridge-Munsee Community. JB MDL has completed consultation with the Delaware Nation and Delaware Tribe of Indians, who were identified as potentially having an interest in JB MDL. In the past, the Stockbridge-Munsee Community was invited by JB MDL to participate in government-to-government consultation, but declined interest in being further consulted (87th Civil Engineering Squadron 2013, Duryee 2013).

3.2.7 Land Use

JB MDL is located in central Burlington County, adjacent to and southeast of the Borough of Wrightstown and within New Hanover Township. Land use within those portions of Burlington County adjacent to McGuire Field is a mix of residential and commercial to the north and south, with several open and agricultural areas adjacent to the western boundary of the installation. The land use in Ocean County northeast of JB MDL is similar to the existing land use in Burlington County that is north of the airfield (Figure 3.2.7-1).

Aircraft noise and potential hazards from aircraft operations at McGuire Field currently are incompatible with some off-installation land use. Since JB MDL surrounds McGuire Field to the east, south, and west, the impact of airfield activities on adjacent communities is limited. Higher DNL contours and APZs associated with the runways at McGuire Field do not extend off installation. (Detailed descriptions of APZs can be found in Section A.1.3 of Appendix A.)

An updated noise study in support of the AICUZ program was completed for JB MDL in 2013 and the JB MDL Joint Land Use Study was completed in 2009. These documents identify incompatible land uses and supports compatible land use planning in the vicinity of JB MDL. Both Burlington and Ocean Counties have supported the AICUZ and Joint Land Use Study programs in their on-going planning and zoning decisions to reduce land use conflicts and ensure future land uses are compatible (JB MDL 2013a, DoD 2009b).

Currently, aircraft noise from JB MDL exposes approximately 332 acres of off-JB MDL areas of land zoned as Recreational, Agricultural, Commercial, Residential, Open Space, and Other to

noise levels between 65 dB and 75 dB DNL. Figure 3.2.7-1 shows an overlay of the baseline DNL contours onto a map displaying the existing land use in the vicinity of JB MDL.

3.2.8 Infrastructure and Transportation

3.2.8.1 Potable Water System

Potable water for the 108 WG installation is supplied by four wells drawn from the Potomac-Raritan-Magothy aquifer. McGuire Field has a water allocation permit that entitles the installation to use 450.75 million gallons of water per year with capacity of 4.03 million gallons per day. Average daily water usage averages between 1 and 1.4 million gallons per day. Water is treated at each well and temporarily stored in 25,000-gallon ASTs, then pumped to a single elevated 750,000-gallon water storage tank by the McGuire Field Water Department (Headquarters AMC 2008, 108 WG 2012).

3.2.8.2 Wastewater

The 108 WG installation generates wastewater from sanitary, stormwater, and industrial processes, including OWS discharge, wash rack discharge, floor wash-down, latrines, sinks, and showers. Wastewater generated within the 108 WG installation is conveyed into the Fort Dix tertiary wastewater treatment plant. The facility has a capacity of 4.6 million gallons per day but typically receives 1.0 to 1.5 million gallons of wastewater per day from McGuire Field (Headquarters AMC 2008).

3.2.8.3 Stormwater

A high percentage of the active administrative and industrial areas of the installation are paved or roofed, resulting in high runoff rates during precipitation events. As described in the 108 WG SWPPP (2010), the 108 WG installation has a stormwater drainage conveyance system typified by overland flow to catch basins, inlets, surface drains, underground pipes, culverts, ditches, and swales that discharge to receiving waters (see Section 3.2.4, *Soils and Water*) or other municipal separate storm sewer systems. The stormwater drainage system has been designed to safely collect and transport surface water runoff from storm events to prevent flooding within the installation and is a separate system from the wastewater (sewage) system.

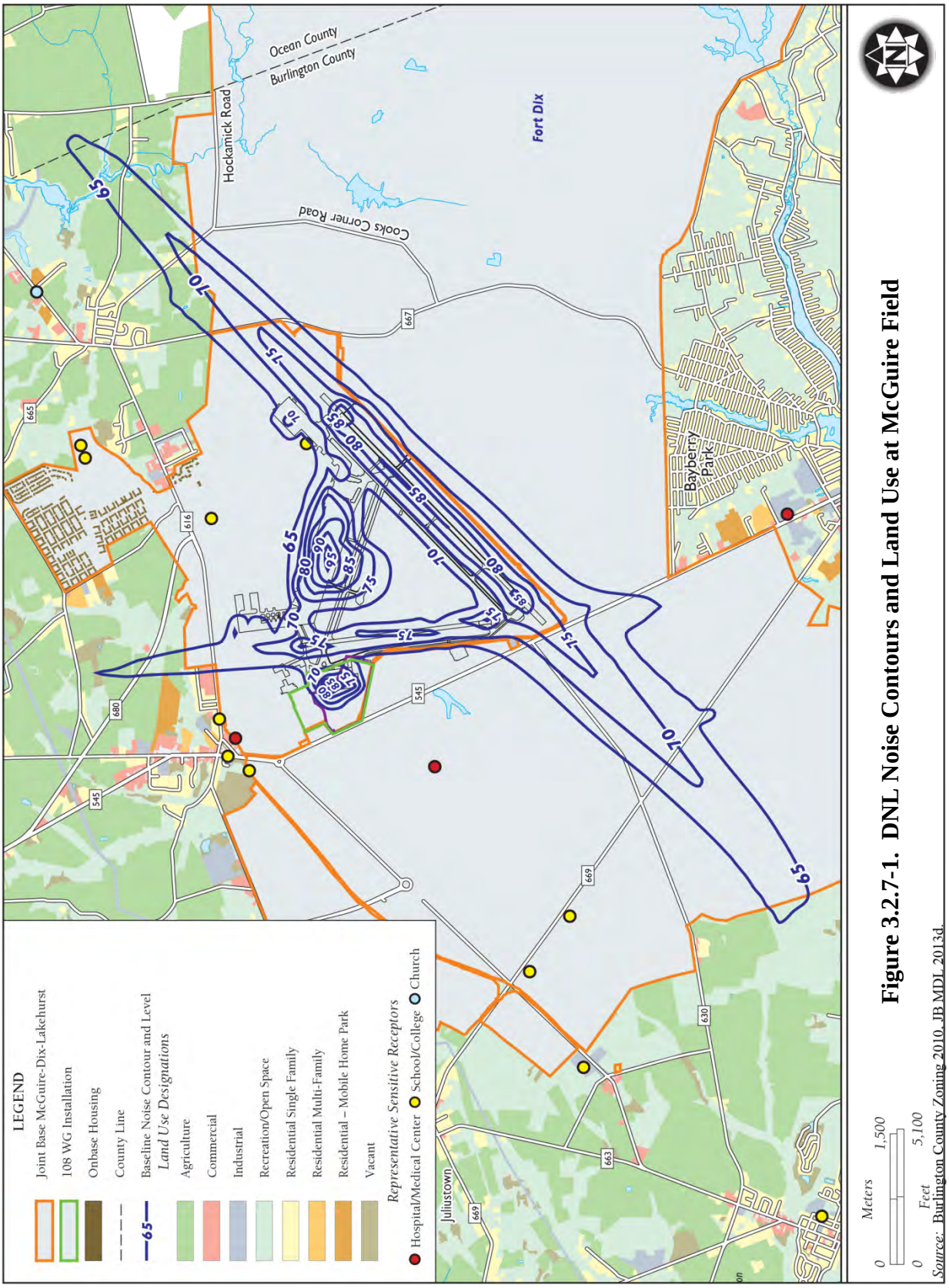


Figure 3.2.7-1. DNL Noise Contours and Land Use at McGuire Field

3.2.8.4 Electrical and Natural Gas Systems

Electricity is supplied to the 108 WG installation by Jersey Central Power & Light via a single 34.5-kilovolt switching station and aboveground lines. Natural gas is supplied by Public Service Electric and Gas Company via two separate metered main lines. Electricity consumption for CY 2012 at the 108 WG installation was 6,071 megawatt hours. Natural gas consumption for CY 2012 at the 108 WG installation was 34,609 thousand cubic feet (108 WG 2012).

3.2.8.5 Solid Waste Management

Municipal solid waste at the 108 WG installation is managed in accordance with the McGuire AFB Solid Waste Management Plan (USAF 2002) and guidelines specified in AFI 32-7042, *Waste Management* (2009). This AFI incorporates, by reference, the federal standard for solid waste regulations contained within 40 CFR, Subtitle D, *Non-hazardous Waste*, and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for recycling, diversion, handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

The 108 WG installation generates solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These non-hazardous solid wastes are collected in dumpsters located throughout the 108 WG installation and transported to the Burlington County Resource Recovery Complex in Mansfield and Florence Townships, New Jersey (USAF 2002).

3.2.8.6 Transportation

The 108 WG installation is located within close proximity to several major highways. The New Jersey Turnpike I-95), a major north/south highway, is less than 10 miles to the west of the installation. State Route (SR) 68 serves as the primary access to the installation from the New Jersey Turnpike. The 108 WG installation can be accessed through McGuire Field or through Fort Dix at Broidy Road Gate (Gate 9) or the NJ ANG gate (Gate 5). Wrightstown-Cookstown Road provides access to the main gate of McGuire Field as well as a secondary entrance to the east (Headquarters AMC 2008).

3.2.9 Hazardous Materials and Waste

3.2.9.1 Hazardous Materials

Hazardous materials are used at the 108 WG installation for aircraft operations support and maintenance, including POL management and distribution, liquid fuels maintenance, transportation maintenance, vehicle paint, power production, machine shop operations, and flight simulation. Types of hazardous substances found on the 108 WG installation include hydraulic fluid, waste oils, recovered fuels, spent cleaners, strippers, solvents, flammable and combustible liquids, acids, aerosols, batteries, corrosives, and paints (108 WG 2011b).

There are currently 14 regulated USTs and 140 ASTs on McGuire Field containing jet fuel, diesel, and motor gasoline (Headquarters AMC 2008). Of these, the 108 WG has no regulated USTs and five ASTs on the installation.

Toxic Substances

Regulated toxic substances typically associated with buildings and facilities include asbestos, LBP, and PCBs. An asbestos survey was performed at the 108 WG installation in 2007. ACM identified in the insulation, floor tiles, and mastic were found in 18 buildings (Buildings/Hangars 1811, 3302, 3303, 3305, 3306, 3310, 3312, 3315, 3321, 3322, 3323, 3325, 3326, 3331, 3332, 3369, 3373, and 3379) (NJ ANG 2007).

A LBP survey has not been conducted at the 108 WG installation. Any buildings on the installation constructed prior to 1978 are presumed to contain LBP and would be tested for LBP prior to demolition or renovation.

The 108 WG does not maintain, operate, or own any PCB equipment or PCB-contaminated equipment and the subject property is considered PCB-free (108 WG 2011b).

3.2.9.2 Hazardous Waste Management

McGuire AFB Integrated Contingency Plan for Oil Spill Prevention and Response Plan incorporates the requirements for a *Spill Prevention Control and Countermeasure Plan* and a *Facility Response Plan* (87th Air Base Wing 2009). It contains the governing regulations for spill prevention and describes specific protocols for preventing and responding to releases, accidents, and spills involving oils and hazardous materials (87th Air Base Wing 2009). The 108 WG Hazardous Waste Management plan outlines procedures for controlling and managing hazardous wastes from the point where they are generated until they are disposed. In addition, it includes guidance for compliance with all federal, state, and local regulations pertaining to hazardous waste (108 WG 2011b).

The 108 WG hazardous waste disposal activities are coved under the McGuire Field USEPA Identification Number NJ2571824018, which is regulated as a Large Quantity Generator of hazardous waste. A hazardous waste generation point is where the waste is initially created or generated. An SAP is an area where hazardous waste is initially accumulated at the point of generation and is under the control of the SAP manager. Hazardous wastes initially accumulated at a SAP are accumulated in appropriate containers before being transferred to the installation CAP. There are seven SAPs (where a waste is initially accumulated) identified at the 108 WG installation in Buildings/Hangars 3324, 3325, 3331, 3333, 3336, 3379, and 3384. The 108 WG installation CAP is located on McGuire Field in Building 2310 (108 WG 2013c).

OWSs are used to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and stormwater drainage systems. OWSs located on the 108 WG installation primarily receive discharge from floor drains in maintenance areas.

3.2.9.3 Environmental Restoration Program

There are currently 42 ERP sites on McGuire Field, with 1 of these sites (SS-39) located on the 108 WG installation. In addition, there is currently a contaminated area located in the POL facility on the 108 WG installation that has recently been discovered and is currently being investigated. Table 3.2.9-1 provides details for each of these sites on the 108 WG installation and Figure 3.2.9-1 shows the locations. The exact boundaries for the Defense Logistics Agency (DLA) site is still being investigated. Therefore, the area shown on the map is only a general location.

Table 3.2.9-1. ERP Sites within the 108 WG Installation

ERP Site	*Materials of Concern*	*Status*
SS-39	Site SS-39 includes several former and current industrial buildings at which aircraft maintenance, aircraft washing, and fuel cell repairs currently and historically were performed. It includes Buildings 3321, 3322, 3325, and 3350. A portion of Site SS-39 is currently an aircraft parking apron.	Remedial Investigation
DLA Site	Recently an area located within the POL facility on the 108 WG installation was discovered to have low levels of jet fuel and other fuel types. This site is being managed by the Defense Logistics Agency (DLA) and is still in the discovery phase. The extent and the source of the contamination is still unknown at this time. Soil and groundwater investigations are ongoing	Preliminary Assessment/Site Investigation

Source: Air Force Center for Engineering and the Environment 2012, 108 WG 2013c

Figure 3.2.9-1. Environmental Restoration Program Sites at the 108 WG Installation, JB MDL

3.2.10 Socioeconomics

3.2.10.1 Population and Employment

Population

JB MDL is located approximately 18 miles southeast of Trenton, New Jersey in Ocean and Burlington counties. Current population data and estimates for the state of New Jersey, Burlington and Ocean counties, and New Hanover, North Hanover, and Pemberton Townships are provided in Table 3.2.10-1. From 1990 to 2010, Burlington County's population increased by 53,668, an increase of approximately 14 percent. Ocean County grew by 143,364 between 1990 and 2010, an increase of approximately 33 percent (USCB 1990b, 2000b, 2010b).

Table 3.2.10-1. Population Growth within the Vicinity of JB MDL

Area	*1990 Census*	*2000 Census*	*2010 Census*
New Jersey	7,730,188	8,414,350	8,791,894
Burlington County	395,066	423,394	448,734
Ocean County	433,203	510,916	576,567
New Hanover Township	9,546	9,744	7,385
North Hanover Township	9,994	7,347	7,678
Pemberton Township	31,342	28,691	27,912
Plumsted Township	2,089	7,275	8,421
Wrightstown Borough	3,843	748	802

Source: USCB 1990b, 2000b, 2010b.

The 108 WG currently supports a workforce authorization of 1,329, including 416 full-time and 913 part-time personnel (see Table 2.3-12).

Employment and Earnings

Table 3.2.10-2 presents total labor force and employment rates for New Jersey; Burlington and Ocean counties; New Hanover, North Hanover, Pemberton and Plumsted Townships; and Wrightstown Borough. Based on 2007-2011 ACS 5-year estimates, there were 244,032 persons in the labor force (able to work) and 224,720 employed within Burlington County, resulting in an unemployment rate of approximately 8 percent. Labor force estimates for Ocean County include 267,716 persons, with 243,182 employed, resulting in an unemployment rate of approximately 9 percent. Top employment industries in Burlington County include 1) educational services, and health care and social assistance; 2) professional, scientific, and management, and administrative and waste management services; and 3) retail trade (USCB 2011b). Principal employers include Virtua Memorial Hospital of Burlington County, Lockheed Martin, Burlington Coat Factory, Viking Yacht Company, and PHH Mortgage (Burlington County 2010). Top employment industries in Ocean County include 1) educational services, and health care and social assistance; 2) retail; and 3) professional, scientific, and management, and administrative and waste

management services (USCB 2011b). Principal employers include Saint Barnabas Health Care System, Six Flags theme parks, Naval Engineering Station-Naval Air Warfare Center, Toms River Regional School System, and Ocean County government (Ocean County 2008).

Table 3.2.10-2. Employment Data (2011) within the Vicinity of JB MDL

Area	*Labor Force*	*Employed*	*Unemployed*	*Unemployment Rate (%)*
New Jersey	4,633,565	4,230,814	402,751	8.7
Burlington County	244,032	224,720	19,312	7.9
Ocean County	267,716	243,182	24,534	9.2
New Hanover Township	2,082	1,984	98	4.7
North Hanover Township	4,030	3,641	389	9.7
Pemberton Township	15,079	13,465	1,614	10.7
Plumsted Township	4,731	4,391	340	7.2
Wrightstown Borough	467	432	35	7.5

Note: Employment numbers include individuals in the Armed Forces.
Source: USCB 2011b.

3.2.10.2 Schools

According to the 2011 ACS enrollment 5-year estimates, 80,547 students were enrolled in schools from Kindergarten through Grade 12 in Burlington County. In Ocean County, 95,936 students were enrolled in schools from Kindergarten through Grade 12 (USCB 2011b).

3.2.10.3 Housing

In 2010, the number of housing units in Burlington County was 175,615, with a vacancy rate of 5.3 percent. In Ocean County in 2010, there were a total of 278,052 housing units with a vacancy rate of approximately 21 percent (USCB 2010b). Currently, approximately 20 percent of active duty personnel live on-base (108 WG 2013c).

3.2.11 Environmental Justice and the Protection of Children

3.2.11.1 Minority and Low-Income Populations

Table 3.2.11-1 displays the minority, low-income, and children under age 18 within the state of New Jersey, as well as the counties, boroughs, and townships within the vicinity of McGuire Field. Approximately 26 percent of the population of Burlington County is composed of minorities (i.e., an ethnic or racial group with a distinctive presence in a community), compared to approximately 31 percent for the state of New Jersey. Ocean County has a lower proportion of minorities (approximately 9 percent) than Burlington County or the state (USCB 2010c).

The percentage of population living below the poverty level for the state of New Jersey (approximately 9 percent) is higher than Burlington County (approximately 5 percent), and similar to Ocean County (approximately 10 percent) (USCB 2010b).

Table 3.2.11-1. Population within the Vicinity of JB MDL[1]

Geographic Area	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*	*Children Under Age 18*	*Percent Children*
New Jersey	8,791,894	2,762,646	31.6	826,438	9.4	2,065,214	23.5
Burlington County	448,734	117,392	26.2	23,783	5.3	104,243	23.2
Ocean County	576,567	51,990	9.0	54,774	9.5	134,919	23.4
New Hanover Township	7,385	3,393	45.9	258	3.5	586	7.9
North Hanover Township	7,678	1,522	19.8	499	6.5	2,266	29.5
Pemberton Township	27,912	9,064	32.5	2,735	9.8	6,869	24.6
Plumsted Township	8,421	489	5.8	1,322	15.7	2,207	26.2
Wrightstown Borough	802	422	52.6	36	4.5	216	26.9

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 American Community Survey 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the Bureau of the Census determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010b, 2011c.

Table 3.2.11-2 displays the total population, total minority population, percentage minority, total low-income population, and low-income percentages for the vicinity of JB MDL with the baseline DNL greater than 65 dB.

Table 3.2.11-2. Population within Baseline Noise Contours, JB MDL[1]

Noise Contour	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*
65-70	54	8	15	3	6
70-75	26	4	15	1	4
75-80	0	0	0	0	0
80-85	0	0	0	0	0
85+	0	0	0	0	0
Total	**80**	**12**	**15**	**4**	**5**

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Sources: USCB 2010c, 2011c.

In the area surrounding JB MDL, approximately 80 people were estimated to be affected by existing DNL between 65 and 75 dB. Out of that total, approximately 30 percent are considered to be minorities and 5 percent to be low-income. The percentage of minority populations currently affected by noise is greater than the approximate 26 percent minority average in Burlington County and greater than the approximate 9 percent minority average in Ocean County. The percentage of low-income populations in the area surrounding JB MDL affected by the DNL greater than 65 dB is approximately the same as the 5 and slightly lower than the 10 percent low-income average in Burlington and Ocean counties (respectively).

3.2.11.2 Protection of Children

In 2010, the number of children under the age of 18 living in Burlington County was approximately 104,243 (approximately 23 percent of the population). In 2010, the number of children under the age of 18 living in Ocean County was approximately 134,919 (approximately 23 percent of the population) (Table 3.2.11-1). The state of New Jersey has a similar percentage population of children compared to the counties (approximately 24 percent). There are no on-installation housing or facilities for children located at the 108 WG installation. Currently, there are no Kindergarten through Grade 12 off-installation schools that are exposed to aircraft DNL of 65 dB or above; however, there is one child development center that is currently located within the 65 dB contour.

3.3 PEASE AIR NATIONAL GUARD STATION

Pease ANGS, home of the 157 ARW of the NH ANG, is located in Portsmouth and Newington, New Hampshire, approximately 55 miles north of Boston, Massachusetts. The 157 ARW base is situated on the northeast side of the Portsmouth IAP at Pease, which is owned and operated by PDA.

3.3.1 Noise

To evaluate noise impacts in the vicinity of a military installation located at a commercial airport with a published FAR Part 150 Airport Noise Compatibility Study, the USAF allows for use of the FAA's INM to generate DNL noise contours. The Airport Authority under the FAA uses INM for generating noise contours and for Portsmouth IAP, the FAA's INM was used. For more detailed information on the noise modeling methods, see Appendix A, Section A.1.2.

3.3.1.1 Baseline Operations

In 1996, the PDA published a FAR Part 150 Airport Noise Compatibility study for Portsmouth IAP. This study is currently being updated but was not available to use for this EIS. The 1996 INM aircraft operational data was updated in 2008 in support of an Environmental Assessment prepared to support construction projects at Pease ANGS (157 ARW 2008a). This data for the KC-135 was updated to reflect the actual KC-135 2012 aircraft operations and is used as the baseline for this analysis.

Based on aircraft operations data validated in March 2013, approximately 37,016 total aircraft operations occurred at Portsmouth IAP during the 12-month period ending October 2012 (Pomeroy 2013). An aircraft operation is counted each time an aircraft departs from the runway and each time they approach the runway. Table 3.3.1-1 summarizes the frequency of aircraft operations for the Portsmouth IAP airfield based on information provided by base staff, flying organizations, and air traffic control personnel. The majority of aircraft traffic includes air cargo, commercial regional jets (air taxi), and larger commercial aircraft and other based military aircraft, along with based ANG KC-135 aircraft. Although the number of aircraft operations at an installation varies from day to day, for Portsmouth IAP, operations are calculated for an AAD, meaning that yearly operations are averaged across all 365 days of the year. Table 3.3.1-1 reflects a total of approximately 102 aircraft operations on an AAD (37,410 divided by 365 days). Approximately 4 percent of the total operations at Portsmouth IAP occur during environmental night (10:00 p.m. through 7:00 a.m.).

Table 3.3.1-1. Current Portsmouth IAP Annual Aircraft Operations

Aircraft	DEPARTURES		ARRIVALS		TOTAL[1]		*Grand Total*[1]
	Day	*Night*[2]	*Day*	Night[2]	*Day*	*Night*[2]	
KC-135	2,939	131	2,939	131	5,878	262	6,140
Other Aircraft[3]	14,541	1,094	14,853	782	29,394	1,876	31,270
Total	**17,480**	**1,225**	**17,792**	**913**	**35,272**	**2,138**	**37,410**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other based military and civilian aircraft and transient aircraft (multiple type aircraft); example aircraft include: Lear 25, 35, Airbus 319.
Source: 157 ARW 2013a.

Based on the 2012 baseline data, the 157 ARW KC-135 aircraft flew a total of 6,140 annual airfield operations, or an average of 17 airfield operations a day. Approximately 4 percent of the total KC-135 operations occur during environmental night. Approximately 16 percent of total operations at Portsmouth IAP are accomplished by the 157 ARW KC-135 aircraft.

3.3.1.2 Runway and Flight Profiles

Portsmouth IAP aircraft use straight out departures, straight in approaches, IFR or radar closed patterns, and VFR closed patterns as the basic flight patterns for training flights and local arrival and departures. Detailed representative arrival, departure, and closed pattern flight tracks are found in Appendix C, *Noise*.

3.3.1.3 Existing Noise Environment

Noise contours developed for baseline conditions at Portsmouth IAP are shown in Figure 3.3.1-1. The acreage within each DNL contour on Portsmouth IAP property is shown in Table 3.3.1-2; no off-airport noise levels greater than 65 dB DNL occur.

Table 3.3.1-2. Acres within Baseline Noise Contours, Portsmouth IAP

Noise Level (dB)	*On-Airport (acres)*	*Off-Airport (acres)*	*Total (acres)*
65-70	237	0	237
70-75	81	0	81
75-80	16	0	16
80-85	1	0	1
Greater than 85	0	0	0
Total	**334**	**0**	**334**

Note: Numbers may not add precisely due to rounding.
dB = decibel

Figure 3.3.1-1. Baseline DNL Noise Contours for Portsmouth IAP

Potential Hearing Loss

As shown in Table 3.3.1-2, there is no property off the Portsmouth IAP that falls within the baseline 80+ dB DNL noise contour; therefore, no potential hearing loss risk is currently associated with these areas.

3.3.1.4 Portsmouth International Airport Noise Abatement Procedures

Portsmouth IAP has published certain restrictions on flying activities that could adversely affect its neighbors in an effort to reduce noise impacts while maintaining safe operations. The restrictions are published on aeronautical charts and apply to both military and civilian aircraft (SkyVector 2013a). The restrictions include guidance for noise abatement procedures for the airfield including, but not limited to, requiring aircraft departing the airport to maintain runway heading to 1,100 feet MSL prior to turning and not allowing aircraft to practice low approaches or touch-and-go landings between the hours of 11:00 p.m. and 7:00 a.m. for local based aircraft and from 9:00 p.m. to 7:00 a.m. for transient aircraft or before 12:00 on Sundays for all aircraft. The noise abatement procedures are considered voluntary for military aircraft and can be waived based on mission requirements (Smith 2013a).

3.3.1.5 Pease Air National Guard Station Noise Complaints Procedures

Currently, all noise complaints are handled through the PDA noise complaint hotline or website. Thirty-one noise complaints were logged between April 10, 2012 and December 12, 2012 (nine of the complaints received were from one specific individual, five complaints from another specific individual, and the rest were from others). Sherman Village, a housing development, lies just outside of the 65 dB DNL noise contour; complaints received from that area are typically associated with helicopter activity (PDA 2012a, 2012b).

3.3.2 Air Quality

3.3.2.1 Regulatory Setting

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. The New Hampshire Department of Environmental Services is the agency responsible for the regulation of air quality within the state of New Hampshire. The state of New Hampshire regulates air quality through the New Hampshire Code of Administrative Rules, ENV-A 100 to ENV-A 4805. The state of New Hampshire has adopted the NAAQS and has not adopted separate state air quality standards. The NAAQS are summarized in Table 3.3.2-1.

Table 3.3.2-1. Ambient Air Quality Standards

Pollutant	*Averaging Time*	NATIONAL STANDARDS [a]	
		Primary [b,c]	*Secondary* [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	—	—
CO	8-hour	9 ppm (10 mg/m^3)	—
	1-hour	35 ppm (40 mg/m^3)	—
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—
SO_2	24-hour	—	—
	3-hour	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—
PM_{10}	Annual	—	Same as primary
	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
	24-hour	35 µg/m^3	Same as primary
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary

Notes: a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.
b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide.
Source: USEPA 2012.

Pease ANGS, home of the 157 ARW of the NH ANG, is located in Portsmouth and Newington, New Hampshire, approximately 55 miles north of Boston, Massachusetts. The USEPA had previously classified the Boston-Manchester-Portsmouth area as a moderate nonattainment area for the 1997 O_3 standard. On January 31, 2013, the USEPA formally redesignated southeastern New Hampshire as an attainment area for the 1997 O_3 standard. The region is therefore considered a maintenance area for O_3. The region is designated attainment/unclassified area for all other criteria pollutants. The Proposed Action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the classification for the region as a maintenance area, the *de minimis* emission thresholds for the General Conformity Rule for ozone precursors (NO_x and VOCs) is 100 tpy.

The USEPA recently promulgated a more stringent standard for lead, and has redesigned its monitoring program to address lead and identified airports for monitoring because aviation gas used in piston aircraft still contains lead. The project area is considered attainment/unclassified for lead, and lead is not used in aviation fuel used in the KC-135 or KC-46A aircraft.

3.3.2.2 Climate and Meteorology

Portsmouth, New Hampshire has a humid continental climate with warm summers and no dry season. The area within 25 miles of this station is covered by forests (62 percent), oceans and seas (34 percent), and lakes and rivers (2 percent). Over the course of a year, the temperature typically varies from 17°F to 81°F and is rarely below 3°F or above 89°F. The warm season lasts from June 4 to September 15 with an average daily high temperature above 71°F. The highest temperatures occur in July, with an average high of 81°F and low of 63°F. The cold season lasts from December 5 to March 13 with an average daily high temperature below 42°F. The coldest temperatures occur in January, with an average low of 17°F and high of 32°F (Northeast Regional Climate Center 2013b).

The wind is most often out of the west (24 percent of the time), north west (14 percent of the time), and south west (11 percent of the time). Over the course of the year, typical wind speeds vary from 0 miles per hour to 16 miles per hour (calm to moderate breeze), rarely exceeding 25 miles per hour (strong breeze). Winds are generally highest during the springtime (Northeast Regional Climate Center 2013b).

3.3.2.3 Regional and Local Air Pollutant Sources

The 157 ARW is based on the northeast side of Portsmouth IAP, approximately 1 mile from Portsmouth, New Hampshire. The surrounding area is developed to the east and south of the airport. To the west of the airport lies the Great Bay National Wildlife Refuge and Great Bay.

The USEPA's National Emissions Inventory includes data for the year 2008 for Rockingham County. Table 3.3.2-2 summarizes the regional emissions (stationary, area-wide, and mobile) of criteria pollutants and precursor emissions for the affected areas.

Table 3.3.2-2. Regional Emissions for Rockingham County, New Hampshire

	EMISSIONS, TONS/YEAR					
	CO	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Regional Emissions						
Stationary Sources	5,780	1,042	2,628	6,982	3,888	3,696
Area-Wide Source	4,368	3,521	159	8	4,055	981
Mobile Sources	50,746	5,226	8,648	587	534	421
Total	**60,894**	**9,789**	**11,435**	**7,577**	**8,477**	**5,098**

Notes: Numbers may not add precisely due to rounding.
Emissions of Pb are not included because the affected region contains no significant sources of this criteria pollutant.
CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: USEPA 2008.

3.3.2.4 Baseline Air Quality

Representative background air monitoring data for the 157 ARW for the period 2008-2012 are shown in Table 3.3.2-3. The closest monitoring stations to Portsmouth IAP include the monitoring station in Portsmouth itself, along with monitoring stations in Nashua and Manchester.

As shown in Table 3.3.2-3, the area has experienced one to two O_3 exceedances annually during the recent 5-year period. The data show that the area did not experience violations of other NAAQS.

Table 3.3.2-3. Ambient Air Monitoring Data for the Portsmouth Area

Air Quality Indicator	*2008*	*2009*	*2010*	*2011*	*2012*
Ozone (O_3)					
Peak 8-hour value (ppm)	0.079	0.076	0.081	0.086	0.083
Days above federal standard (0.075 ppm)	1	1	2	1	1
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)					
Peak 24-hour value ($\mu g/m^3$)	33.2	29	26.3	14	24.3
Days above federal standard (35 $\mu g/m^3$)	0	0	0	0	0
Annual Average value ($\mu g/m^3$)	8.2	7.1	7.4	6.5	7.7
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	61	57	60	59	59
Days above federal standard (150 $\mu g/m^3$)	0	0	0	0	0
Carbon Monoxide (CO)					
Peak 1-hour value (ppm)	9.4	3.3	3.4	2.6	0.6
Days above federal standard (9 ppm)	0	0	0	0	0
Peak 8-hour value (ppm)	4.4	2.3	2.4	2.4	0.6
Days above federal standard (35 ppm)	0	0	0	0	0
Nitrogen Dioxide (NO_2)					
Peak 1-hour value (ppm)	NA	0.051	0.050	0.012	0.011
98th Percentile (ppm)	NA	0.047	0.042	0.010	0.010
Days above federal standard (0.100 ppm)	NA	0	0	0	0
Sulfur Dioxide (SO_2)					
Peak 1-hour value (ppm)	0.085	0.073	0.048	0.070	0.034
99th Percentile (ppm)	0.062	0.042	0.045	0.037	0.021
Days above federal standard (0.075 ppm)[1]	0	0	0	0	0
Peak 24-hour value (ppm)	0.025	0.016	0.015	0.014	0.006

Notes: 1. The federal 1-hour SO_2 standard was adopted in 2010.
$\mu g/m^3$ = micrograms per cubic meter; NA = data not available; ppm = parts per million
Source: USEPA 2013a.

3.3.2.5 157th Air Refueling Wing Emissions

The 157 ARW currently flies and maintains eight KC-135 refueler aircraft and one backup inventory KC-135 to support its air refueling mission. The primary support operations performed at the 157 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance (157 ARW 2005, 2013c).

Emissions for the 157 ARW have been quantified in the *Final 2009 Air Emissions Inventory* (157 ARW 2010). The inventory evaluated the emissions from the 157 ARW to determine its status under the Title V Federal Operating Permits program. Based on the major source thresholds for the area, the major source thresholds are 50 tpy for O_3 precursors NO_x and VOCs, 100 tpy for all other criteria pollutants, and less than 10 tpy of any single HAP or 25 tpy of any combination of HAPs (157 ARW 2010).

The 157 ARW operates under General State Permit GSP-EG-0370 which includes nine emergency generators and one emergency fire pump. The permit contains operational limits such that its potential emissions are restricted below the Title V major source thresholds. The 2009 Air Emissions Inventory demonstrates that the installation operates in compliance with the limits in its permit, and total base-wide potential emissions from stationary sources are below the major source thresholds (157 ARW 2010).

Stationary source emissions at the 157 ARW include emissions from natural gas, diesel, and propane-fired heating units, internal combustion engines, fuel tanks, a gasoline service station, and various minor sources such as solvent use, deicing, and welding. Mobile source emissions include emissions from aircraft operations (take-offs and landings), AGE, ground vehicle operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft operations at the 157 ARW installation considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the default mixing height (3,000 feet AGL). Baseline emissions also include stationary sources, and emissions associated with vehicle trips associated with existing personnel and dependents. These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the installation.

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #3, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related AGE, and POVs associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations identified in Table 2.3-13, utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet AGL. A discussion of the methodology for quantifying emissions is provided in Appendix A, Section A.2.3. Emissions for the baseline emissions associated with baseline operations of the KC-135 aircraft are provided in Table 3.3.2-4.

Table 3.3.2-4. 157 ARW Baseline Emissions at Pease ANGS

	EMISSIONS, TONS/YEAR						
Emission Source	*VOCs*	*CO*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*CO_2e*
KC-135 Baseline Aircraft Operations	2.41	36.29	73.94	6.29	0.33	0.33	17,480
AGE	0.00	0.01	0.07	0.00	0.00	0.00	1,588
Engine Testing	0.10	1.47	0.40	0.06	0.01	0.01	174
POVs	1.11	19.06	0.91	0.01	0.04	0.02	597
Total Baseline Emissions	**3.62**	**56.84**	**75.32**	**6.36**	**0.37**	**0.35**	**19,839**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: 157 ARW 2010.

3.3.3 Safety

This section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, APZs/RPZs, explosive safety, and AT/FP. Flight safety includes discussions on flight safety procedures, aircraft mishaps, BASH, and fuel jettison requirements. The affected environment includes the airfield and local airspace surrounding Portsmouth IAP.

3.3.3.1 Ground Safety

Fire/Crash Response

Day-to-day operations and maintenance activities conducted by the 157 ARW are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders, and standards prescribed by AFOSH requirements. ARFF services at Pease ANGS are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services. ARFF equipment and personnel at Pease ANGS meet USAF requirements (Headquarters AMC and NGB 2013a).

Accident Potential Zone/Runway Protection Zone

Development restrictions associated with RPZs are intended to preclude incompatible land use activities from being established in these areas. The city of Portsmouth, New Hampshire utilizes the FAA's airport land use compatibility guidelines, and as such, the RPZs have allowed development to be compatible with airport operations. Details of development and land use in the Portsmouth IAP vicinity are included in Section 3.3.7, *Land Use*.

Explosive Safety

The 157 ARW uses a small range of munitions required for performance of their mission. The existing munitions storage capabilities on Pease ANGS meet the requirement for small arms deployment/training ammunition and other munitions required by the 157 ARW. The munitions storage complex consists of five earth-covered igloos of 208 SF each (total storage area of 1,040 SF), with a 192 SF receipt/inspection facility. Additional storage was established in the Squadron Operations building, which provides additional square footage for aircrew flight equipment assets. Additionally, a 2013 Memorandum of Agreement with Westover Air Reserve Base is in place augmenting munitions storage capacity.

Anti-Terrorism/Force Protection

Many of the 157 ARW military facilities at Pease ANGS were constructed before AT/FP considerations became a critical concern. Thus, under current conditions, many facilities do not comply with all current AT/FP standards. However, as new construction occurs and as facilities are modified, the 157 ARW would incorporate these standards to the maximum extent practicable.

3.3.3.2 Flight Safety

Flight Safety Procedures

Aircraft flight operations from Pease ANGS are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2KC-135V3, *Flying Operations, C/KC-135 Operations Procedures*, 2010) to ensure flight safety. While having aircraft in close proximity during air refueling is inherently dangerous, refueling mishaps are rare. Emergency separation procedures are established and practiced by both tanker and receiver aircrews.

Aircraft Mishaps

KC-135 aircraft (all models) have flown more than 14,750,000 hours since the aircraft entered the USAF inventory in 1957. Over that period, 83 Class A mishaps have occurred and 64 aircraft have been destroyed (specific statistics for mishaps during refueling are not recorded). This results in a Class A mishap rate of 0.56 per 100,000 flight-hours, and an aircraft destroyed rate of 0.43 per 100,000 flight-hours (AFSEC 2012). The 157 ARW has not experienced a Class A mishap in the past 10 years (Pease ANGS 2013).

Bird/Wildlife Aircraft Strike Hazard

The USAF BASH Team maintains a database that documents all reported bird/wildlife aircraft strikes. Historic information across the USAF for the past 40 years indicates that 39 USAF KC-135 aircraft have been destroyed and 33 fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2010 (AFSEC 2013).

The 157 ARW of the NH ANG has an effective, on-going BASH program through which information and assistance is freely shared between airfield users, the Portsmouth IAP staff, and the local air traffic controllers. The airport also has an aggressive program with the USDA, including continual monitoring within the fenceline to minimize BASH potential. The airport has an excellent track record of managing BASH issues and has successfully included the management at the off-airport landfill property. Serious BASH-related accidents within the

immediate Portsmouth IAP area are rare and have never resulted in a Class A mishap (Pease ANGS 2013). The 157 ARW has recorded 98 minor BASH incidents from 2008 to 2013, with an average of fewer than 20 per year (Pease ANGS 2013).

Fuel Jettison

For use in emergency situations, the KC-135 aircraft have the capability to jettison fuel and reduce aircraft gross weight for flight safety. In accordance with AFIs, Pease ANGS has established local procedures for gross weight adjustments; fuel jettison areas are over the Atlantic Ocean and above 20,000 feet AGL. 157 ARW aircraft jettisoned fuel once in 2012 and twice in 2011 (Pease ANGS 2013).

3.3.4 Soils and Water

3.3.4.1 Soils

The Portsmouth area of New Hampshire is within the Appalachian Highlands and consists almost entirely of glaciated till plains and rolling hills dissected by narrow valleys with a thin mantle of till. The river valleys and coastal plains are filled with glacial lake sediments, marine sediments, and glacial outwash (USDA 2006). The 157 ARW installation is located on improved land and is generally flat with plateau-like declining coastal terrain. Relief ranges from approximately 0 to 115 feet MSL with slopes generally under 5 percent (157 ARW 2008a).

The NRCS Soil Survey for Rockingham County, New Hampshire identifies the following five individual soil types at the installation:

Pennichuck channery very fine sandy loam, 3 to 8 percent slopes: This is a gently sloping soil typically found on low hills and terraces from till or glacial drift composed of an unconsolidated mixture of sediments. The rating class for building site development is considered somewhat limited due to slope, depth to hard bedrock, and depth to saturated zone. This soil type is designated as Prime Farmland (NRCS 2012). Approximately 11 percent of the installation is composed of this soil type.

Udorthents, smoothed: This soil is found in areas that have been excavated and regraded or that have been filled with soil material and graded. This soil type is typically used for urban development or landfills. The suitability of the soils as a site for development varies (NRCS 2012). The rating class for building site development is not rated for this soil type. Approximately 15 percent of the installation is composed of this soil type.

Urban land: This soil primarily consists of cut/fill sites used for buildings, paved roads, parking lots, and other areas of urban development. The rating class for building site development is not

rated for this soil type and requires onsite investigation and evaluation for most land use decisions to identify any potential limitations (NRCS 2012). Approximately 42 percent of the installation is composed of this soil type.

Urban land-Canton complex, 3 to 15 percent slopes: This soil is typically found on broad plains and low hills that are partially covered by streets, parking lots, and buildings. The soil consists of strongly intermingled Urban land and sloping Canton soil (NRCS 2012). The rating class for building site development is not rated for this soil type. Approximately 30 percent of the installation is composed of this soil type.

Windsor loamy sand, 3 to 8 percent slopes: This gently sloping soil is typically found on low hills, broad plains, and adjacent to major streams. The rating class for building site development is considered somewhat limited due to slope and depth to saturated zone. In addition, this soil type is designated as Farmland of Local Importance (NRCS 2012). Approximately 2 percent of the installation is composed of this soil type.

3.3.4.2 Surface Water

The 157 ARW installation is located within the Piscataqua-Salmon Falls Watershed that encompasses over 2,590 square miles across the states of Maine, New Hampshire, and Massachusetts (USEPA 2013d). The Piscataqua River Watershed, a sub-basin of Piscataqua-Salmon Falls Watershed, is the local watershed surrounding Portsmouth IAP. The Piscataqua River Watershed begins at the confluence of Salmon Falls and Cocheco Rivers and ultimately drains to Portsmouth Harbor (Seacoast Watershed Information Manager 2013).

Surface water features within the vicinity of the 157 ARW installation include the Atlantic Ocean and Portsmouth Harbor to the east, the Great Bay National Estuary to the southwest, Little Bay to the northwest, and several rivers and creeks including: Flagstone Brook to the north, the confluence of Oyster and Piscataqua rivers to the northeast, Paul's Brook to the northeast, Grafton Ditch to the south, Hodgson Brook to the east, and McIntyre Brook to the west (Figure 3.3.4-1).

The Great Bay National Estuary, adjacent to the Portsmouth IAP along its southwestern border, is a unique water feature as it is both a saltwater and a freshwater system, set apart from the coastline. Great Bay lies at the confluence of tidally driven salt water from the Gulf of Maine and fresh water from the Salmon Falls, Cocheco, Bellamy, Oyster, Lamprey, Squamscott, and Winnicut rivers. The USEPA has afforded special protection to it as one of only 28 Estuaries of National Significance (New Hampshire Department of Environmental Services 2013).

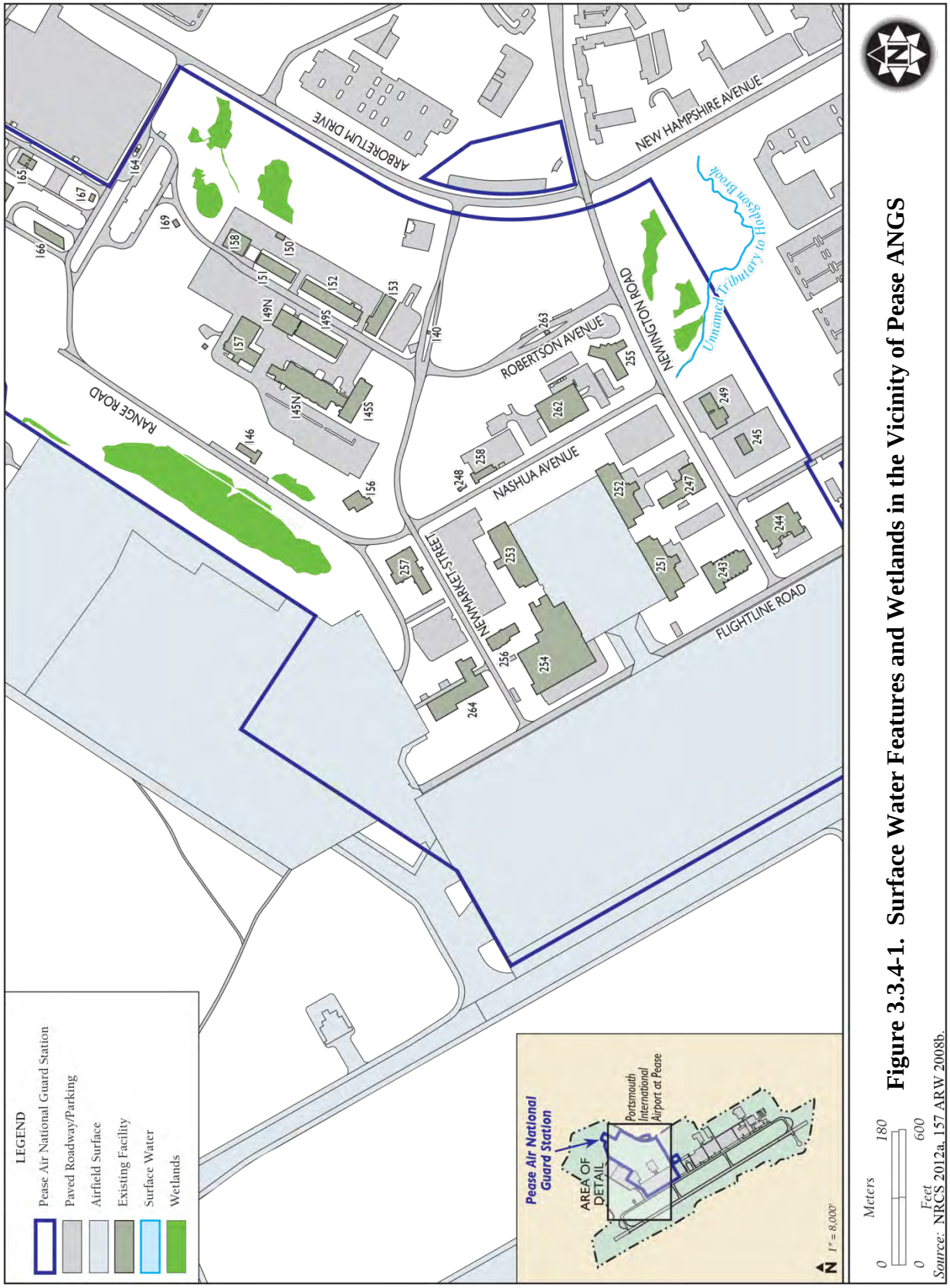


Figure 3.3.4-1. Surface Water Features and Wetlands in the Vicinity of Pease ANGS

Source: NRCS 2012a, 157 ARW 2008b.

Surface water within the installation primarily consists of a series of man-made ditches, storm sewers, and drainage swales. Drainage of the developed area is typified by overland flow to storm drain inlets and basins connected by a network of underground pipes. There are four primary drainage basins on the installation: Outfall-001, -002, -003, and -004. Outfall-001 drains to Hodgson Brook and ultimately joins the Piscataqua River. Outfall-002 drains to Flagstone Brook and eventually discharges to Little Bay. Outfall-003 drains to McIntyre Brook ultimately discharging to Great Bay. Outfall-004 drains to Grafton Ditch and eventually discharges to the Piscataqua River. The outfalls associated with industrial activity are regulated under an individual National Pollutant Discharge Elimination System (NPDES) permit for Stormwater Runoff Associated with Industrial Activity (Permit No. NH0090000). The permit is administered by the USEPA New England Region (Portsmouth IAP 2011).

3.3.4.3 Groundwater

Groundwater in this area is primarily composed of crystalline-rock aquifers of the New England Physiographic Province (USGS 1995b). The regional groundwater system within the Great Bay area consists of a till- or marine-sediment-covered crystalline bedrock aquifer. Coarse-grained sand and gravel aquifers are generally small and discontinuous with the exception of a large ice-contact deposit beneath the former Pease AFB, in Newington. Crystalline bedrock consists of three main units: the Kittery Formation, a metasandstone on the western side of the bay; the Eliot Formation, a phyllite along the eastern and southern sides of the bay; and the Exeter Diorite, inland west of the bay (USGS 2001).

Groundwater at the 157 ARW occurs in unconsolidated material, fractured bedrock, and competent bedrock. The principal water-bearing overburden units are the Upper Sand and Lower Sand. Tidal fluctuations can be measured in both water table and bedrock wells within the installation. Groundwater elevations also vary seasonally, with groundwater highs from December to May and lows from July to September. Based on the installation groundwater contour map, the subject property is on a localized high point with radial flow outward (157 ARW 2008a).

The primary water source for the Pease International Tradeport are three wells operated by Portsmouth waterworks; Haven, Smith, and Harrison wells (City of Portsmouth 2010). There are currently three active Groundwater Management Zones located on the installation, as mandated by the New Hampshire Department of Environmental Services. A Groundwater Management Zone is a three-dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. The source of contaminants in the three Groundwater Management Zones on the installation include the flightline, Building 249 (a storage facility), and the Bulk Fuels Storage area (157 ARW 2008a).

3.3.4.4 Floodplains

Per the FEMA Flood Insurance Rate Map for Rockingham County, New Hampshire, Panel 255 (Map Number 33015C0255E, Effective May 17, 2005), the 157 ARW installation is located within an area designated as Zone X. The designation Zone X are areas determined to be outside the 0.2 percent annual chance flood (500 year flood), indicating areas of minimal flooding (FEMA 2005).

3.3.5 Biological Resources

3.3.5.1 Vegetation

Portsmouth IAP occurs within the Eastern Broadleaf Forest (Oceanic) Province. Vegetation in this region typically is characterized by a winter deciduous forest dominated by tall broadleaf trees (Bailey 1995). The majority of the 157 ARW installation is developed or actively landscaped, with approximately 37 percent containing natural vegetation. Natural vegetation consists of primarily fragmented areas comprised of Appalachian oak-pine forests in the northern and southeastern portion of the installation. Dominant evergreen species include white pine (*Pinus strobus*) and hemlock (*Tsuga canadensis*). Dominant deciduous species include maples (*Acer* spp.), oaks (*Quercus* spp.), birch (*Betula* spp.), beech (*Fagus grandifolia*), and hickories (*Carya* spp.) (NGB 2011; 157 ARW 2008a, 2013b).

3.3.5.2 Wildlife

Due to the fragmented pockets of native vegetation, high noise levels, and human activities at and surrounding the airport, wildlife habitat is limited. As a result, the majority of wildlife present at the airport and the 157 ARW installation consists of species that are highly adapted to developed and disturbed areas. Pease ANGS is located within the Atlantic Flyway, one of four major North American corridors for migratory birds. The majority of the bird species found at Portsmouth IAP or within its vicinity are protected under the MBTA. Common bird species occurring or potentially occurring in or near the airport include Rock Doves (*Columba livia*), European Starlings (*Sturnus vulgaris*), Mourning Doves (*Zenaida macroura*), American Crows (*Corvus brachyrhynchos*), American Kestrels (*Falco sparverius*), Red-winged Blackbirds (*Agelaius phoeniceus*), Short-eared Owls (*Asio flammeus*), and Red-tailed Hawks (*Buteo jamaicensis*). Common mammals include white-tailed deer (*Odocoileus virginianus*), red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), eastern chipmunk (*Tamias striatus*), gray squirrel (*Sciurus carolinensis*), and raccoon (*Procyon lotor*). Common reptiles and amphibians include the American bullfrog (*Lithobates catesbianus*), American toad (*Anaxyrus americanus*), eastern red-backed salamander (*Plethodon cinereus*), black racer (*Coluber constrictor*), snapping turtle (*Chelydra serpentina*), and spotted turtle (*Clemmys guttata*) (157 ARW 2008a, 2013b).

3.3.5.3 Special Status Species

No federally listed or candidate species are known to occur within the airport vicinity or on the 157 ARW installation. However, eight state listed species have been observed within the airport vicinity, and additional special status species have been observed within Rockingham County within the vicinity of Portsmouth IAP. A list of these species can be found in Appendix E. There is no critical habitat located on the installation (157 ARW 2013, New Hampshire Fish and Game 2013, New Hampshire Natural Heritage Bureau 2013).

3.3.5.4 Wetlands

Nine jurisdictional wetlands, totaling 6.86 acres, occur on the 157 ARW installation in the southeast and northern portion of the installation (Figure 3.3.4-1). Seven of these wetlands are palustrine forested and two are considered palustrine emergent wetlands (NGB 2011, 157 ARW 2013b). None of these wetlands occur within the vicinity of the proposed construction projects.

3.3.6 Cultural Resources

3.3.6.1 Archaeological Resources

All portions of the 157 ARW installation determined to be relatively undisturbed were intensively surveyed for cultural resources. One archaeological resource consisting of two Native American artifacts was encountered in a shovel test pit within a layer of fill material from adjacent construction activities. Due to the isolated and sparse nature of the find and its location in fill, the resource is considered not eligible for listing in the NRHP (157 ARW 2009). The New Hampshire SHPO has concurred with these findings (see Muzzey 2009 in Appendix B4).

3.3.6.2 Architectural Resources

All 46 buildings and structures pre-dating the end of the Cold War era (pre-1990) were inventoried and evaluated for NRHP-eligibility (157 ARW 2009). None of the buildings, structures, or monuments were recommended as eligible for listing in the NRHP (157 ARW 2009; St. Louis 2009). The New Hampshire SHPO has concurred with these recommendations (see Muzzey 2009 and St. Louis 2009 in Appendix B4).

3.3.6.3 Traditional Resources

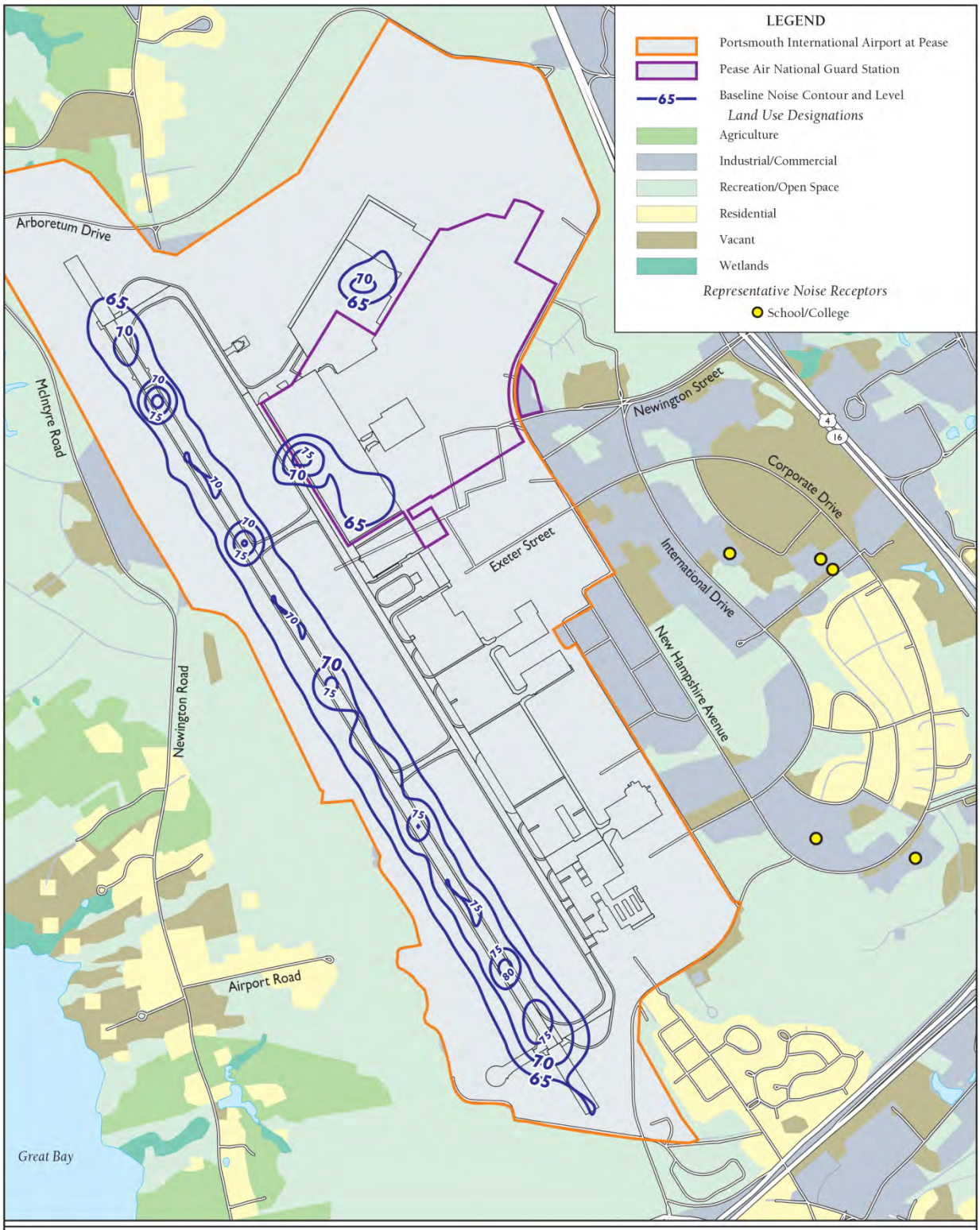
The 157 ARW installation contains no known traditional resources; however, one federally-recognized Tribe that is historically, culturally, and linguistically affiliated with the area has been identified: The Penobscot Indian Nation.

3.3.7 Land Use

The Pease ANGS occupies approximately 220 fee owned acres in the northeastern portion of Portsmouth IAP, situated in both Newington and Portsmouth in Rockingham County, New Hampshire. Portsmouth IAP is a holding of the Pease International Tradeport; the Tradeport is owned and operated by the PDA, a state agency of New Hampshire. The present day Pease International Tradeport was established in the 1950s by the USAF as Pease AFB and owned by the USAF Strategic Air Command. When the Base Realignment and Closure Committee closed Pease AFB in October 1991, the 157 ARW became the sole occupant. The USAF maintained ownership of and management responsibility for the property of the remaining 1,073 acres until 1997. Between 1992 and 1997, the USAF transferred 1,054 acres to the USFWS and 19 acres to the U.S. Department of Transportation (157 ARW 2008a).

Land use surrounding Portsmouth IAP is predominantly open space characterized by forested areas interspersed with commercial, residential, industrial parcels. Small parcels of agricultural use are located to the southwest. Wetland areas lie to the northwest and southeast. The Great Bay National Wildlife Refuge, established in 1992 and managed by the USFWS, occupies a large tract of land just to the northwest of the airport and presents a barrier to future development (Rockingham Planning Commission 2006). The Great Bay Estuary, New Hampshire's largest estuarine system, lies approximately 1 mile to the west and north of the airport boundary. This estuarine complex is fed by the tidal waters of the Piscataqua River, flowing approximately 1.5 miles east of the airport. The Spaulding Turnpike (SR 4) runs roughly parallel to the airport's eastern boundary and I-95 traverses just beyond the southeastern boundary of the airport

Zoning surrounding the airport generally supports compatible land use planning and provides protection of Portsmouth IAP (City of Portsmouth 2012a). Zoning codes define and establish airport hazard zones height limitations and land use restrictions within these zones. This zoning protects RPZs, details of which can be found in the Safety section of Appendix A, Section A.3. In Portsmouth, land surrounding the airport to the south and west is zoned primarily as Natural Resource Protection (Open Space/Conservation) with an isolated development zoned for Residential use, located between I-95 and the south end of the airport. A golf course is also located just south of the airport. Adjacent areas to the east of the airport are zoned for Business (Commercial), Residential, and Municipal (Public) (City of Portsmouth 2012a). In Newington, areas to the north are generally zoned for Residential and Commercial uses (Town of Newington 2009). Current average noise levels from aircraft operations above 65 dB DNL do not extend off-base (Figure 3.3.7-1).



Meters 0 480
Feet 0 1,800

Figure 3.3.7-1. DNL Noise Contours and Land Use at Portsmouth IAP

Source: Plumsted Township Zoning 2013, Pease International Tradeport 2013.

3.3.8 Infrastructure and Transportation

3.3.8.1 Potable Water System

Potable water for the 157 ARW installation is supplied by the Madbury Treatment Plant operated by the City of Portsmouth Water Department. Potable water in the area is supplied primarily from the three regional groundwater aquifer wells located on Pease International Tradeport. The City of Portsmouth pumps approximately 1.64 trillion gallons of water per year to its customers (City of Portsmouth 2012b). In CY 2012, 26,510,960 gallons of potable water was supplied to the 157 ARW installation (157 ARW 2012a).

3.3.8.2 Wastewater

The 157 ARW installation generates wastewater from sanitary, stormwater, and industrial processes, including oil/water separator discharge, wash rack discharge, floor wash-down, latrines, sinks, and showers. Wastewater generated within the 157 ARW installation is conveyed into the municipal sewage system, operated by the City of Portsmouth to the Pease International Tradeport Wastewater Treatment Facility. The facility has an average daily flow capacity of 1.2 million gallons per day but typically receives 0.75 million gallons of wastewater per day for treatment (City of Portsmouth 2006).

3.3.8.3 Stormwater

A high percentage of the active administrative and industrial areas of the installation are paved or roofed, resulting in high runoff rates during precipitation events. As described in the Pease International Tradeport SWPPP (2011), the 157 ARW installation has a stormwater drainage conveyance system typified by overland flow to catch basins, inlets, surface drains, underground pipes, culverts, ditches, and swales that discharge to receiving waters (see Section 3.3.4, *Soils and Water*) or other municipal separate storm sewer systems. The stormwater drainage system has been designed to safely collect and transport surface water runoff from storm events to prevent flooding within the installation and is a separate system from the wastewater (sewage) system.

3.3.8.4 Electrical and Natural Gas Systems

Electricity is supplied to the 157 ARW installation by Public Service of New Hampshire via a substation located on the north side of Building 153 and is distributed via underground lines. Natural gas is supplied by Unitil Corporation. Electricity consumption for CY 2012 at the 157 ARW installation was 4,271,136 kilowatt hours. Natural gas consumption for CY 2012 at the 157 ARW installation was 124,582 thousand cubic feet (157 ARW 2012a).

3.3.8.5 Solid Waste Management

Municipal solid waste at the 157 ARW installation is managed in accordance with the 157 ARW Solid Waste Management Plan (157 ARW 2012a) and guidelines specified in AFI 32-7042, *Waste Management* (2009). This AFI incorporates, by reference, the federal standard for solid waste regulations contained within 40 CFR, Subtitle D, *Non-hazardous Waste*, and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for recycling, diversion, handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

The 157 ARW installation generates solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These nonhazardous solid wastes are collected in dumpsters located throughout the 157 ARW installation, recyclables are separated, and waste is transported by contract to Turnkey Landfill in Rochester, New Hampshire or other local landfill (157 ARW 2012a). Up to 83 percent of mixed containers (both debris and recyclables) is recycled, and 100 percent of metal and cardboard are recycled (Smith 2013b).

3.3.8.6 Transportation

The 157 ARW installation is located within close proximity to several major highways. U.S. Route 4 is located to the north and east of the installation and runs west to Concord, New Hampshire. U.S. Route 4 intersects with New Hampshire Route 16 northeast of the installation. New Hampshire Route 16 intersects with I-95 southeast of the airport and runs the entire length of the eastern seaboard. In addition, SRs 101 and 108 are located near the installation to the south and west. Access to the installation is located at the intersection of Pease Boulevard and Arboretum Drive (157 ARW 2008a).

3.3.9 Hazardous Materials and Waste

3.3.9.1 Hazardous Materials

Hazardous materials are used at the 157 ARW installation for aircraft operations support and maintenance, including POL management and distribution, liquid fuels maintenance, transportation maintenance, vehicle paint, power production, machine shop operations, and flight simulation. Types of hazardous substances found on the 157 ARW installation include hydraulic fluid, waste oils, recovered fuels, spent cleaners, strippers, solvents, flammable and combustible liquids, acids, aerosols, batteries, corrosives, and paints (157 ARW 2013c).

The are 16 ASTs that are currently on the installation that are used to store heating oil, diesel, jet fuel, motor gasoline, and high expansion foam. The majority of USTs currently at the installation are used as overflow storage tanks in conjunction with various OWSs. There is one registered 4,000-gallon UST adjacent to Building 168 in the Bulk Fuels Storage Area (157 ARW 2005).

Toxic Substances

Regulated toxic substances typically associated with buildings and facilities include asbestos, LBP, and PCBs. An asbestos survey was performed at the 157 ARW installation in 2011. ACM identified in the insulation, floor tiles, and mastic were found in Buildings/Hangars 149, 151, 152, 153, 241, 247, 251, 252, 254, and 262 (157 ARW 2005, 2011a).

A LBP survey has not been conducted at the 157 ARW installation. Any buildings on the installation constructed prior to 1978 are presumed to contain LBP and would be tested for LBP prior to demolition or renovation (157 ARW 2005).

PCB-containing transformers were removed from the subject property in 1993. With the exception of occasionally encountering a PCB ballast, there are no known sources of PCBs at the subject property (157 ARW 2005).

3.3.9.2 Hazardous Waste Management

The 157 ARW Spill Prevention, Control, and Countermeasure Plan contains the governing regulations for spill prevention and describes specific protocols for preventing and responding to releases, accidents, and spills involving oils and hazardous materials (157 ARW 2012b). The 157 ARW Hazardous Waste Management plan outlines procedures for controlling and managing hazardous wastes from the point where they are generated until they are disposed. In addition, it includes guidance for compliance with all federal, state, and local regulations pertaining to hazardous waste (157 ARW 2012a).

The 157 ARW is regulated as a Small Quantity Generator of hazardous waste by the USEPA and maintains USEPA Identification Number NH8572824847. The 157 ARW is regulated as a Full Quantity Generator of hazardous waste per New Hampshire regulations. Full Quantity Generators are defined as those entities generating greater than or equal to 100 kilograms of hazardous waste a month. Although facilities that generate this amount (but no more than 2,200 pounds) of hazardous waste are considered a small quantity generator by the USEPA, the 157 ARW follows the more stringent Full Quantity Generator requirements of New Hampshire. A hazardous waste generation point is where the waste is initially created or generated. A SAP is an area where hazardous waste is initially accumulated at the point of generation and is under the

control of the SAP manager. Hazardous wastes initially accumulated at a SAP are accumulated in appropriate containers before being transferred to the installation CAP. There are 29 SAPs (where a waste is initially accumulated) identified at the installation in Buildings/Hangars 145, 146, 149, 157, 243, 244, 245, 168, 249, 251, 253, 254, and 256. The installation CAP consists of two outdoor hazmat storage sheds and a small portion of Hangar 253 (157 ARW 2013c).

OWSs are used to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and stormwater drainage systems. Fourteen OWSs are located on the 157 ARW installation. These OWSs primarily receive discharge from floor drains in maintenance areas. One 3,000-gallon concrete OWS for Building 249 failed in the 1980s and contaminated the soil and groundwater. It was replaced in 1992 with a new 1,000-gallon concrete OWS. This resulted in the institution of a ground water management zone to monitor the petroleum contaminants (see Section 3.3.4, *Soils and Water*) (157 ARW 2005).

3.3.9.3 Environmental Restoration Program

There are two closed ERP sites at the 157 ARW installation. Table 3.3.9-1 provides details for each of these sites and Figure 3.3.9-1 shows the locations.

Table 3.3.9-1. ERP Sites within the 157 ARW Installation

ERP Site	*Materials of Concern*	*Status*
31	Waste Solvent Tank located at Building 244, former aircraft maintenance and repair building. Degreasing operations generated waste solvents, primarily trichloroethene. Trichloroethene was held in a 1,200-gallon UST adjacent to Building 244. Soil and groundwater sampling confirmed that the UST had leaked.	Closed
44	This site was a Paint Can Disposal Area and was a common location for burial waste flocculent generated at the industrial waste treatment plant. Soil and groundwater sampling conducted showed that contaminant concentrations did not exceed action levels.	Closed

Note: UST = underground storage tank
Source: 157 ARW 2005.

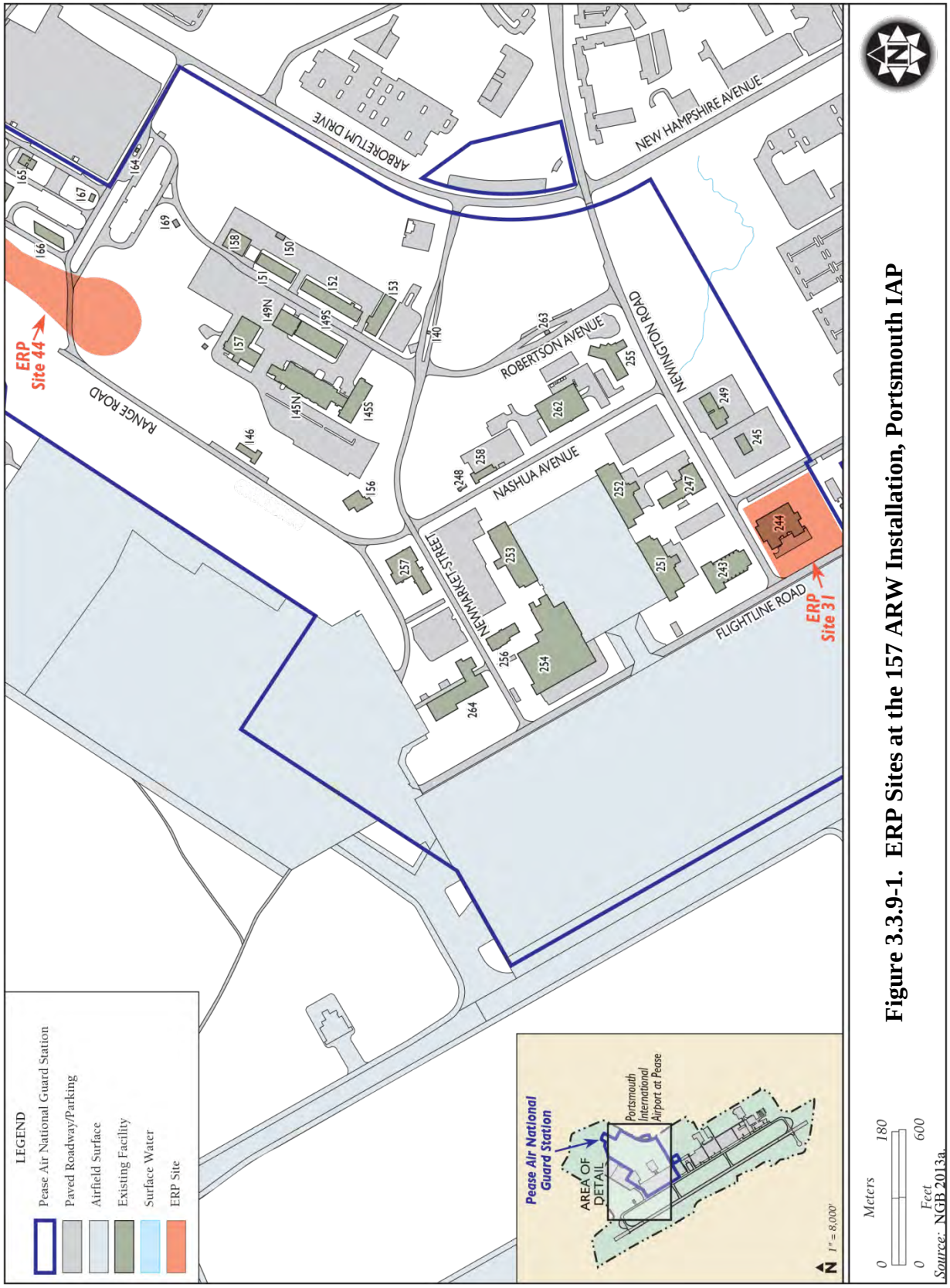


Figure 3.3.9-1. ERP Sites at the 157 ARW Installation, Portsmouth IAP

3.3.10 Socioeconomics

3.3.10.1 Population and Employment

Population

Pease ANGS is located in Portsmouth and Newington, New Hampshire, in Rockingham County. Current population data and estimates for the state of New Hampshire, Rockingham County, Town of Newington, and Portsmouth are provided in Table 3.3.10-1. From 1990 to 2010, Rockingham County's population increased by 49,378, an increase of approximately 20 percent (USCB 1990c, 2000c, 2010d).

Table 3.3.10-1. Population Growth within the Vicinity of Pease ANGS

Area	*1990 Census*	*2000 Census*	*2010 Census*
New Hampshire	1,109,252	1,235,786	1,316,470
Rockingham County	245,845	277,359	295,223
Town of Newington	990	775	753
Portsmouth	25,925	20,784	20,779

Source: Town of Newington 2009; USCB 1990c, 2000c, 2010d.

The 157 ARW currently supports a workforce authorization of 1,382, including 539 full-time and 843 part-time personnel (see Table 2.3-18).

Employment and Earnings

Table 3.3.10-2 presents total labor force and employment rates for New Hampshire, Rockingham County, Town of Newington, and Portsmouth. Based on 2007-2011 ACS 5-year estimates, there were 171,749 persons in the labor force (able to work) and 161,577 employed within Rockingham County, resulting in an unemployment rate of approximately 6 percent. Top employment industries in Rockingham County include 1) educational services, and health care and social assistance; 2) retail; and 3) manufacturing (USCB 2011d). Principal employers in the region include Portsmouth Naval Shipyard, UA Local 788 Marine Pipefitter, Portsmouth Regional Hospital, and Liberty Mutual Insurance (InfoGroup 2013, 157 ARW 2008a).

Table 3.3.10-2. Employment Data (2011) within the Vicinity of Pease ANGS

Area	*Labor Force*	*Employed*	*Unemployed*	*Unemployment Rate (%)*
New Hampshire	743,342	696,674	46,668	6.3
Rockingham County	171,749	161,577	10,172	5.9
Town of Newington	416	414	2	0.5
Portsmouth	13,222	12,625	597	4.5

Note: Employment numbers include individuals in the Armed Forces.
Source: USCB 2011d.

3.3.10.2 Schools

According to the 2011 ACS enrollment 5-year estimates, 53,702 students were enrolled in schools from Kindergarten through Grade 12 in Rockingham County (USCB 2011d).

3.3.10.3 Housing

In 2010, the number of housing units in Rockingham County was 126,709, with a vacancy rate of approximately 9 percent (USCB 2010d).

3.3.11 Environmental Justice and the Protection of Children

3.3.11.1 Minority and Low-Income Populations

Table 3.3.11-1 displays the minority, low-income, and children under age 18 within the state of New Hampshire, as well as the county and towns within the vicinity of Portsmouth IAP. Approximately 4 percent of the population of Rockingham County is composed of minorities (i.e., an ethnic or racial group with a distinctive presence in a community), compared to approximately 6 percent for the state of New Hampshire. The percentage of population living below the poverty level for the state of New Hampshire (approximately 8 percent) is higher than Rockingham County (approximately 5 percent) (USCB 2010d).

Table 3.3.11-1. Population within the Vicinity of Pease ANGS[1]

Geographic Area	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*	*Children Under Age 18*	*Percent Children*
New Hampshire	1,316,470	80,420	6.1	105,318	8.0	287,234	21.8
Rockingham County	295,223	13,257	4.4	14,466	4.9	67,438	22.8
Town of Newington	753	28	3.7	28	3.7	130	17.3
Portsmouth	20,779	1,762	8.5	1,870	9.0	3,459	16.6

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010d, 2011d.

The 65 dB DNL contour does not extend off the airport property; therefore, currently there are no populations, including minority or low-income populations, in the vicinity of Portsmouth IAP within the baseline DNL greater than 65 dB.

3.3.11.2 Protection of Children

In 2010, the number of children under the age of 18 living in Rockingham County was approximately 67,438 (22.8 percent of the population) (Table 3.3.11-1). The state of New Hampshire has a slightly lower percentage population of children compared to the counties (21.8 percent). There are no on-installation housing or facilities for children located at the 157 ARW installation. Currently there are no Kindergarten through Grade 12 off-installation schools that are exposed to DNL of 65 dB or above.

3.4 PITTSBURGH AIR NATIONAL GUARD STATION

Pittsburgh ANGS, home of 171 ARW of the PA ANG, is located approximately 12 miles northwest of Pittsburgh, Pennsylvania in Allegheny County. The 171 ARW installation is situated on the southeastern side of the Pittsburgh IAP, an international airport owned and operated by the ACAA.

3.4.1 Noise

To evaluate noise impacts in the vicinity of a military installation located within a commercial airport with a published FAR Part 150 Airport Noise Compatibility Study, the USAF allows for use of the FAA's INM to generate DNL noise contours. The ACAA under the FAA uses the INM computer model for generating noise contours and for Pittsburgh IAP, the FAA's INM was used. For more detailed information on the noise modeling methods see Appendix A, Section A.1.2.

3.4.1.1 Baseline Operations

This section describes the baseline conditions as approved by the ACAA. In 2006, the ACAA completed Noise Exposure Maps Update as part of the FAA's FAR Part 150 Noise Compatibility Program for Pittsburgh IAP based on operational data from a 12-month period ending February 2005. The study used the standard FAA INM program to establish noise contours based on those operations and is the FAA approved and public document for the noise compatibility program currently in effect for the airport.

Based on aircraft operations data validated in March 2013 (FAA 2013, 171 ARW 2013a), approximately 139,217 total aircraft operations occurred at Pittsburgh IAP during 2012; of those, the 171 ARW flew a total of 6,943 airfield operations with approximately 7 percent at night (approximately 5 percent of total operations at the airfield). These numbers were validated by the 171 ARW and Pittsburgh ATADs (FAA tower) report and are used as the basis for determination of KC-46A airfield operations for the Proposed Action (FAA 2013, 171 ARW 2013a).

The current FAR Part 150 data identified 321,436 total aircraft operations that occurred at Pittsburgh IAP during the 12-month period ending March 2006. Per the request of the ACAA, the current approved and published FAR Part 150 Noise Compatibility Program Update for Pittsburgh IAP is used as the baseline for this analysis (Belotti 2013). The baseline aircraft operations at the airport used for this analysis differs from the current 2012 aircraft operations

due to changes to airfield use by U.S. Air which no longer uses Pittsburgh IAP as a major commercial airline hub.

Table 3.4.1-1 summarizes the frequency of aircraft operations for Pittsburgh IAP based on information provided by base staff, flying organizations, and air traffic control personnel. An aircraft operation is counted each time an aircraft departs from the runway and each time they approach the runway. The majority of aircraft traffic includes air cargo, commercial regional jets (air taxi), and larger commercial aircraft and other based military aircraft, along with based ANG KC-135 aircraft. There are also a number of general aviation jet and non-jet and corporate aircraft based at the airfield. Although the number of aircraft operations at an airfield varies from day to day, for Pittsburgh IAP, operations are calculated for an AAD, meaning that yearly operations are averaged across all 365 days of the year. Table 3.4.1-1 reflects a total of approximately 881 aircraft operations on an AAD (321,436 divided by 365 days). Approximately 9 percent of the total operations at Pittsburgh IAP occur during environmental night (10:00 p.m. through 7:00 a.m.).

Table 3.4.1-1. Current Pittsburgh IAP Annual Aircraft Operations FAR Part 150[1]

	Departures		Arrivals		Total[2]		Grand
Aircraft	*Day*	*Night[3]*	*Day*	Night[3]	*Day*	*Night[3]*	*Total[2]*
KC-135	6,530	0	6,530	0	13,060	0	13,060
Other Aircraft[4]	140,683	13,505	140,683	13,505	281,366	27,010	308,376
Total	**147,213**	**13,505**	**147,213**	**13,505**	**294,426**	**27,010**	**321,436**

Notes: 1. Operations based on currently approved FAR Part 150.
2. Includes Closed Patterns (which count as two airfield operations).
3. Night –Between 10 p.m. and 7 a.m. for environmental night.
4. Other based military and civilian aircraft and transient aircraft (multiple type aircraft); example aircraft include: Boeing 747, 717, and the Airbus 321.

Source: ACAA 2006.

Based on the published FAR Part 150 Study (2006), the 171 ARW KC-135 aircraft flew a total of 13,060 annual airfield operations, or an average of 36 airfield operations a day. No KC-135 operations at Pittsburgh IAP occur during environmental night in the baseline data. Approximately 4 percent of total operations at Pittsburgh IAP are accomplished by the 171 ARW KC-135 aircraft (ACAA 2006).

3.4.1.2 Runway and Flight Profiles

Pittsburgh IAP aircraft use VFR departures, published Standard Instrument Departures, straight in approaches, overhead approaches, IFR or radar closed patterns, and VFR closed patterns along with re-entry VFR patterns as the basic flight patterns for general aviation and military training flights and local arrival and departures. Detailed representative arrival, departure, and closed pattern flight tracks are found in the Appendix C, *Noise*.

3.4.1.3 Existing Noise Environment

Noise contours developed for the baseline conditions at Pittsburgh IAP are shown in Figure 3.4.1-1. The acreage within each DNL contour on and off Pittsburgh IAP property is shown in Table 3.4.1-2. Approximately 3,138 acres are exposed to DNL greater than or equal to 65 dB. Detailed information on off-airport land use that lies within a DNL greater than 65 dB can be found in Section 3.4.7, *Land Use*.

Table 3.4.1-2. Acres within Baseline Noise Contours, Pittsburgh IAP

Noise Level (dB)	*On Airport (acres)*	*Off Airport (acres)*	*Total (acres)*
65-70	1,331.5	128.6	1,460.1
70-75	850.7	0	850.7
75-80	468.6	0	468.6
80-85	151.5	0	151.5
Greater than 85	207.5	0	207.5
Total	**3,009.8**	**128.6**	**3,138.4**

Notes: dB = decibel

Potential Hearing Loss

As shown in Table 3.4.1-2, there is no property off the Pittsburgh IAP that falls within the 80+ dB DNL noise contour; therefore, no potential hearing loss risk is currently associated with these areas.

3.4.1.4 Pittsburgh International Airport Noise Abatement Procedures

Pittsburgh IAP has no published restrictions on flying activities but has instituted noise abatement procedures that are incorporated directly into their Air Traffic Control Operating Procedures. Procedures include departing aircraft to maintain runway heading to 1,700 feet above mean sea level (AMSL) and follow Departure Control (SkyVector 2013b).

3.4.1.5 Pittsburgh International Airport Noise Complaints Procedures

Currently, Pittsburgh IAP procedures for registering and logging noise complaints are through the Airport Operation's staff, who receive calls on a 24-hour basis. Calls requiring investigation and/or follow up to assure compliance with the FAR Part 150 Noise Program are submitted to the Manager of Planning Services. During 2012, the airport reported a total of 274 complaints, 259 from three specific individuals and 15 from others. Any noise complaints resulting from the 171 ARW are routed through 171 ARW operations for resolution. The number of noise complaints is not considered significant due to the large airport property and lack of urban encroachment (Belotti 2013).

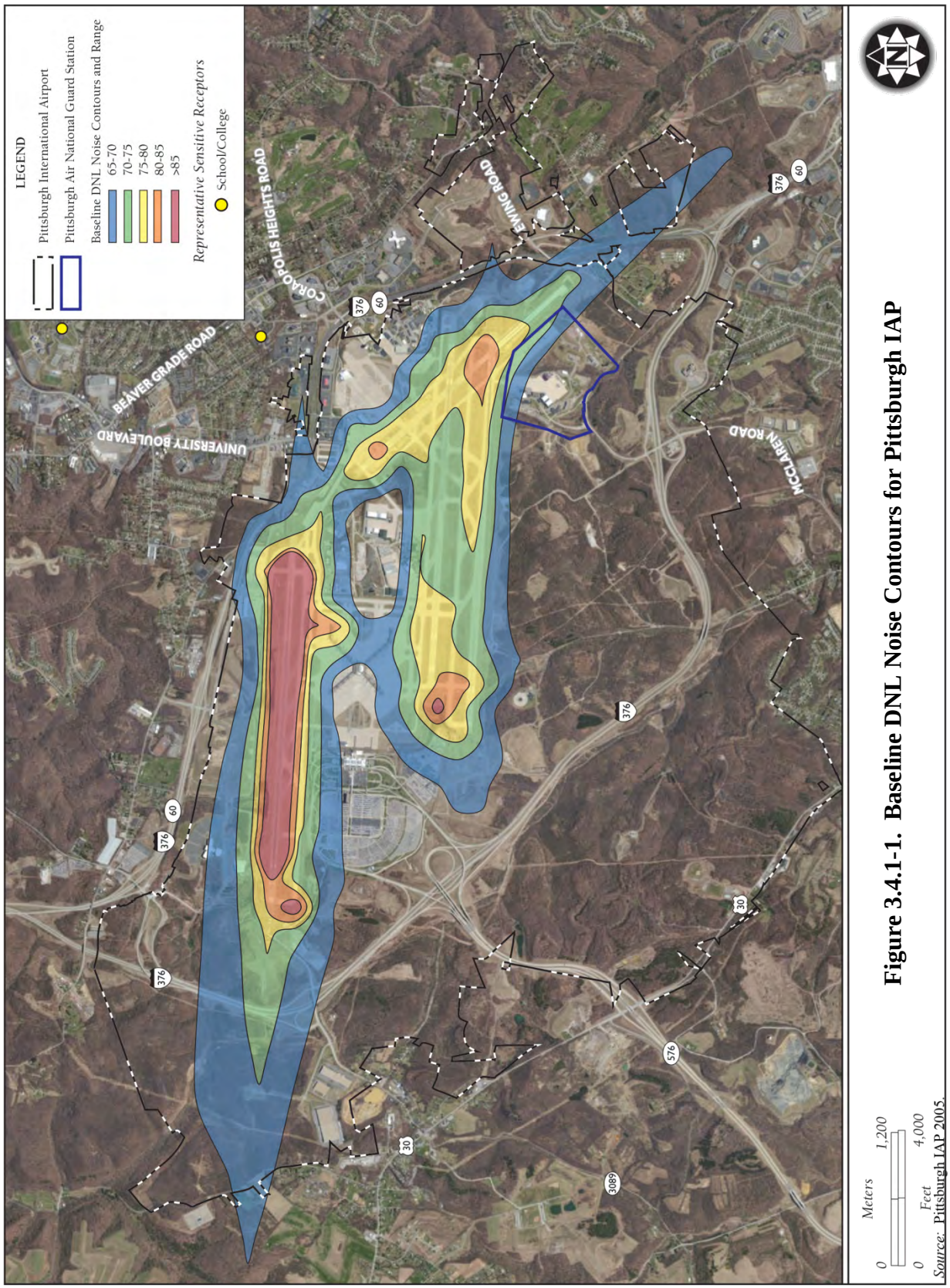


Figure 3.4.1-1. Baseline DNL Noise Contours for Pittsburgh IAP

3.4.2 Air Quality

3.4.2.1 Regulatory Setting

In addition to criteria pollutants, the USEPA has defined 187 substances as HAPs. HAPS are substances that have been determined to present some level of acute or chronic health risk (cancer or non-cancer) to the general public. These pollutants may be emitted in trace amounts from various types of sources, including combustion sources. HAPs are regulated for specific source categories under the USEPA's *National Emission Standards for Hazardous Air Pollutants* regulations.

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. The Pennsylvania Department of Environmental Protection (PADEP) Bureau of Air Quality is the agency responsible for the regulation of air quality within the state of Pennsylvania. The state of Pennsylvania regulates air quality through the Pennsylvania Code Title 25, Article III, Chapters 121 through 145. Within Allegheny County, air quality is regulated by the Allegheny County Health Department Division of Air Quality through Article XXI Air Quality Regulations. The state of Pennsylvania has adopted the NAAQS, and has adopted additional standards regulating beryllium, fluorides, hydrogen sulfide, and settled particulate matter. Because the Proposed Action would not contribute to emissions of these pollutants, they are not considered further in this EIS. The NAAQS are summarized in Table 3.4.2-1.

Pittsburgh ANGS is located approximately 12 miles northwest of Pittsburgh, Pennsylvania in Allegheny County. The USEPA has classified Allegheny County as a moderate nonattainment area for the 1997 8-hour O_3 NAAQS, and is classified as a marginal nonattainment area for the 2008 8-hour O_3 NAAQS. Allegheny County is also a nonattainment area for $PM_{2.5}$. Pittsburgh is also designated as a nonattainment area for CO, but this designation applies only in high traffic areas in the central business district of the city. The region is designated attainment/unclassified area for all other criteria pollutants. Alternative #4 is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (NO_x and VOCs) is 100 tpy, and the *de minimis* emission threshold for $PM_{2.5}$ emissions is also 100 tpy.

Table 3.4.2-1. Ambient Air Quality Standards

Pollutant	*Averaging Time*	NATIONAL STANDARDS [a]	
		Primary [b,c]	*Secondary* [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	—	—
CO	8-hour	9 ppm (10 mg/m^3)	—
	1-hour	35 ppm (40 mg/m^3)	—
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—
SO_2	24-hour	—	—
	3-hour	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—
PM_{10}	Annual	—	Same as primary
	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
	24-hour	35 µg/m^3	Same as primary
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary

Notes: a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.
b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide
Source: USEPA 2012.

The USEPA recently promulgated a more stringent standard for lead, and has redesigned its monitoring program to address lead and identified airports for monitoring because aviation gas used in piston aircraft still contains lead. The project area is considered attainment/unclassified for lead, and lead is not used in aviation fuel used in the KC-135 or KC-46A aircraft.

3.4.2.2 Climate and Meteorology

Pittsburgh is located in the southwestern corner of Pennsylvania, at the foothills of the Allegheny Mountains, where the Allegheny and Monongahela Rivers join to form the Ohio. The city's humid climate is modified slightly by its relative proximity to the Atlantic Seaboard and the

Great Lakes. The Pittsburgh area experiences extremes of all four seasons. Precipitation is distributed throughout the year, with much of the precipitation occurring as snow during the winter months (Northeast Regional Climate Center 2013c).

January is the coldest month, with an average minimum temperature of 19.9ºF. July is the hottest month, with an average maximum temperature of 82.7ºF. The average annual temperature is 50.3ºF. The average annual precipitation in Pittsburgh is 36.9 inches (Northeast Regional Climate Center 2013c).

The average wind speed in the Pittsburgh area is 9 miles per hour. Winds are generally westerly to southwesterly during the year (Northeast Regional Climate Center 2013c).

3.4.2.3 Regional and Local Air Pollutant Sources

The 171 ARW of the PA ANG is based on the southwestern side of Pittsburgh IAP in Allegheny County, Pennsylvania. The surrounding area includes a mix of uses, including residential development, commercial development, and open space.

The USEPA's National Emissions Inventory includes data for the year 2008 for Allegheny County. Table 3.4.2-2 summarizes the regional emissions (stationary and mobile) of criteria pollutants and precursor emissions for the affected areas.

Table 3.4.2-2. Regional Emissions for Allegheny County, Pennsylvania

	EMISSIONS, TONS/YEAR					
	CO	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Regional Emissions						
Stationary Sources	21,006	4,790	17,467	43,185	6,387	5,411
Area-Wide Source	1,196	20,270	165	29	11,969	1,613
Mobile Sources	141,851	13,231	24,496	351	1,203	1,038
Total	**164,053**	**38,291**	**42,128**	**43,565**	**19,559**	**8,062**

Notes: Numbers may not match precisely due to rounding.
Emissions of Pb are not included because the affected region contains no significant sources of this criteria pollutant
CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound
Source: USEPA 2008.

3.4.2.4 Baseline Air Quality

Representative background air monitoring data for the 171 ARW for the period 2008-2012 are shown in Table 3.4.2-3. The closest monitoring stations to Pittsburgh IAP include three monitoring stations in Pittsburgh itself.

As shown in Table 3.4.2-3, the area has experienced several O_3 exceedances during the recent 5-year period. The Pittsburgh area also experienced exceedances of the 24-hour $PM_{2.5}$ standard. The data show that the area did not experience violations of other NAAQS.

Table 3.4.2-3. Ambient Air Monitoring Data for the Pittsburgh Area

Air Quality Indicator	*2008*	*2009*	*2010*	*2011*	*2012*
Ozone (O_3)					
Peak 8-hour value (ppm)	0.08	0.071	0.084	0.086	0.086
Days above federal standard (0.075 ppm)	1	0	2	3	8
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)					
Peak 24-hour value ($\mu g/m^3$)	39.7	33.3	41.5	32.1	23.1
Days above federal standard (35 $\mu g/m^3$)	3	0	3	0	0
Annual Average value ($\mu g/m^3$)	12.9	11.6	12.2	11.1	10.1
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	58	53	58	55	54
Days above federal standard (150 $\mu g/m^3$)	0	0	0	0	0
Carbon Monoxide (CO)					
Peak 1-hour value (ppm)	1.8	1.9	1.8	1.9	4.6
Days above federal standard (9 ppm)	0	0	0	0	0
Peak 8-hour value (ppm)	1.3	1.3	1.4	1.5	2.5
Days above federal standard (35 ppm)	0	0	0	0	0
Nitrogen Dioxide (NO_2)					
Peak 1-hour value (ppm)	0.086	0.059	0.066	0.069	0.047
98th Percentile (ppm)	0.066	0.049	0.051	0.058	0.043
Days above federal standard (0.100 ppm)	0	0	0	0	0
Sulfur Dioxide (SO_2)					
Peak 1-hour value (ppm)	0.106	0.087	0.057	0.037	0.034
99th Percentile (ppm)	0.062	0.061	0.035	0.023	0.022
Days above federal standard (0.075 ppm)[1]	0	0	0	0	0
Peak 24-hour value (ppm)	0.019	0.020	0.021	0.013	0.010

Notes: 1.The federal 1-hour SO_2 standard was adopted in 2010.
$\mu g/m^3$ = micrograms per cubic meter; NA = data not available; ppm = parts per million
Source: USEPA 2013a.

3.4.2.5 171st Air Refueling Wing Emissions

The 171 ARW currently flies and maintains 16 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 171 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

Emissions for the 171 ARW have been quantified in the *Final 2011 Air Emissions Inventory* (171 ARW 2013b). The inventory evaluated the emissions from the 171 ARW to determine its status under the Title V Federal Operating Permits program. Based on the major source

thresholds for the area, the major source thresholds are 50 tpy for VOCs, 100 tpy for all other criteria pollutants, and less than 10 tpy of any single HAP or 25 tpy of any combination of HAPs.

The 171 ARW does not currently hold a Title V Operating Permit, but operates under a Minor Source Operating Permit (No. 0287) issued by the Allegheny County Health Department. The *2011 Air Emissions Inventory* demonstrates that total base-wide potential emissions from stationary sources are below the major source thresholds.

Stationary source emissions at the 171 ARW include emissions from combustion sources, chemical use, and small arms fire. Mobile source emissions include emissions from aircraft operations (take-offs and landings), AGE, ground vehicle operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft operations at the 171 ARW installation considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the default mixing height (3,000 feet AGL). Baseline emissions also include stationary sources, and emissions associated with vehicle trips associated with existing personnel and dependents. These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the installation.

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #4, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related AGE, and POVs associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations identified in Table 2.3-19, utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet AGL. A discussion of the methodology for quantifying emissions is provided in Appendix A, Section A.2.3. Emissions for the baseline emissions associated with baseline operations of the KC-135 aircraft are provided in Table 3.4.2-4.

Table 3.4.2-4. 171 ARW Baseline Emissions at Pittsburgh ANGS

	EMISSIONS, TONS/YEAR						
Emission Source	*VOCs*	*CO*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*CO_2e*
KC-135 Baseline Aircraft Operations	3.42	50.69	67.79	6.14	0.33	0.33	17,082
AGE	0.01	0.01	0.10	0.00	0.00	0.00	2,395
Engine Testing	0.11	1.67	0.46	0.07	0.01	0.01	198
POVs	4.27	65.56	3.37	0.05	0.14	0.06	2,270
Total Baseline Emissions	**7.81**	**117.93**	**71.72**	**6.26**	**0.48**	**0.40**	**21,946**

Notes: Numbers may not match precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: 171 ARW 2013b.

3.4.3 Safety

This section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, APZs/RPZs, explosive safety, and AT/FP. Flight safety includes discussions on flight safety procedures, aircraft mishaps, BASH, and fuel jettison requirements. The affected environment includes the airfield and local airspace surrounding Pittsburgh IAP.

3.4.3.1 Ground Safety

Fire/Crash Response

Day-to-day operations and maintenance activities conducted by the 171 ARW are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders, and standards prescribed by AFOSH requirements. Under previous NEPA analysis (171 ARW 2012a), the 171 ARW plans to move the Fire/Crash Rescue Station to Building 304. The Fire/Crash Rescue Station currently provides fire, crash, rescue, and structural fire protection for the installation and its aircraft. The 171 ARW also has arrangements with the Allegheny County Fire Department; Ohio Valley Fire Defense Mutual Aid Association; and the PADEP Emergency Response Team, Greater Pittsburgh area for mutual aid in fire protection, first responder and lifesaving services, and hazardous materials incident response (171 ARW 2009).

Accident Potential Zone/Runway Protection Zone

Development restrictions associated with RPZs are intended to preclude incompatible land use activities from being established in these areas. The city of Pittsburgh, Pennsylvania utilizes the FAA's airport land use compatibility guidelines, and as such, the RPZs have allowed development to be compatible with airport operations. Details of development and land use in the Pittsburgh IAP vicinity are included in Section 3.4.7, *Land Use*.

Explosive Safety

The 171 ARW uses a small range of munitions required for performance of their mission. The existing munitions storage capabilities on Pittsburgh ANGS meet the requirement for small arms deployment/training ammunition and other munitions required by the 171 ARW. Three munitions storage areas (Buildings 515, 516, and 517) have quantity-distance (QD) safety zones (171 ARW 2012a).

Anti-Terrorism/Force Protection

Many of the 117 ARW military facilities at Pittsburgh ANGS were constructed before AT/FP considerations became a critical concern. Thus, under current conditions, many facilities do not comply with all current AT/FP standards. However, as new construction occurs and as facilities are modified, the PA ANG would incorporate these standards to the maximum extent practicable.

3.4.3.2 Flight Safety

Flight Safety Procedures

Aircraft flight operations from Pittsburgh ANGS are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2KC-135V3, *Flying Operations, C/KC-135 Operations Procedures*, 2010) to ensure flight safety. While having aircraft in close proximity during air refueling is inherently dangerous, refueling mishaps are rare. Emergency separation procedures are established and practiced by both tanker and receiver aircrews.

Aircraft Mishaps

KC-135 aircraft (all models) have flown more than 14,750,000 hours since the aircraft entered the USAF inventory in 1957. Over that period, 83 Class A mishaps have occurred and 64 aircraft have been destroyed (specific statistics for mishaps during refueling are not recorded). This results in a Class A mishap rate of 0.56 per 100,000 flight-hours, and an aircraft destroyed rate of 0.43 per 100,000 flight hours (AFSEC 2012). The 171 ARW recently completed their 53rd consecutive year and nearly 230,000 flying hours without a Class-A mishap (Pittsburgh ANGS 2013).

Bird/Wildlife Aircraft Strike Hazard

The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 40 years indicates that 39 USAF aircraft have been destroyed and 33 fatalities have occurred from bird/wildlife aircraft strikes, with the last Class A mishap occurring in 2010 (AFSEC 2013).

The 171 ARW has an on-going BASH program through which information and assistance is freely shared between airfield users, the Pittsburgh IAP staff, and the local air traffic controllers. Most strikes occur in August and September with small birds such as blackbirds, swallows, or larks. Serious BASH-related accidents within the immediate Pittsburgh IAP area are rare and

have never resulted in a Class A mishap (Pittsburgh ANGS 2013). The 171 ARW has recorded 69 minor BASH incidents in the airfield area from 2005 to 2012, with an average of fewer than nine bird strikes per year (Pittsburgh ANGS 2013).

Fuel Jettison

For use in emergency situations, the KC-135 aircraft have the capability to jettison fuel and reduce aircraft gross weight for flight safety. Airbases must establish jettison areas and procedures to minimize the impact of fuel jettisoning. Ideally, jettison areas are established at altitudes above 20,000 feet AGL, off published federal airways, avoiding urban areas, agricultural regions, and water supply sources. AFIs cover the fuel jettison procedures, and local operating policies define specific fuel ejection areas for each base. In accordance with the AFI, Pittsburgh ANGS has established local procedures for gross weight adjustments but fuel jettisoning is an emergency procedure only and is not practiced (Pittsburgh ANGS 2013).

3.4.4 Soils and Water

3.4.4.1 Soils

This area of Pennsylvania is within the Appalachian Highlands on a dissected plateau that is underlain by sedimentary rocks. There are narrow, level valleys and narrow, sloping ridgetops separated by long, steep to very steep side slopes (USDA 2006). The 171 ARW installation is surrounded by steep slopes that can exceed 25 percent in some areas. The developed areas within the installation consist of a graded hilltop leveled to accommodate aircraft facilities and a series of terraces to maximize buildable land. Relief ranges from 135 to 140 feet MSL (171 ARW 2012a).

The NRCS Soil Survey for Allegheny County, Pennsylvania identifies the following eight individual soil types at the installation:

Atkins silt loam: This soil is typically found on floodplains from recent alluvium derived from sandstone and shale. The rating class for building site development is considered very limited due to high flooding potential and depth to saturated zone (NRCS 2013c). Approximately 5 percent of the installation is composed of this soil type.

Ernest silt loam, 2 to 8 percent slopes: This soil is typically found on hillslopes from colluvium derived from shale and siltstone. The rating class for building site development is considered somewhat limited due to steep slopes and depth to saturated zone. In addition, this soil type is designated as Farmland of Statewide Importance (NRCS 2013c). Approximately 3 percent of the installation is composed of this soil type.

Gilpin-Upshur complex, very steep: This soil is typically found on hillslopes from residuum weathered from sandstone, siltstone, and shale. The rating class for building site development is considered very limited due to steep slope and depth to hard bedrock (NRCS 2013c). Approximately 10 percent of the installation is composed of this soil type.

Gilpin silt loam: This soil is typically found on hills from residuum weathered from sandstone, siltstone, and shale. The rating class for building site development is considered very limited due to steep slope and depth to hard bedrock (NRCS 2013c). Approximately 3 percent of the installation is composed of this soil type.

Gilpin, Weikert, and Culleoka shaly silt loams, very steep: This soil is typically found on hillslopes from residuum weathered from sandstone, siltstone, and shale. The rating class for building site development is considered very limited due to steep slope and depth to hard bedrock (NRCS 2013c). Approximately 3 percent of the installation is composed of this soil type.

Urban land-Culleoka complex, gently sloping and moderately steep: This soil consists of strongly intermingled Urban land and Culleoka soil. Urban land consists of soil from cut/fill sites used for buildings, paved roads, parking lots, and other areas of urban development. The rating class for building site development is not rated for this soil type (NRCS 2013c). Approximately 56 percent of the installation is composed of this soil type.

Wharton silt loam: This soil is typically found on hills from residuum weathered from siltstone and shale. The rating class for building site development is considered somewhat limited to very limited due to shrink-well potential, slope, and depth to saturated zone. In addition, this soil type is designated as Prime Farmland or Farmland of Statewide Importance depending upon slope (NRCS 2013c). Approximately 21 percent of the installation is composed of this soil type.

3.4.4.2 Surface Water

Surface water features within the vicinity of the 171 ARW installation include McClarens Run to the southwest, a tributary of Montour Run, that ultimately discharges into the Ohio River. Surface water within the installation primarily consists of a series of man-made ditches, storm sewers, and drainage swales (Figure 3.4.4-1). Drainage of the developed area is typified by overland flow to storm drain inlets and basins connected by a network of underground pipes (171 ARW 2010a).

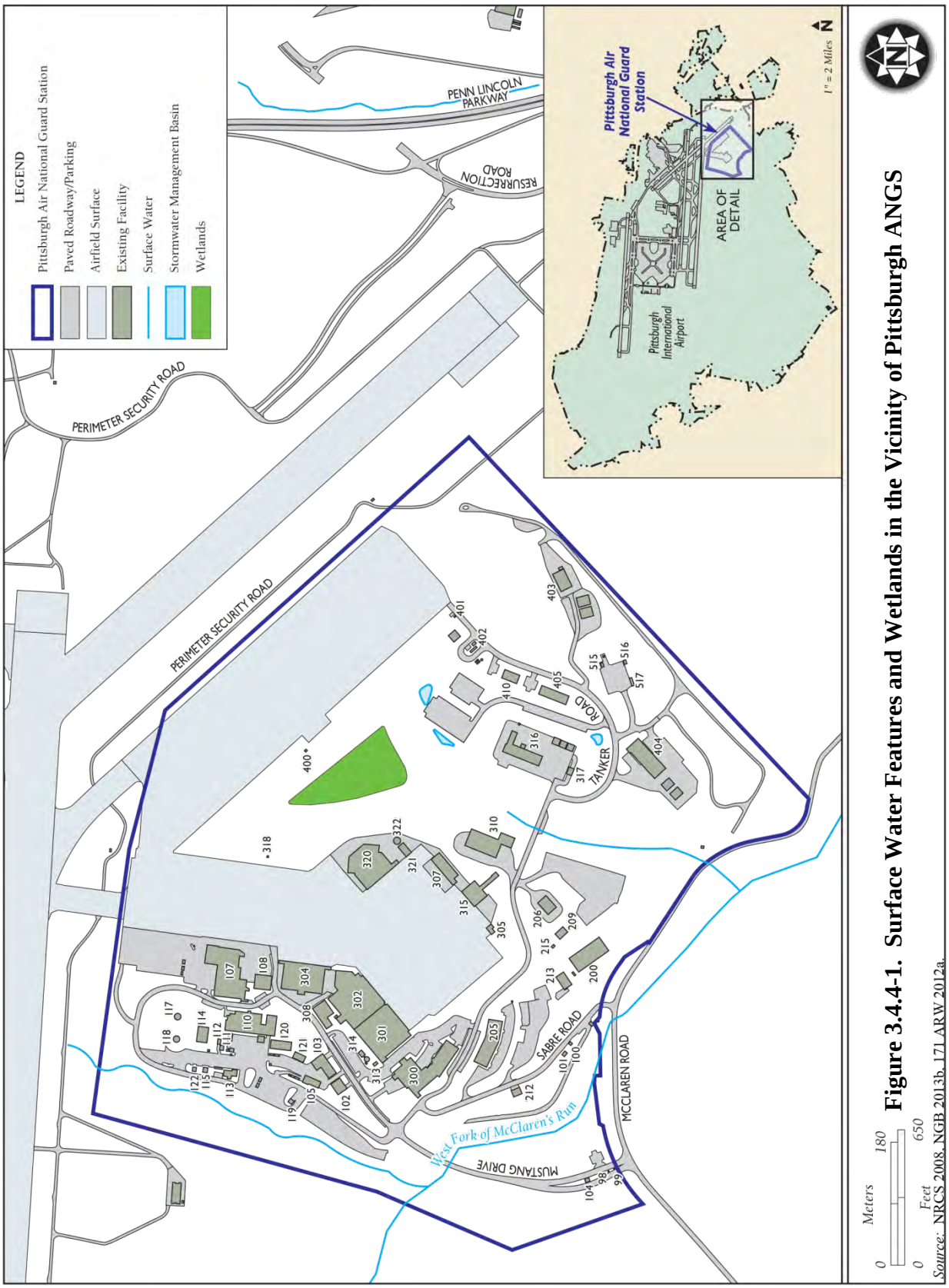


Figure 3.4.4-1. Surface Water Features and Wetlands in the Vicinity of Pittsburgh ANGS

Source: NRCS 2008, NGB 2013b, 171 ARW 2012a.

There are 15 stormwater outfalls on the 171 ARW installation, including an OWS outfall. Nine drainage basins receive runoff from industrial areas on the installation: SDO-001, -002, -003, -004, -006, -007, -010, -014, and -015. All outfalls ultimately discharge to McClarens Run. The nine outfalls associated with industrial activity are regulated under the Pennsylvania General Permit for Discharges of Stormwater Associated with Industrial Activity (PA-R806184). The permit is administered by the PA DEP under the auspice of the USEPA (171 ARW 2010a).

3.4.4.3 Groundwater

Groundwater in this area is part of the Appalachian Plateaus aquifers. The principal coal-bearing formations are Pennsylvanian in age and consist of sequences of sandstone, shale, conglomerate, clay, coal, and minor limestone. The sandstones are the most productive aquifers, although coal beds and limestones also yield water (USGS 1995c). Historical large-scale coal mining has led to pollution issues in both groundwater and surface water in many areas by sulfur and iron exposure (PADEP 2004).

Based on topography of the installation, the direction of regional groundwater flow is to the southwest, toward McClarens Run. Site-specific groundwater flow may fluctuate based on local geology, local well use, and seasonal variations (Department of Military and Veterans Affairs 2007). The major source of groundwater near the installation is alluvial deposits in floodplains, particularly along the Allegheny and Ohio rivers (171 ARW 2012a).

3.4.4.4 Floodplains

Per the FEMA Flood Insurance Rate Map for Allegheny County, Pennsylvania, Panel 302 (Map Number 42003C0302E, Effective October 4, 1995), the 171 ARW installation is located within an area designated as Zone X. The designation Zone X are areas determined to be outside the 0.2 percent annual chance flood (500 year flood), indicating areas of minimal flooding (FEMA 1995).

3.4.5 Biological Resources

3.4.5.1 Vegetation

The Pittsburgh IAP occurs within the Eastern Broadleaf Forest (Oceanic) Province. Vegetation in this region typically is characterized by a winter deciduous forest dominated by tall broadleaf trees (Bailey 1995). The majority of the 171 ARW installation is developed or actively landscaped, with approximately 15 percent containing natural vegetation. Natural vegetation is comprised of fragmented stands of deciduous forest along the southwest portion of the installation which consist of primarily sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), American elm (*Ulmus americana*), shagbark hickory (*Carya ovata*), and box elder (*Acer negundo*). In addition, small areas of shrublands occur along the edge of the forest stands

and are comprised of species such as blackberry (*Rubus* spp.), red-panicle dogwood (*Cornus racemosa*), and multiflora rose (*Rosa multiflora*) (171 ARW 2012a).

3.4.5.2 Wildlife

Due to the lack of substantial pockets of native vegetation, high noise levels, and human activities at and surrounding the airport, wildlife habitat is limited. As a result, the majority of wildlife present in the vicinity of the airport and the 171 ARW installation consists of species that are highly adapted to developed and disturbed areas. Pittsburgh ANGS is located within the Atlantic Flyway, one of four major North American corridors for migratory birds. The majority of the bird species found within Pittsburgh IAP or its vicinity are protected under the MBTA. Common bird species found within the vicinity of the airport include Ring-Billed Gull (*Larus delawarensis*), Canada Goose (*Branta canadensis*), American Crow (*Corvus brachyrhynchos*), European Starling (*Sternus vulgaris*), Killdeer (*Charadrius wilsonia*) and Mourning Dove (*Zenaida macroura*). Other common wildlife species include white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes vulpes*), Eastern gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis marsupialis*), eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), and woodchuck (*Marmota monax*) (171 ARW 2012a).

3.4.5.3 Special Status Species

No federally listed or candidate species are known to occur within the airport or on the 171 ARW installation. The potential for several federally listed species that have been observed in Allegheny County to occur within the vicinity of the airport exists; however, there is little to no habitat for these species within the airport or the installation (171 ARW 2012a). Several state listed species have been observed within Allegheny County and have the potential to occur on or within the vicinity of the installation; however, only one of these have been observed on the installation (Torrey's Rush). Torrey's Rush (*Juncus torrei*), a Pennsylvania threatened plant species, has been identified on the installation, in the area of the mitigation wetlands (see Wetland Section below). A list of these species can be found in Appendix E. There is no critical habitat located on the installation.

3.4.5.4 Wetlands

One palustrine emergent/scrub-shrub wetland occurs on the installation between the east and west aircraft parking aprons. This wetland was constructed as mitigation for the wetlands that were impacted during the construction of the east aircraft parking apron in the 1990s. This wetland is associated with headwaters of two unnamed tributaries to McClaren's Run and are most likely jurisdictional wetlands (Figure 3.4.4-1) (171 ARW 2012a).

3.4.6 Cultural Resources

3.4.6.1 Archaeological Resources

A majority of the 171 ARW installation is developed with buildings and pavement. Approximately 1.2 acres in the southeast portion of the installation was determined to be relatively undisturbed. This area was intensively surveyed for cultural resources in 2011. No NRHP-eligible resources were located (171 ARW 2012b, McLearen 2011). The Pennsylvania SHPO concurred with these findings (see McLearen 2011 in Appendix B4).

3.4.6.2 Architectural Resources

All 25 architectural resources at the 171 ARW installation pre-dating the end of the Cold War era or constructed before 1990 were inventoried and evaluated for NRHP eligibility (171 ARW 2012b). None of the buildings were recommended as eligible to the NRHP.

3.4.6.3 Traditional Resources

The 171 ARW installation contains no known traditional resources; however, five federally-recognized Tribes that are historically, culturally, and linguistically affiliated with the area have been identified: Cayuga Nation of New York, Onondaga Nation of New York, Seneca Nation of Indians, Tonawanda Band of Seneca Indians of New York, and Tuscarora Nation of New York.

3.4.7 Land Use

The 171 ARW is located at Pittsburgh IAP, in Allegheny County, Pennsylvania. Two townships are immediately adjacent to the airport: Moon Township is north and east of the Airport, and Findlay Township is west and south of the airport. Independence Township (Beaver County), North Fayette Township, Robinson Township, and Coraopolis Township are located to the west, south, southeast, and northeast of the airport, respectively. Land uses surrounding the airport include a mixture of suburban and rural land uses including Recreation/Conservation, Commercial, Industrial, and Undeveloped (Allegheny County 2008). No houses, churches, schools or other sensitive noise receptors are located within areas exposed to DNL greater than 70 dB off-airport.

Zoning surrounding the airport generally supports compatible land use planning and provides for protection of the areas surrounding Pittsburg IAP. Zoning codes define and establish airport hazard zones height limitations and land use restrictions within these zones. This zoning protects RPZs, details of which can be found in the Safety section of Appendix A, Section A.3.

Pittsburgh IAP exposes 128.6 acres, off-airport, to noise levels between 65 dB and 70 dB DNL. Figure 3.4.7-1 shows an overlay of the baseline noise contours onto a map displaying the existing land use in the vicinity of the airfield.

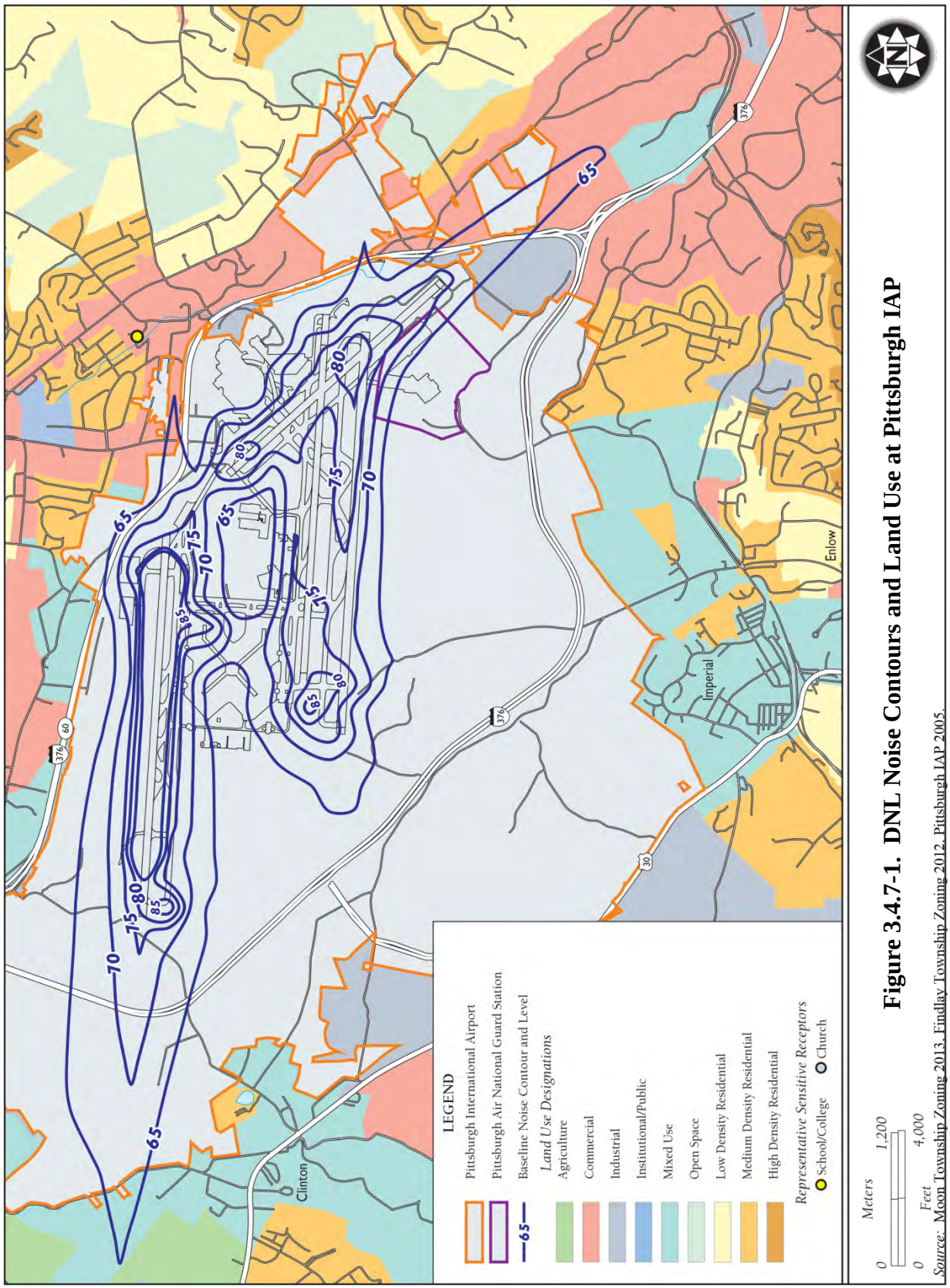


Figure 3.4.7-1. DNL Noise Contours and Land Use at Pittsburgh IAP

Source: Moon Township Zoning 2013, Findlay Township Zoning 2012, Pittsburgh IAP 2005.

3.4.8 Infrastructure and Transportation

3.4.8.1 Potable Water System

Currently, Findlay Township Water Authority is acting as a back-up source for potable water for the 171 ARW installation due to a break in the line from the Moon Township Water Authority, which is typically the primary source of potable water for the installation. A new waterline from Moon Township is in the process of design for construction. Findlay Township buys water from Moon Township, Robinson Township, and other sources (Tower 2013a). Potable water in the area is supplied primarily from four regional groundwater aquifer wells. Moon Township pumps approximately 1.18 trillion gallons of water per year to its customers (Moon Township no date). The groundwater supply is supplemented with treated surface water from the Ohio River. In FY 2012, 4.7 million gallons of potable water were supplied to the 171 ARW installation (171 ARW 2013c).

3.4.8.2 Wastewater

The 171 ARW installation generates wastewater from sanitary, stormwater, and industrial processes, including oil/water separator discharge, wash rack discharge, floor wash-down, latrines, sinks, and showers. Wastewater generated within the 171 ARW installation is conveyed into the municipal sewage system, operated by Moon Township Municipal Authority. The Authority's Leonard L. Nary Wastewater Treatment plant treats water from Moon, Findlay, North Fayette, and Robinson Townships, as well as the installation. The facility has a capacity of a 6.2 million gallons per day (171 ARW 2012a).

3.4.8.3 Stormwater

A high percentage of the active administrative and industrial areas of the installation are paved or roofed, resulting in high runoff rates during precipitation events. As described in the 171 ARW *SWPPP* (2010), the 171 ARW installation has a stormwater drainage conveyance system typified by overland flow to catch basins, inlets, surface drains, underground pipes, culverts, ditches, and swales that discharge to receiving waters (see Section 3.4.4, *Soils and Water*) or other municipal separate storm sewer systems. The stormwater drainage system has been designed to safely collect and transport surface water runoff from storm events to prevent flooding within the installation and is a separate system from the wastewater (sewage) system.

3.4.8.4 Electrical and Natural Gas Systems

Electricity is supplied to the 171 ARW installation by Duquesne Light Company via three single phase 667 kilovolt ampere transformers and underground power lines. Natural gas is supplied by UGI Energy Services from a single 4-inch steel line. Electricity consumption for FY 2012 at the

171 ARW installation was 5,751 megawatt hours. Natural gas consumption for FY 2012 at the 171 ARW installation was 26,880 thousand cubic feet (171 ARW 2013c).

3.4.8.5 Solid Waste Management

Municipal solid waste at the 171 ARW installation is managed in accordance with the 171 ARW Solid Waste Management Plan/Qualified Recycling Program (171 ARW 2010b) and guidelines specified in AFI 32-7042, *Waste Management* (2009). This AFI incorporates, by reference, the federal standard for solid waste regulations contained within 40 CFR, Subtitle D, *Non-hazardous Waste*, and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for recycling, diversion, handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

The 171 ARW installation generates solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These nonhazardous solid wastes are collected in dumpsters located throughout the 171 ARW installation and transported to the Allied Waste Imperial Landfill.

3.4.8.6 Transportation

The 171 ARW installation is located approximately 14 miles northwest of downtown Pittsburgh and is easily accessible from several major highways. I-79 runs in a north-south direction approximately 4 miles east of the installation. I-376/SR 60 runs in a northwest-southeast direction through the Pittsburgh IAP property and provides direct access to the airport. In addition, U.S. Highway 30, a principal arterial that runs east-west south of the airport and then takes a turn to the north running parallel to the airport on the western side, also provides regional access. McClaren Road exit off of I-376 provides direct access to the main entrance for the 171 ARW installation.

3.4.9 Hazardous Materials and Waste

3.4.9.1 Hazardous Materials

Hazardous materials are used at the 171 ARW installation for aircraft and vehicle operations support and maintenance. Types of hazardous substances found on the 171 ARW installation include hydraulic fluid, waste oils, recovered fuels, spent cleaners, strippers, solvents, flammable and combustible liquids, acids, aerosols, batteries, corrosives, and paints (171 ARW 2009).

Nineteen ASTs occur on the 171 ARW installation and are used to store diesel, jet fuel, motor gasoline, aqueous film forming foam, potassium acetate, developer, dye penetrant, emulsifier,

and rinse solution. There is one 1,000-gallon UST on the installation located in the POL yard used to store reclaimed JP-8 (171 ARW 2012a).

Toxic Substances

Regulated toxic substances typically associated with buildings and facilities include asbestos, LBP, and PCBs. An asbestos survey was performed at the 171 ARW installation in 1991. ACMs identified in the insulation, floor tiles, and mastic were found in Buildings/Hangars 102, 103, 107, 110, 201, 206, 300, 301/302, 304 (171 ARW 2012a).

A LBP survey has not been conducted at the 171 ARW installation. Any buildings on the installation constructed prior to 1978 are presumed to contain LBP and would be tested for LBP prior to demolition or renovation (171 ARW 2012a).

The 171 ARW does not maintain, operate, or own any PCB equipment or PCB-contaminated equipment and the subject property is considered PCB-free (171 ARW 2008).

3.4.9.2 Hazardous Waste Management

The 171 ARW Oil and Hazardous Substances Spill Prevention and Response Plan contains the governing regulations for spill prevention and describes specific protocols for preventing and responding to releases, accidents, and spills involving oils and hazardous materials (171 ARW 2012c). The 171 ARW Hazardous Waste Management Plan outlines procedures for controlling and managing hazardous wastes from the point where they are generated until they are disposed. In addition, it includes guidance for compliance with all federal, state, and local regulations pertaining to hazardous waste (171 ARW 2009).

The 171 ARW is regulated as a Large Quantity Generator of hazardous waste and maintains USEPA Identification Number PAD114942832. A hazardous waste generation point is where the waste is initially created or generated. An SAP is an area where hazardous waste is initially accumulated at the point of generation and is under the control of the SAP manager. Hazardous wastes initially accumulated at a SAP are accumulated in appropriate containers before being transferred to the installation CAP. There are 20 SAPs (where a waste is initially accumulated) identified at the installation in Buildings/Hangars 103, 107, 113, 121, 213, 301, 302, 304, 307, 308, 310, 316, 320, 403, 404, and 520. The installation CAP is located in Building 501/502 (171 ARW 2009, Tower 2013b).

OWSs are used to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and stormwater drainage systems. Fifteen OWSs are located on the 171 ARW installation. These OWSs primarily receive discharge from floor drains in maintenance areas (171 ARW 2012c).

3.4.9.3 Environmental Restoration Program

There are three closed ERP sites and two closed Areas of Concern (AOCs) at the 171 ARW installation. Table 3.4.9-1 provides details for each of these sites and Figure 3.4.9-1 shows the locations.

Table 3.4.9-1. ERP Sites within the 171 ARW Installation

ERP/AOC Site	*Materials of Concern*	*Status*
1	This site was a waste oil tank where JP-4 fuel, hydraulic, and engine oils were released from a UST. Soil and groundwater sampling performed at this site did not reveal contaminants of concern above PADEP guidelines.	Closed
2	This site was a UST for a gasoline for a motor pool area. Soil and groundwater sampling performed at this site revealed gasoline-related soil contamination at low levels. Results from a risk assessment of this area showed that contaminated soils did not pose a threat to human life or the environment.	Closed
7	This site was a POL storage area and fuel hydrant system for JP-4 fuel. Soil and groundwater sampling performed at this site did not reveal contaminants of concern above PADEP guidelines.	Closed
AOC A	This site is referred to as the Cabbage Patch Area and was used for dumping fuels, POLs, and solvents. Soil sampling results at this location did not identify contaminants in exceedance of regulatory criteria or posing a threat to human health or the environment. No further action was recommended.	Closed
AOC B	This site is referred to as the Embankment Area and was used for dumping petroleum distillate, tetrachloroethylene, methyl ethyl ketone, and other liquid wastes. Soil sampling results at this location did not identify contaminants in exceedance of regulatory criteria or posing a threat to human health or the environment. No further action was recommended.	Closed

Notes: ERP = Environmental Restoration Program; AOC = Area of Concern; UST = underground storage tank; PADEP = Pennsylvania Department of Environmental Protection; POL = petroleum, oil, and lubricant

Source: 171 ARW 2012a.

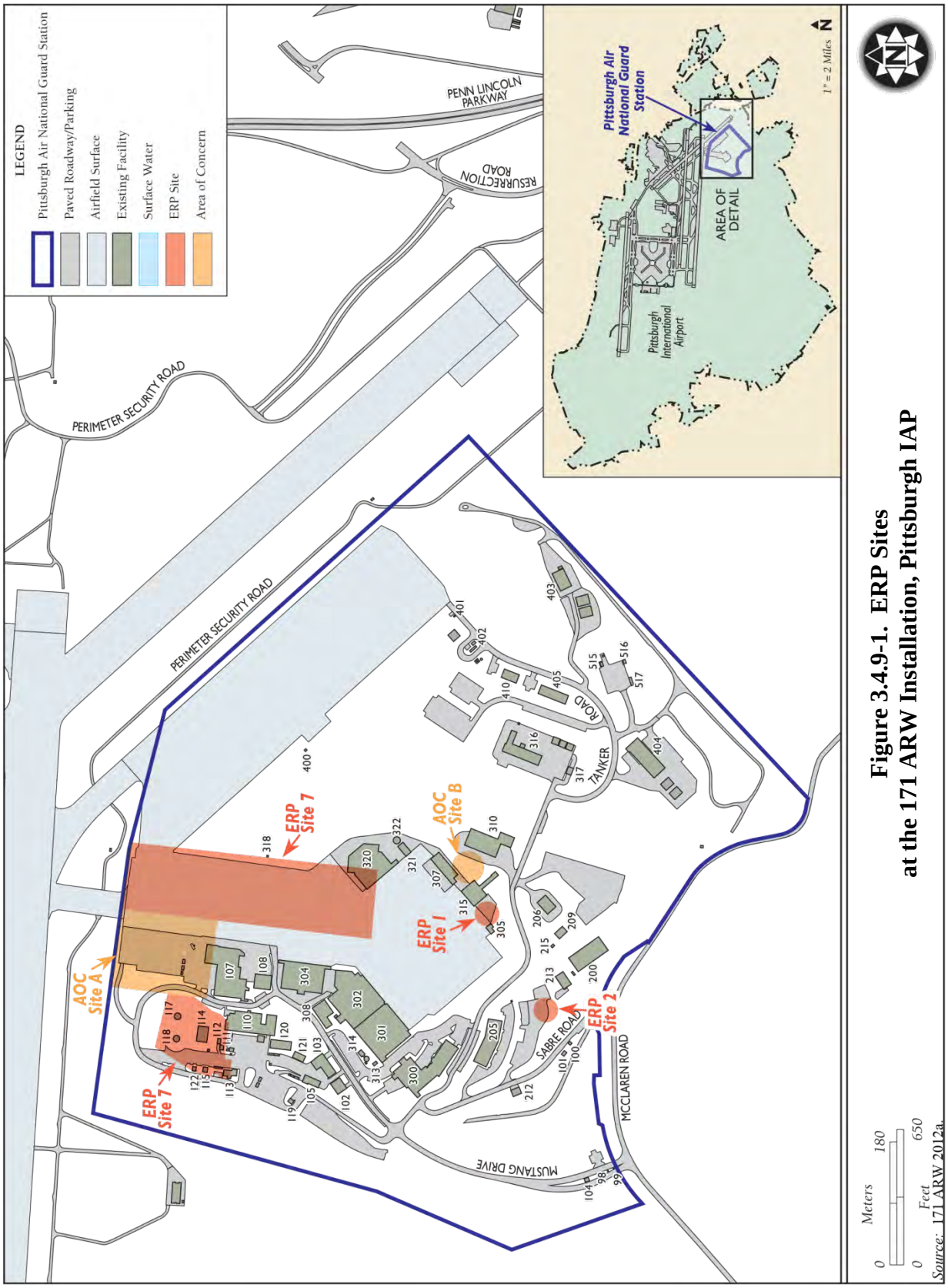


Figure 3.4.9-1. ERP Sites at the 171 ARW Installation, Pittsburgh IAP

3.4.10 Socioeconomics

3.4.10.1 Population and Employment

Population

Pittsburgh ANGS is located is located approximately 12 miles northwest of Pittsburgh, Pennsylvania in Allegheny County. The airport ROI includes portions of Moon and Finlay Townships. Current population data and estimates for the state of Pennsylvania, Allegheny County, and Findlay and Moon Townships are provided in Table 3.4.10-1. From 1990 to 2010, Allegheny County's population decreased by 113,101, approximately 9 percent (USCB 1990d, 2000d, 2010e).

Table 3.4.10-1. Population Growth within the Vicinity of Pittsburgh ANGS

Area	*1990 Census*	*2000 Census*	*2010 Census*
Pennsylvania	11,881,643	12,281,054	12,702,379
Allegheny County	1,336,449	1,281,666	1,223,348
Findlay Township	4,500	5,145	5,060
Moon Township	19,631	22,290	24,185

Source: USCB 1990d, 2000d, 2010e.

The 171 ARW currently supports a workforce authorization of 1,306, including 393 full-time and 913 part-time personnel (see Table 2.3-24).

Employment and Earnings

Table 3.4.10-2 presents total labor force and employment rates for Pennsylvania, Allegheny County, and Findlay and Moon Townships. Based on 2007-2011 ACS 5-year estimates, there were 644,951 persons in the labor force (able to work) and 598,554 employed within Allegheny County, resulting in an unemployment rate of approximately 7 percent. Top employment industries in Allegheny County include 1) educational services, and health care and social assistance; 2) professional, scientific, and management, and administrative and waste management services; and 3) retail (USCB 2011e). Principal employers include UPMC Presbyterian Shadyside, University of Pittsburgh, the federal government, Giant Eagle Inc., and PNC Bank NA (Center for Workforce Information and Analysis 2012).

Table 3.4.10-2. Employment Data (2011) within the Vicinity of Pittsburgh ANGS

Area	*Labor Force*	*Employed*	*Unemployed*	*Unemployment Rate (%)*
Pennsylvania	6,456,527	5,947,873	508,654	7.9
Allegheny County	644,951	598,554	46,397	7.2
Findlay Township	2,879	2,598	281	9.8
Moon Township	13,199	12,532	667	5.1

Note: Employment numbers include individuals in the Armed Forces.
Source: USCB 2011e.

3.4.10.2 Schools

According to the 2011 ACS enrollment 5-year estimates, 179,072 students were enrolled in schools from Kindergarten through Grade 12 in Allegheny County (USCB 2011e).

3.4.10.3 Housing

In 2010, the number of housing units in Allegheny County was 589,201, with a vacancy rate of approximately 9 percent (USCB 2010e).

3.4.11 Environmental Justice and the Protection of Children

3.4.11.1 Minority and Low-Income Populations

Table 3.4.11-1 displays the minority, low-income, and children under age 18 within the state of Pennsylvania, as well as the county and townships within the vicinity of Pittsburgh IAP. Approximately 19 percent of the population of Allegheny County is composed of minorities (i.e., an ethnic or racial group with a distinctive presence in a community), compared to approximately 18 percent for the state of Pennsylvania. The percentage of population living below the poverty level for the state of Pennsylvania (approximately 13 percent) is slightly higher than Allegheny County (approximately 12 percent) (USCB 2010e).

Table 3.4.11-1. Population within the Vicinity of Pittsburgh ANGS[1]

Geographic Area	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*	*Children Under Age 18*	*Percent Children*
Pennsylvania	12,702,379	2,296,091	18.1	1,600,500	12.6	2,792,155	22.0
Alleghany County	1,223,348	226,053	18.5	151,695	12.4	241,663	19.8
Findlay Township	5,060	198	3.9	202	4.0	1,139	22.5
Moon Township	24,185	2,473	10.2	2,080	8.6	5.169	21.4

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 American Community Survey 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the Bureau of the Census determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, person in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010e, 2011f.

Table 3.4.11-2 displays the total population, total minority population, percentage minority, total low-income population, and low-income percentages for the areas in the vicinity of Pittsburgh IAP within the baseline DNL greater than 65 dB.

Table 3.4.11-2. Population within Baseline Noise Contours, Pittsburgh ANGS[1]

Noise Contour	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*
65-70	12	0	0	0	0
70-75	0	0	0	0	0
75-80	0	0	0	0	0
80-85	0	0	0	0	0
85+	0	0	0	0	0
Total	**12**	**0**	**0**	**0**	**0**

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010f, 2011f.

In the area surrounding Pittsburgh IAP, approximately 12 people were estimated to be affected by baseline DNL between 65 dB and 70 dB. Out of that total, none are considered to be minorities or low-income populations.

3.4.11.2 Protection of Children

In 2010, the number of children under the age of 18 living in Allegheny County was approximately 241,633 (19.8 percent of the population). The state of Pennsylvania has a slightly higher percentage population of children compared to the county (22 percent). There are no on-installation housing or facilities for children located at the 171 ARW installation. Currently, there are no Kindergarten through Grade 12 off-installation schools that are exposed to aircraft DNL of 65 dB or above.

3.5 RICKENBACKER AIR NATIONAL GUARD STATION

Rickenbacker ANGS, home of the 121 ARW of the OH ANG, is located approximately 12 miles southeast of downtown Columbus, Ohio in Franklin County. The 121 ARW installation is situated on the west side of Rickenbacker IAP, an international airport operated by the CRAA.

3.5.1 Noise

To evaluate noise impacts in the vicinity of a military installation located within a commercial airport with a published FAR Part 150 Airport Noise Compatibility Study, the USAF allows for use of the FAA's INM to generate DNL noise contours. The CRAA under the FAA uses the INM computer model for generating noise contours and for Rickenbacker IAP, the FAA's INM was used. For more detailed information on the noise modeling methods see Appendix A, Section A.1.2.

3.5.1.1 Baseline Operations

In August 2007, the CRAA approved a Noise Compatibility Program Update as part of the FAA's FAR Part 150 Noise Compatibility Program for Rickenbacker IAP based on operational data from a 12-month period ending April 2005. The study used the standard FAA INM program to establish noise contours based on those operations and is the FAA-approved and public document for the noise compatibility program currently in affect for the airport.

Based on aircraft operations data validated in February 2013 (FAA 2012a, 121 ARW 2013a), approximately 39,436 total aircraft operations occurred at Rickenbacker IAP during 2012; of those, the 121 ARW flew a total of 6,445 airfield operations with approximately 3 percent at night (approximately 16 percent of total operations at the airfield). These numbers were validated by the 121 ARW and Rickenbacker ATADs (FAA tower) report and are used as the basis for determining airfield operations for the Proposed Action (FAA 2012a, 121 ARW 2013a).

The current FAR Part 150 data identified 67,160 total aircraft operations that occurred at Rickenbacker IAP during the 12-month period ending April 2005. Per the request of the CRAA, the current approved Final FAR Part 150 Noise Compatibility Program Update August 2007 for Rickenbacker IAP is used as the baseline for this analysis (Gwiner 2013). The baseline aircraft operations at the airport used for this analysis differs from the current 2012 aircraft operations due to changes to airfield use by AirNet Systems Cargo with significantly reduced activity, along with reductions in general aviation and other cargo aircraft (CRAA 2007).

Table 3.5.1-1 summarizes the frequency of aircraft operations for Rickenbacker IAP based on the 2007 published FAR Part 150 Study. An aircraft operation is counted each time an aircraft

departs from the runway and each time they approach the runway. The majority of aircraft traffic includes jet cargo, charter aircraft along with based ANG KC-135, C-130, and general aviation aircraft. Although the number of aircraft operations at an airfield varies from day to day, for Rickenbacker IAP, operations are calculated for an AAD, meaning that yearly operations are averaged across all 365 days of the year. Table 3.5.1-1 reflects a total of approximately 184 aircraft operations on an AAD (67,160 divided by 365 days). Approximately 40 percent of the total operations occur during environmental night (10:00 p.m. through 7:00 a.m.).

Table 3.5.1-1. Current Rickenbacker IAP Annual Aircraft Operations FAR Part 150[1]

	Departures		Arrivals		Total[2]		Grand
Aircraft	*Day*	*Night*[3]	*Day*	Night[3]	*Day*	*Night*[3]	*Total*[2]
KC-135	6,570	0	6,205	365	12,775	365	13,140
Other Aircraft[4]	13,870	13,140	13,505	13,505	27,375	26,645	54,020
Total	**20,440**	**13,140**	**19,710**	**13,870**	**40,150**	**27,010**	**67,160**

Notes: 1. Operations based on currently approved FAR Part 150
2. Includes Closed Patterns (which count as two airfield operations).
3. Night –Between 10 p.m. and 7 a.m. for environmental night.
4. Other based military, civilian aircraft and transient aircraft (multiple type aircraft) including: Boeing 737, 747, and Airbus 300.

Source: CRAA 2007.

Based on the 2007 baseline data, the 121 ARW KC-135 aircraft flew a total of 13,140 annual airfield operations, or an average of 36 airfield operations a day. Approximately 3 percent of the total KC-135 operations occur during environmental night. Approximately 20 percent of total operations at Rickenbacker are accomplished by the 121 ARW KC-135 aircraft.

3.5.1.2 Runway and Flight Profiles

Rickenbacker IAP aircraft use VFR departures, published Standard Instrument Departures, straight in approaches, overhead approaches, published IFR or radar patterns, and VFR closed patterns along with re-entry VFR patterns as the basic flight patterns for local arrival and departures and flight training. Detailed representative arrival, departure, and closed pattern flight tracks are found in Appendix C, *Noise*.

3.5.1.3 Existing Noise Environment

Noise contours developed for the baseline conditions at Rickenbacker IAP are shown in Figure 3.5.1-1. The acreage within each DNL contour on and off Rickenbacker IAP property is shown in Table 3.5.1-2. Approximately 2,359 acres are exposed to DNL greater than or equal to 65 dB. Detailed information on off-airport land use that lies within a DNL greater than 65 dB can be found in Section 3.5.7, *Land Use*.

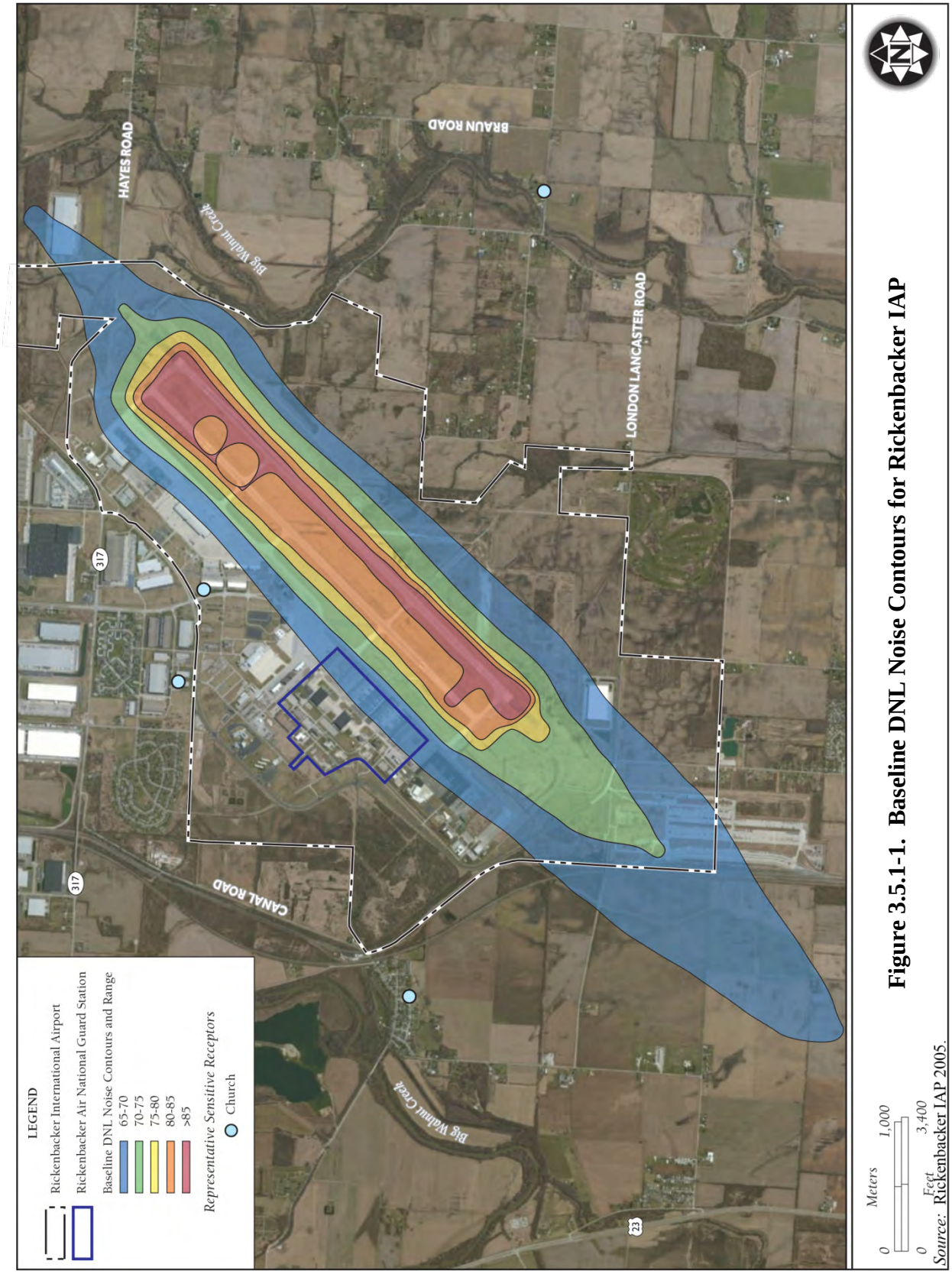


Figure 3.5.1-1. Baseline DNL Noise Contours for Rickenbacker IAP

Table 3.5.1-2. Acres within Baseline Noise Contours, Rickenbacker IAP

Noise Level (dB)	*On Airport (acres)*	*Off Airport (acres)*	*Total (acres)*
65-70	811	417	1,228
70-75	478	0	478
75-80	156	0	156
80-85	265	0	265
Greater than 85	232	0	232
Total	**1,942**	**417**	**2,359**

Notes: dB = decibel

Potential Hearing Loss

As shown in Table 3.5.1-2, there is no property off the Rickenbacker IAP that falls within the 80+ dB DNL noise contour; therefore, no potential hearing loss risk is currently associated with these areas.

3.5.1.4 Rickenbacker International Airport Noise Abatement Procedures

Rickenbacker IAP has published certain restrictions on flying activities that could adversely affect its neighbors in an effort to reduce noise impacts while maintaining safe operations. The restrictions are published on aeronautical charts and apply to both military and civilian aircraft. The restrictions include guidance for noise abatement procedures for the airfield including noise abatement procedures in effect from 11:00 p.m. until 7:00 a.m. for departures on Runways 23L and 23R with winds 10 knots or less and arrivals on Runways 05L and 05R with winds 10 knots or less. Aircraft are advised to contact airport operations for any other noise abatement instructions or more information (SkyVector 2013c).

3.5.1.5 Rickenbacker International Airport Noise Complaints Procedures

Rickenbacker IAP has an automated phone messaging system that the public can call to leave a complaint. The complaint is investigated and the individual receives a call back within 3 days. The airport planning office reviews the radar and listens to tower and ground communication to explore the noise complaints and provide a response. In 2012, Rickenbacker IAP received 17 noise complaints, 13 of which were found to be from military aircraft (primary transient military aircraft). Over the past five years, 156 noise complaints were submitted with 50 percent of those from military transient aircraft focused on the F-16, F-18, and other fighter or high performance transient aircraft (Gwiner 2013).

In addition, the 121 ARW noise complaint procedures include referring callers to the CRAA Noise Hotline at 614-239-4065. The caller may also submit noise complaints via email to the airport noise web site: noiseabatementoffice@columbusairports.com (121 ARW 2013c).

3.5.2 Air Quality

3.5.2.1 Regulatory Setting

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. The Ohio Environmental Protection Agency is the agency responsible for the regulation of air quality within the state of Ohio. The state of Ohio regulates air quality through the Ohio Administrative Code, Chapters 3745-14 through 3745-114. The state of Ohio has adopted the NAAQS, and has not adopted additional more stringent state standards. The NAAQS are summarized in Table 3.5.2-1.

Rickenbacker ANGS is located approximately 12 miles south of downtown Columbus, Ohio in Franklin County. The USEPA has classified the Columbus area, including all of Franklin County, as nonattainment for the O_3 and $PM_{2.5}$ NAAQS. The region is designated attainment/unclassified area for all other criteria pollutants. The Proposed Action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for ozone precursors (NOx and VOCs) is 100 tpy, and the *de minimis* emission threshold for $PM_{2.5}$ emissions is also 100 tpy.

The USEPA recently promulgated a more stringent standard for lead, and has redesigned its monitoring program to address lead and identified airports for monitoring because aviation gas used in piston aircraft still contains lead. The project area is considered attainment/unclassified for lead, and lead is not used in aviation fuel used in the KC-135 or KC-46A aircraft.

Table 3.5.2-1. Ambient Air Quality Standards

Pollutant	*Averaging Time*	NATIONAL STANDARDS [a]	
		Primary [b,c]	*Secondary* [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	—	—
CO	8-hour	9 ppm (10 mg/m^3)	—
	1-hour	35 ppm (40 mg/m^3)	—
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—
SO_2	24-hour	—	—
	3-hour	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—
PM_{10}	Annual	—	Same as primary
	24-hour	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3
	24-hour	35 µg/m^3	Same as primary
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary

Notes: a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.

b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.

c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.

d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide

Source: USEPA 2012.

3.5.2.2 Climate and Meteorology

Columbus is located in the central portion of Ohio in an area with relatively flat terrain. Situated in central Ohio in the drainage area of the Ohio River, Columbus is located on the Scioto and Olentangy rivers; two minor streams running through the city are Alum Creek and Big Walnut Creek. Columbus's weather is changeable, influenced by air masses from central and southwest Canada; air from the Gulf of Mexico reaches the region during the summer and to a lesser extent in the fall and winter. The moderate climate is characterized by four distinct seasons. Snowfall averages around 27 inches annually (Midwest Regional Climate Center 2013).

January is the coldest month, with an average minimum temperature of 20ºF. July is the hottest month, with an average maximum temperature of 86ºF. The average annual temperature is 52.8ºF. The average annual precipitation in Columbus is 40.0 inches (Midwest Regional Climate Center 2013).

Prevailing winds in Columbus are generally westerly to southwesterly during the year. The annual average wind speed is 8.3 miles per hour (Midwest Regional Climate Center 2013).

3.5.2.3 Regional and Local Air Pollutant Sources

The 121 ARW is based on the western side of Rickenbacker IAP in Franklin County, Ohio. The surrounding area to the west, south, and east of the airport is mainly agricultural, with light industrial/commercial uses to the north.

The USEPA's National Emissions Inventory includes data for the year 2008 for Franklin County. Table 3.5.2-2 summarizes the regional emissions (stationary, area-wide, and mobile) of criteria pollutants and precursor emissions for the affected areas.

Table 3.5.2-2. Regional Emissions for Franklin County, Ohio

	EMISSIONS, TONS/YEAR					
	CO	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
Regional Emissions						
Stationary Sources	18,108	3,208	3,797	1,326	3,180	2,719
Area-Wide Source	1,124	14,821	376	11	16,452	1,764
Mobile Sources	220,807	19,397	35,271	318	1,948	1,559
Total	**240,039**	**37,426**	**39,444**	**1,655**	**21,580**	**6,042**

Notes: Numbers may not add precisely due to rounding.
Emissions of Pb are not included because the affected region contains no significant sources of this criteria pollutant.
CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: USEPA 2008.

3.5.2.4 Baseline Air Quality

Representative background air monitoring data for the Rickenbacker ANGS for the period 2008-2012 are shown in Table 3.5.2-3. The closest monitoring stations to Rickenbacker IAP include monitoring stations in Columbus, which measure O_3, CO, PM_{10}, $PM_{2.5}$, and SO_2 (2008 – 2009). NO_2 data were collected in Cincinnati, and SO_2 data were collected from 2010 through 2012 in Clark County. NO_2 data from Cincinnati may be conservative as the area is more developed than the area surrounding Rickenbacker IAP.

As shown in Table 3.5.2-3, the area has experienced several O_3 exceedances during the recent 5-year period; however, Franklin County has not been designated as an O_3 nonattainment area.

The Columbus area also experienced two exceedances of the 24-hour $PM_{2.5}$ standard in 2010. The data show that the area did not experience violations of other NAAQS.

Table 3.5.2-3. Ambient Air Monitoring Data for the Columbus Area

Air Quality Indicator	*2008*	*2009*	*2010*	*2011*	*2012*
Ozone (O_3)					
Peak 8-hour value (ppm)	0.087	0.074	0.079	0.079	0.102
Days above federal standard (0.075 ppm)	2	0	2	6	8
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)					
Peak 24-hour value ($\mu g/m^3$)	33.1	26.2	38.7	31	26.6
Days above federal standard (35 $\mu g/m^3$)	0	0	2	0	0
Annual Average value ($\mu g/m^3$)	12.8	11.5	13.1	11.9	10.7
Particulate matter less than or equal to 10 microns in diameter (PM_{10})					
Peak 24-hour value ($\mu g/m^3$)	82	64	138	86	74
Days above federal standard (150 $\mu g/m^3$)	0	0	0	0	0
Carbon Monoxide (CO)					
Peak 1-hour value (ppm)	2.7	3.1	3.1	2.3	3.0
Days above federal standard (9 ppm)	0	0	0	0	0
Peak 8-hour value (ppm)	1.7	1.6	2.0	1.9	2.0
Days above federal standard (35 ppm)	0	0	0	0	0
Nitrogen Dioxide (NO_2)					
Peak 1-hour value (ppm)	0.079	0.056	0.069	0.054	0.043
98th Percentile (ppm)	0.058	0.050	0.054	0.046	0.040
Days above federal standard (0.100 ppm)	0	0	0	0	0
Sulfur Dioxide (SO_2)					
Peak 1-hour value (ppm)	0.038	0.036	0.034	0.028	0.023
99th Percentile (ppm)	0.029	0.036	0.028	0.022	0.018
Days above federal standard (0.075 ppm)[1]	0	0	0	0	0
Peak 24-hour value (ppm)	0.013	0.012	0.014	0.013	0.010

Notes: 1. The federal 1-hour SO_2 standard was adopted in 2010.
$\mu g/m^3$ = micrograms per cubic meter; NA = data not available; ppm = parts per million
Source: USEPA 2013a.

3.5.2.5 121st Air Refueling Wing Emissions

The 121 ARW currently flies and maintains 18 KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 121 ARW include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance (121 ARW 2008).

Emissions for the 121 ARW have been quantified in the *Final 2009 Air Emissions Inventory* (121 ARW 2011a). The inventory evaluated the emissions from the 121 ARW to determine its status under the Title V Federal Operating Permits program. Based on the major source thresholds for the area, the major source thresholds are 100 tpy for all criteria pollutants, and less than 10 tpy of any single HAP or 25 tpy of any combination of HAPs (121 ARW 2011a).

The 121 ARW is not required to operate under a Title V Operating Permit. The 2009 Air Emissions Inventory demonstrates that total base-wide potential emissions from stationary sources are below the major source thresholds (121 ARW 2011a).

Stationary source emissions at the 121 ARW include emissions from natural gas and fuel oil fired heating units, internal combustion engines, fuel tanks, and minor sources including chemical use, aircraft deicing, and fuel cell maintenance activities. Mobile source emissions include emissions from aircraft operations (take-offs and landings), AGE, ground vehicle operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft operations at the 121 ARW considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the default mixing height (3,000 feet AGL). Baseline emissions also include stationary sources and emissions associated with vehicle trips associated with existing personnel and dependents. These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the installation (121 ARW 2011a).

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #5, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related AGE, and POVs associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations identified baseline airfield operations identified in Table 2.3-25, utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet AGL. A discussion of the methodology for quantifying emissions is provided in Appendix A, Section A.2.3. Emissions for the baseline emissions associated with baseline operations of the KC-135 aircraft are provided in Table 3.5.2-4.

Table 3.5.2-4. 121 ARW Baseline Emissions at Rickenbacker ANGS

	EMISSIONS, TONS/YEAR						
Emission Source	*VOCs*	*CO*	*NO_x*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*	*CO_2e*
KC-135 Baseline Aircraft Operations	4.63	68.57	64.35	6.38	0.34	0.34	17,742
AGE	0.01	0.02	0.15	0.00	0.01	0.01	3,333
Engine Testing	0.11	1.55	0.43	0.07	0.01	0.01	185
POVs	4.55	67.35	3.55	0.05	0.15	0.07	2,407
Total Baseline Emissions	**9.29**	**137.50**	**68.48**	**6.50**	**0.51**	**0.42**	**23,667**

Notes: Numbers might not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Source: 121 ARW 2011a.

3.5.3 Safety

This section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, APZs/RPZs, explosive safety, and AT/FP. Flight safety includes discussions on flight safety procedures, aircraft mishaps, BASH, and fuel jettison requirements. The affected environment includes the airfield and local airspace surrounding Rickenbacker IAP.

3.5.3.1 Ground Safety

Fire/Crash Response

ARFF services at Rickenbacker ANGS are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services. ARFF equipment and personnel at Rickenbacker ANGS meet USAF requirements (Headquarters AMC and NGB 2013b).

Accident Potential Zone/Runway Protection Zone

Development restrictions associated with RPZs are intended to preclude incompatible land use activities from being established in these areas. The city of Columbus, Ohio utilizes the FAA's airport land use compatibility guidelines, and as such, the RPZs have allowed development to be compatible with airport operations. Details of development and land use in the Rickenbacker IAP vicinity are included in Section 3.5.7, *Land Use*.

Explosive Safety

No QD arcs exist at Rickenbacker IAP as there are no storage facilities of any hazardous materials on the installation (Headquarters AMC and NGB 2013b).

Anti-Terrorism/Force Protection

Many of the military facilities at the 121 ARW installation at Rickenbacker ANGS were constructed before AT/FP considerations became a critical concern. Thus, under current conditions, many facilities do not comply with all current AT/FP standards. However, as new construction occurs and as facilities are modified, the 121 ARW would incorporate these standards to the maximum extent practicable.

3.5.3.2 Flight Safety

Flight Safety Procedures

Aircraft flight operations from Rickenbacker ANGS are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2KC-135V3, *Flying Operations, C/KC-135 Operations Procedures*, 2010) to ensure flight safety. While having aircraft in close proximity during air refueling is inherently dangerous, refueling mishaps are rare. Emergency separation procedures are established and practiced by both tanker and receiver aircrews.

Aircraft Mishaps

KC-135 aircraft (all models) have flown more than 14,750,000 hours since the aircraft entered the USAF inventory in 1957. Over that period, 83 Class A mishaps have occurred and 64 aircraft have been destroyed (specific statistics for mishaps during refueling are not recorded). This results in a Class A mishap rate of 0.56 per 100,000 flight-hours, and an aircraft destroyed rate of 0.43 per 100,000 flying hours (AFSEC 2012). The last Class A mishap of a 121 ARW aircraft at the Rickenbacker airfield was in 2002 (Buzzard 2013).

Bird/Wildlife Aircraft Strike Hazard

The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 40 years indicates that 39 USAF KC-135 aircraft have been destroyed and 33 fatalities have occurred from bird/wildlife aircraft strikes, with the last Class A mishap occurring in 2010 (AFSEC 2013).

The 121 ARW has an on-going BASH program through which information and assistance is freely shared between airfield users, the Rickenbacker IAP staff, and the local air traffic controllers. Serious BASH-related accidents within the immediate Rickenbacker IAP area are unusual and have never resulted in a Class A mishap (Buzzard 2013). The 121 ARW has recently recorded 21 minor BASH incidents in 2010, 19 in 2011, and 13 in 2012, and an average over 8 years of 22 incidents (Buzzard 2013).

Fuel Jettison

For use in emergency situations, the KC-135 aircraft have the capability to jettison fuel and reduce aircraft gross weight for flight safety. Airbases must establish jettison areas and procedures to minimize the impact of fuel jettisoning. Ideally, jettison areas are established at

altitudes above 20,000 feet AGL, off published federal airways, avoiding urban areas, agricultural regions, and water supply sources

The primary fuel jettison area for the 121 ARW is within the Buckeye MOA, and above 20,000 feet AGL (121 ARW 2011b). The aircrew would follow fuel jettisoning procedures in AFI 11-2KC135, C/KC-135 Operations Procedures.

3.5.4 Soils and Water

3.5.4.1 Soils

This area of Ohio is within the Columbus Valley, which was formed by glaciers and has relatively level to gently rolling terrain. This area is characterized by limited relief except near streams, glacial moraines, or resistant bedrock (USDA 2006). The 121 ARW installation is located on relatively flat improved land with relief ranging from 734 to 744 feet MSL (121 ARW 2010).

The NRCS Soil Survey for Franklin County, Ohio identifies the following two individual soil types at the installation:

Kokomo-Urban land complex. This soil, typically found in shallow depressions and drainages, is composed of silty and clayey till. The rating class for building site development is considered very limited due to ponding, shrink-swell potential, and depth to saturated zone (NRCS 2013d). Approximately 20 percent of the installation is composed of this soil type.

Crosby-Urban land complex, 0 to 2 percent slopes. This soil consists of strongly intermingled Urban land and Crosby soil. Urban land consists of soil from cut/fill sites used for buildings, paved roads, parking lots, and other areas of urban development. The rating class for building site development is not rated for this soil type (NRCS 2013d). Approximately 80 percent of the installation is composed of this soil type.

3.5.4.2 Surface Water

The 121 ARW installation is located within the Scioto River Watershed that encompasses over 6,510 square miles within the state of Ohio (USEPA 2013e) (Figure 3.5.4-1). The Scioto River Watershed drains a very diverse landscape from rural to dense urban environments and covers portions of Crawford, Delaware, Franklin, Hardin, Logan, Madison, and Union counties. The Scioto River originates near Roundhead in Hardin County, running south through central Ohio before emptying into the Ohio River at the confluence in Portsmouth, Ohio (Mid-Ohio Regional Planning Commission 2012).

Surface water features within the vicinity of the 121 ARW installation include Scioto River and Big Walnut Creek to the east and Walnut Creek to the west. Surface water within the installation primarily consists of a series of man-made ditches, storm sewers, and drainage swales. Drainage of the developed area is typified by overland flow to storm drain inlets and basins connected by a network of underground pipes.

There are two primary drainage areas on the installation, SDO-014 and SDO-601. Both outfalls, SDO-014 and -601, exit the installation via the SDO-014 drainage ditch that discharges into an unnamed tributary that ultimately converges with the Big Walnut Creek. These two outfalls are regulated under the Ohio Industrial Stormwater General Permit (OHR000005). The permit is administered by the Ohio Environmental Protection Agency under the auspice of the USEPA (121 ARW 2009).

3.5.4.3 Groundwater

Groundwater in this area is part of the Central Lowland Aquifer Province. Central Lowland aquifers are generally comprised of unconsolidated sand and gravel deposits and consolidated sandstone, limestone, and dolomite. The unconsolidated sand and gravel deposits, which are collectively called the surficial aquifer system, supply more than 50 percent of the fresh groundwater withdrawn in the Central Lowland Province, and are primarily glacial in origin (USGS 1995d).

Three aquifers have been identified beneath the 121 ARW installation: the upper water-bearing zone, the intermediate aquifer, and the deep aquifer. The upper water-bearing zone is found beneath all portions of the installation, with the top of the water table typically less than 10 feet below ground surface. Groundwater flow direction and gradient in the upper zone is controlled primarily by surface topography, including the configuration of the drainage system and the locations of the creeks in the area. A north/south trending groundwater divide is located in the central portion of the installation. Groundwater west of this divide flows southwest toward Big Walnut Creek. Groundwater east of the divide flows southeast toward Little Walnut Creek (121 ARW 2010).

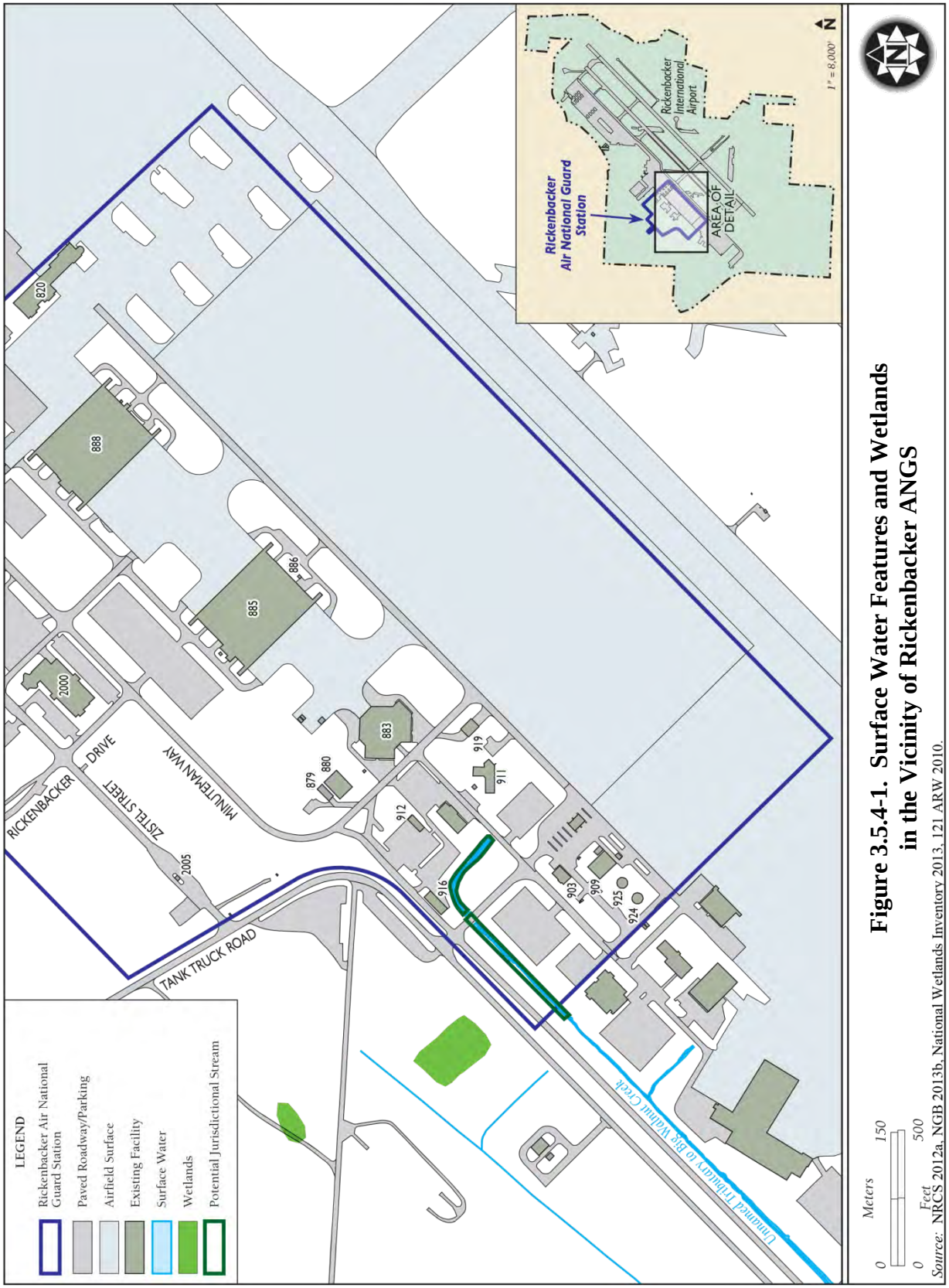


Figure 3.5.4-1. Surface Water Features and Wetlands in the Vicinity of Rickenbacker ANGS

Source: NRCS 2012a, NGB 2013b, National Wetlands Inventory 2013, 121 ARW 2010.

The intermediate and deep aquifers are confined. The intermediate aquifer is the shallowest aquifer capable of supporting a water supply adequate for domestic use. It is present beneath the installation at depths of between 60 and 100 feet below ground surface with a west and west southwest gradient. The deep aquifer lies at depths of between 130 and 210 feet below ground surface, where it meets a shale bedrock layer. The gradient of the deep aquifer is west and west southwest (121 ARW 2010).

3.5.4.4 Floodplains

A majority of the installation lies within the FEMA Flood Insurance Rate Map for Franklin County, Ohio, Panel 437 (Map Number 39049C0437K, Effective June 17, 2008) within an area designated as Zone X. The designation Zone X are areas determined to be outside the 0.2 percent annual chance flood (500 year flood), indicating areas of minimal flooding. The northern portion of the installation lies within Panel 433 (Map Number 39049C0433K) also determined to be Zone X (FEMA 2008).

3.5.5 Biological Resources

3.5.5.1 Vegetation

The Rickenbacker IAP occurs within the ecotone between the Eastern Broadleaf Forest Continental and Oceanic Provinces. Vegetation in this region typically is characterized by deciduous forests dominated by tall broadleaf trees often with a drought-resistant oak-hickory association in the western portion of the province. Dominant trees within these forests include white oak (*Quercus alba*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), bitternut hickory (*Carya cordiformis*), and shagbark hickory (*Carya ovata*) (Bailey 1995). The majority of the airport is developed or actively landscaped, with little natural vegetation or habitat remaining. A few small, hardwood forested areas occur near the southwest, south, and east sides of the 121 ARW installation.

3.5.5.2 Wildlife

Due to the lack of substantial pockets of native vegetation, high noise levels, and human activities at and surrounding the airport, wildlife habitat is limited. As a result, the majority of wildlife present at the airport and the 121 ARW ANGS consists of species that are highly adapted to developed and disturbed areas. Rickenbacker ANGS is located within the Mississippi Flyway, one of four major North American corridors for migratory birds. The majority of the bird species found at Rickenbacker IAP or its vicinity are protected under the MBTA. Common bird species include Turkey Vultures (*Cathartes auru*), Rock Pigeons (*Columbia livia*), House Sparrows (*Passer domesticus*), Red-tailed Hawks (*Buteo jamaicensis*), Rough-legged Hawks

(*Buteo lagopus*), Great Horned Owls (*Bubo virgianus*), Barn Owls (*Tyto alba*), Screech Owls (*Otus asio*), American Goldfinch (*Carduellis tristis*), Killdeer (*Charadrius vociferous*), Blue Jay (*Cyanocitta cristata*), Horned Lark (*Eremophila alpestris*), Barn Swallow (*Hirundo rustica*), European Starling (*Sturnus vulgaris*), and Mourning Dove (*Zenaida macroura*). Other common wildlife species observed in or near the airport include white-tailed deer (*Odocoileus virginianus*), woodchuck (*Marmota monax*), eastern gray squirrel (*Sciurus carolinensis*), and spring frog (*Hyla* sp.) (121 ARW 2010, 2011c).

3.5.5.3 Special Status Species

No federally listed or candidate species are known to occur within the airport or on the 121 ARW installation. The potential for several federally listed species to occur within Franklin County within the vicinity of the airport exists; however, there is little to no habitat for these species within the airport or the installation (USFWS 2005). One state endangered species, the Northern Harrier (*Circus cyaneus*), was observed during a 2004 survey of the airport. However, no nesting habitat (i.e., shrubby thickets) occurs within the airport boundaries. Several other state listed species have been observed within Franklin County and have the potential to occur on or within the vicinity of the installation; however, none of these have been observed on the installation. A list of these species can be found in Appendix E. There is no critical habitat located on the installation (Ohio Department of Natural Resources 2012; USFWS 2005, 2010).

3.5.5.4 Wetlands

A formal wetland delineation was conducted on the 121 ARW installation in 2005. This delineation identified only one jurisdictional stream in the northwest corner of the installation. This stream is an unnamed tributary to Big Walnut Creek and has a small wetland fringe immediately adjacent estimated to be 0.05 acre. No other jurisdictional wetlands or waters of the U.S. were identified within the installation boundaries (121 ARW 2010, OH ANG 2006) (see Figure 3.5.4-1).

A small drainage ditch is located near the intersection of Second Street and Tank Truck Road, as shown in Figure 3.5.4-1. This ditch is approximately 30 feet wide and flows to the northwest and eventually drains to Big Walnut Creek via a network of ditches. Although this ditch has not been surveyed, it is similar to other ditches (including the one surveyed during the 2005 delineation) on and around the airport and it is therefore likely a jurisdictional stream (121 ARW 2010, OH ANG 2006).

3.5.6 Cultural Resources

3.5.6.1 Archaeological Resources

The entire 121 ARW installation at Rickenbacker has been intensively surveyed for archaeological resources. Three archaeological sites have been recorded on the installation. Sites 33FR2652 and 33FR2653 are both isolated prehistoric artifacts found in disturbed soil contexts (National Guard Bureau 2008). These sites are not considered eligible to the NRHP and the Ohio SHPO has concurred (see Snyder 2007 in Appendix B4). Site 33FR2844 was discovered in 1985 during excavation for a new building foundation. It was described as a multi-component archaeological site consisting of two historic burials with associated historic coffin materials, a historic dump, and a prehistoric lithic scatter. The site was determined eligible for inclusion on the NRHP (Ohio ANG 2011).

3.5.6.2 Architectural Resources

Eighteen buildings within the 121 ARW property pre-dating the end of the Cold War-era (pre-1990) were inventoried in 2006. Two hangars (Hangars 885 and 888) are considered eligible for listing in the NRHP under criterion A and criterion C (121 ARW 2011d). The remaining 16 buildings are not eligible for listing in the NRHP. The Ohio Historic Preservation Office has concurred with these eligibility determinations (121 ARW 2011d, Snyder 2007).

3.5.6.3 Traditional Resources

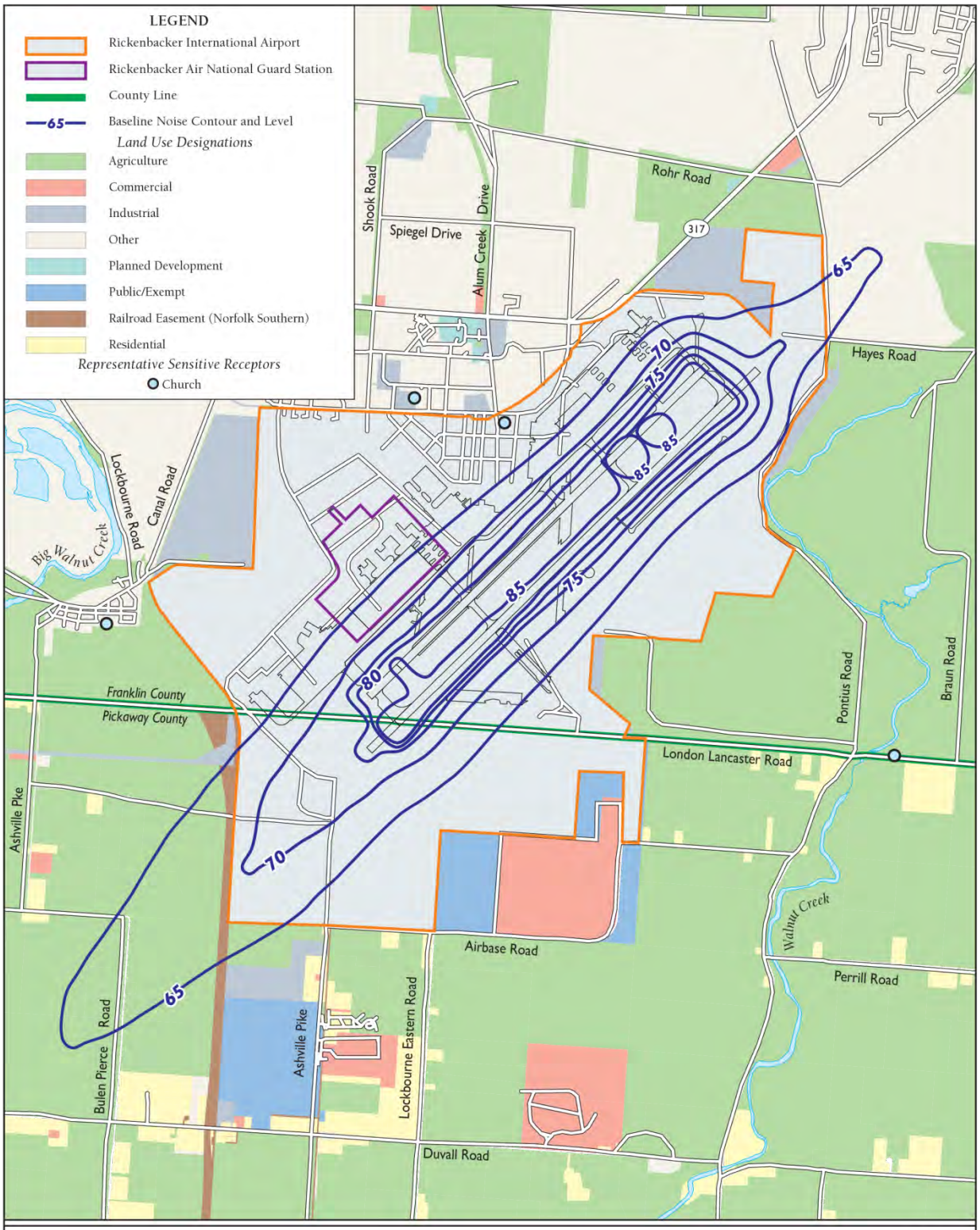
The 121 ARW installation contains no known traditional resources; however, 13 federally-recognized Tribes that are historically, culturally, and linguistically affiliated with the area have been identified: Citizen Potawatomi Nation, Delaware Nation, Prairie Band of Potawatomi Nation, Eastern Shawnee Tribe of Oklahoma, Forest County Potawatomi Community, Hannahville Indian Community, Miami Tribe of Oklahoma, Ottawa Tribe of Oklahoma, Peoria Tribe of Indians Oklahoma, Pokagon Band of Potawatomi Indians, Shawnee Tribe, Turtle Mountain Band of Chippewa Indians of North Dakota, and Wyandotte Nation.

3.5.7 Land Use

Rickenbacker ANGS operates as a tenant activity of Rickenbacker IAP, which operates military, commercial, and cargo flights. The entire airport occupies 4,342 acres and is located 10 miles south of the central business district of Columbus, Ohio, near the village of Lockbourne in southern Franklin County and the northernmost part of Pickaway County.

Zoning surrounding the airport generally supports compatible land use planning and provides for protection of the areas surrounding Rickenbacker IAP. Comprehensive Land Use plans adopted by Franklin and Pickaway Counties guide long-term planning. Hamilton Township land use codes define and established airport hazard zones, height limitations, and land use restrictions within these zones. This zoning protects RPZs from incompatible land use. Detailed descriptions of RPZs can be found in the Safety section of Appendix A, Section A.3. Land use in the areas surrounding the airfield is predominantly Agricultural/Open Space interspersed with pockets of single-family residential parcels. Commercial use dominates along the northwest boundary of the airfield in Hamilton Township. No houses, churches, schools or other sensitive noise receptors are located within the 65 dB and 70 dB DNL off-airport noise contour areas (CRAA 2007).

Figure 3.5.7-1 is an overlay of the baseline noise contours onto a map displaying the existing land use in the vicinity of the installation. The impact of baseline airfield activities on surrounding communities in these areas is limited. Current noise levels between 65 dB DNL and 70 dB DNL expose off-base areas of Agricultural and Industrial to the southwest in Pickaway County and to a lesser degree to the northeast of the airport in Franklin County. Both land use designations are considered compatible uses under Federal Interagency Committee on Urban Noise (FICUN) standards found in Appendix A, Section A.7 (CRAA 2007).



Meters
0 1,000
0 3,500
Feet

Figure 3.5.7-1. DNL Noise Contours and Land Use at Rickenbacker IAP

Source: Pickaway County 2013, Franklin County Zoning 2013, Rickenbacker IAP 2005.

3.5.8 Infrastructure and Transportation

3.5.8.1 Potable Water System

Potable water for the 121 ARW installation is provided by the Franklin County Parsons Avenue Water Treatment Plant operated by the City of Columbus (121 ARW 2010). Potable water in the area is supplied primarily from the regional groundwater aquifer wells. The City of Columbus Water Division pumps approximately 190 trillion gallons of water per year to its customers. The groundwater supply is supplemented with treated surface water from the Scioto River and the Big Walnut Creek (Franklin County Department of Sanitary Engineering 2010). In CY 2012, 1.8 trillion gallons of potable water was supplied to the 121 ARW installation (121 ARW 2013d).

3.5.8.2 Wastewater

The 121 ARW installation generates wastewater from sanitary, stormwater, and industrial processes, including OWS discharge, wash rack discharge, floor wash-down, latrines, sinks, and showers. Wastewater generated within the 121 ARW installation is conveyed into the municipal sewage system, operated by the City of Columbus to the Columbus Southerly Wastewater Treatment Plant. The facility has a capacity of 114 million gallons per day but typically receives 96 million gallons of wastewater per day for treatment (City of Columbus n.d.).

3.5.8.3 Stormwater

A high percentage of the active administrative and industrial areas of the installation are paved or roofed, resulting in high runoff rates during precipitation events. As described in the 121 ARW SWPPP (2009), the 121 ARW installation has a stormwater drainage conveyance system typified by overland flow to catch basins, inlets, surface drains, underground pipes, culverts, ditches, and swales that discharge to receiving waters (see Section 3.5.4, *Soils and Water*) or other municipal separate storm sewer systems. The stormwater drainage system has been designed to safely collect and transport surface water runoff from storm events to prevent flooding within the installation and is a separate system from the wastewater (sewage) system.

3.5.8.4 Electrical and Natural Gas Systems

Electricity is supplied to the 121 ARW installation by South-Central Power via an aboveground, 46,000-volt primary power line that was recently buried on the northern half of the installation. Natural gas is supplied by Columbia Gas of Ohio via main lines ranging in size from 0.5 inch to 4 inches in diameter. Electricity consumption for CY 2012 at the 121 ARW installation was 4,999,752 kilowatt hours. Natural gas consumption for CY 2012 at the 121 ARW installation was 219,801 hundred cubic feet (121 ARW 2013d).

3.5.8.5 Solid Waste Management

Municipal solid waste at the 121 ARW installation is managed in accordance with the *121 ARW Solid Waste Management Plan* (121 ARW 2013e) and guidelines specified in AFI 32-7042, *Waste Management* (2009). This AFI incorporates, by reference, the federal standard for solid waste regulations contained within 40 CFR, Subtitle D, *Non-hazardous Waste*, and other applicable federal regulations, AFIs, and DoD Directives. In general, AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for recycling, diversion, handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

The 121 ARW installation generates solid waste in the form of office trash, non-hazardous industrial wastes, normal municipal waste, and construction debris. These nonhazardous solid wastes are collected in dumpsters located throughout the 121 ARW installation and transported to the Franklin County Landfill.

3.5.8.6 Transportation

The 121 ARW installation is located within close proximity to several major highways. I-70 runs in an east-west direction approximately 8 miles north of the installation. I-270 runs in a northwest-southeast direction approximately 4 miles north of the installation and provides regional access to Rickenbacker IAP and the Rickenbacker ANGS. SR 317 provides direct access to Rickenbacker IAP. The principal access route to the airport is Alum Creek Drive, a four-lane arterial road that intersects I-70 and I-270, linking the airport to the regional ground transportation network. U.S. Highway 23, a principal arterial that runs north-south approximately 3 miles west of the airport and intersects I-270, also provides regional access. This highway intersects with Groveport Road, an arterial that provides access to the airport.

Rickenbacker Drive provides vehicle access to the road network and main cantonment area of the installation. The secondary entrance to the installation, Gate N-5, is typically used only by contractors (e.g., delivery of supplies by truck) to access the installation. This gate enters the installation off Tank Truck Road on the west side of the installation. Tank Truck Road connects to Zistel Street, which also connects with Rickenbacker Drive.

3.5.9 Hazardous Materials and Waste

3.5.9.1 Hazardous Materials

Hazardous materials are used at the 121 ARW installation for aircraft operations support and maintenance, including POL management and distribution, liquid fuels maintenance, transportation maintenance, vehicle paint, power production, machine shop operations, and flight

simulation. Types of hazardous substances found on the 121 ARW installation include strippers, batteries, spent cleaners, aerosols, paints, solvents, waste oils, hydraulic fluid, flammable and combustible liquids, acids, corrosives, and recovered fuels (121 ARW 2008). The primary storage facility for hazardous materials on the installation is in Building 872 (121 ARW 2006).

Sixteen ASTs are located on the 121 ARW installation and are used to store propylene glycol, gasoline, diesel, jet fuel, used oil, and used hydraulic oil. USTs were previously used at the installation to store kerosene, diesel, fuel oil, waste oil, jet fuel, gasoline, hydraulic fluid, and liquid propane. All USTs were removed from the 121 ARW installation in 1994 (121 ARW 2006).

Toxic Substances

Regulated toxic substances typically associated with buildings and facilities include asbestos, LBP, and PCBs. An asbestos survey was performed at the 121 ARW installation in 1995. ACM identified in the insulation, floor tiles, and mastic were found in Buildings 846 and 872 (121 ARW 2006).

A LBP survey has not been conducted at the 121 ARW installation. Any buildings on the installation constructed prior to 1978 are presumed to contain LBP and would be tested for LBP prior to demolition or renovation. Lead abatement was conducted in 2004 at Hangars 885 and 888 (121 ARW 2006).

The 121 ARW installation is permitted by the Nuclear Regulatory Commission for use of radioactive material in chemical agent monitoring devices (Permit No. OH-30567-01/00AFP). These devices are returned to the manufacturer for repair and disposal (121 ARW 2006).

The 121 ARW does not maintain, operate, or own any PCB equipment or PCB-contaminated equipment and the subject property is considered PCB-free (121 ARW 2006).

3.5.9.2 Hazardous Waste Management

The 121 ARW Oil and Hazardous Substances Spill Prevention and Response Plan contains the governing regulations for spill prevention and describes specific protocols for preventing and responding to releases, accidents, and spills involving oils and hazardous materials (121 ARW 2012). The 121 ARW Hazardous Waste Management plan outlines procedures for controlling and managing hazardous wastes from the point where they are generated until they are disposed. In addition, it includes guidance for compliance with all federal, state, and local regulations pertaining to hazardous waste (121 ARW 2008).

The 121 ARW is regulated as a Small Quantity Generator of hazardous waste and maintains USEPA Identification Number OH0000553829. A hazardous waste generation point is where

the waste is initially created or generated. An SAP is an area where hazardous waste is initially accumulated at the point of generation and is under the control of the SAP manager. Hazardous wastes initially accumulated at a SAP are accumulated in appropriate containers before being transferred to the installation CAP. There are 15 SAPs (where a waste is initially accumulated) identified at the installation in Buildings/Hangars 888, 2000, 883, 885, 872, and 846. The installation CAP is located in Building 872 (121 ARW 2008).

OWSs are used to separate oils, fuels, sand, and grease from wastewater and to prevent contaminants from entering the sanitary sewer and stormwater drainage systems. There are currently five OWSs located on the 121 ARW installation. These OWSs primarily receive discharge from floor drains in maintenance areas (121 ARW 2006).

3.5.9.3 Environmental Restoration Program

There is one active ERP site and five closed sites located on the 121 ARW installation. Table 3.5.9-1 provides details for each of these sites and Figure 3.5.9-1 shows the locations.

Table 3.5.9-1. ERP Sites within the 121 ARW Installation

ERP Site	*Materials of Concern*	*Status*
12	Old drum storage area that continued until 1984. Some drums contained methyl ethyl ketone, solvents, and paint strippers. Investigations determined that groundwater on the northwest side of the site was contaminated with chlorinated solvents. Groundwater remediation was performed to reduce contaminant concentrations below detection limits. In 1995 the southeast portion of the site was paved to create a parking lot for Building 887. In 1996, soils and grass were placed on the remaining portion of the site.	Active
46	Formerly known as AOC A. This site was investigated as part of a jet fuel pipeline investigation. Tier 1 and Tier 2 Bureau of Underground Storage Tank Regulation investigations were conducted and petroleum contamination levels were found to be below Bureau of Underground Storage Tank Regulation limits. Therefore, it was determined that remedial actions were not necessary.	Closed
19	Known as the North Coal Pile, this location was a concrete pad used for holding up to 6,000 tons of coal soaked in fuel oil. Arsenic, cadmium, chromium, mercury, lead, and nickel were detected in the groundwater underneath the site and polynuclear aromatic hydrocarbons were found in the soil and sediments.	Closed
22	This site was located behind the heating plant and adjacent to the former North Coal Pile and consisted of a concrete pad for drum storage. The concrete pad was removed and an interim remedial action was conducted to remove and treat the contaminated soils.	Closed
25	This includes all of the open drainage ditches throughout the installation which have had spills and leaks of hazardous materials and petroleum products discharged into them in the past. VOCs, semi-volatile organic compounds, pesticides, and metals were detected at several sites out of 51 sediment sampling locations.	Closed
35	Former UST that was removed in 1991.	Closed

Notes: AOC = Area of Concern; VOC = volatile organic compound; UST = underground storage tank
Source: 121 ARW 2006, 2010.

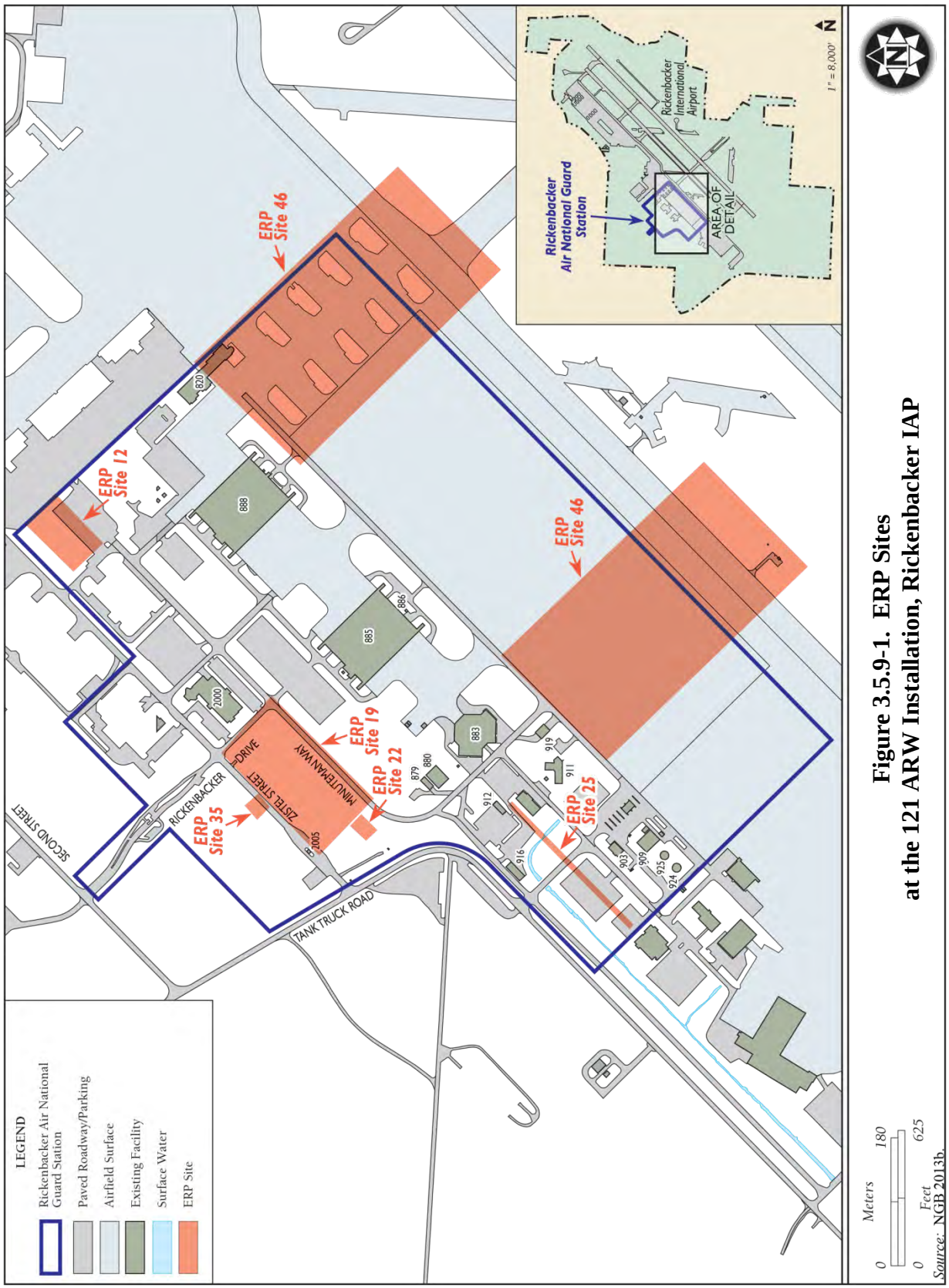


Figure 3.5.9-1. ERP Sites at the 121 ARW Installation, Rickenbacker IAP

3.5.10 Socioeconomics

3.5.10.1 Population and Employment

Population

Rickenbacker ANGS is located approximately 12 miles southeast of downtown Columbus in Franklin County. Current population data and estimates for the state of Ohio, Franklin, and Pickaway counties, Groveport and Lockbourne Villages, and Hamilton, Harrison, and Madison Townships are provided in Table 3.5.10-1. From 1990 to 2010, Franklin County's population increased by 201,977, an increase of approximately 21 percent. Pickaway County grew by 7,443 between 1990 and 2010, an increase of approximately 15 percent (USCB 1990e, 2000e, 2010g).

Table 3.5.10-1. Population Growth within the Vicinity of Rickenbacker ANGS

Area	*1990 Census*	*2000 Census*	*2010 Census*
Ohio	10,847,115	11,353,140	11,536,504
Franklin County	961,437	1,068,978	1,163,414
Pickaway County	48,255	52,727	55,698
Groveport Village[1]	2,948	3,865	5,363
Lockbourne Village[1]	N/A	280	237
Hamilton Township	9,746	7,950	8,260
Harrison Township	5,292	6,424	7,593
Madison Township	18,749	21,243	23,509

Notes: 1990 census data was not available for this village.
N/A = not available
Source: USCB 1990e, 2000e, 2010g.

The 121 ARW currently supports a workforce authorization of 1,497, including 442 full-time and 1,055 part-time personnel (see Table 2.3-30).

Employment and Earnings

Table 3.5.10-2 presents total labor force and employment rates for Ohio, Franklin and Pickaway counties, and Groveport and Lockbourne Villages. Based on 2007-2011 ACS 5-year estimates, there were 632,774 persons in the labor force (able to work) and 580,359 employed within Franklin County, resulting in an unemployment rate of approximately 8 percent. Labor force estimates for Pickaway County include 25,074 persons, with 23,184 employed, resulting in an unemployment rate of approximately 7 percent. Top employment industries in Franklin County include 1) educational services, and health care and social assistance; 2) retail; and 3) professional, scientific, and management, and administrative and waste management services (USCB 2011g). Principal employers include state of Ohio, The Ohio State University, JP Morgan Chase, Nationwide, and Ohio Health (Franklin County 2010). Top employment industries in Pickaway County include 1) educational services, and health care and social

assistance; 2) manufacturing; and 3) retail (USCB 2011g). Principal employers include ALSO Metals Corporation, Berger Health System, Circle Plastics/TriMold LLC, Circleville City Schools, and DuPont (Pickaway Progress Partnership 2013).

Table 3.5.10-2. Employment Data (2011) within the Vicinity of Rickenbacker ANGS[1]

Area	*Labor Force*	*Employed*	*Unemployed*	*Unemployment Rate (%)*
Ohio	5,883,960	5,338,072	545,888	9.2
Franklin County	632,774	580,359	52,415	8.3
Pickaway County	25,074	23,184	1,918	7.6
Groveport Village	2,973	2,842	131	4.4
Lockbourne Village	139	112	27	19.4
Hamilton Township	4,089	3,404	685	16.8
Harrison Township	3,710	3,443	267	7.2
Madison Township	12,473	11,612	861	6.9

Note: 1. Employment numbers include individuals in the Armed Forces and are from the 2007-2011 American Community Survey 5-Year Estimates.
Source: USCB 2011g.

3.5.10.2 Schools

According to the 2011 ACS enrollment 5-year estimates, 195,535 students were enrolled in schools from Kindergarten through Grade 12 in Franklin County. In Pickaway County, 10,658 students were enrolled in schools from Kindergarten through Grade 12 (USCB 2011g).

3.5.10.3 Housing

In 2010, the number of housing units in Franklin County was 525,186, with a vacancy rate of approximately 10 percent. In the Pickaway County in 2010, there were a total of 21,275 housing units with a vacancy rate of approximately 7 percent (USCB 2010g).

3.5.11 Environmental Justice and the Protection of Children

3.5.11.1 Minority and Low-Income Populations

Table 3.5.11-1 displays the minority, low-income, and children under age 18 within the state of Ohio, as well as the counties, villages, and townships within the vicinity of Rickenbacker IAP. Approximately 31 percent of the population of Franklin County is composed of minorities (i.e., an ethnic or racial group with a distinctive presence in a community), compared to approximately 17 percent for the state of Ohio. Pickaway County has a lower proportion of minorities (5.5 percent) than Franklin County or the state (USCB 2010g).

The percentage of population living below the poverty level for the state of Ohio (approximately 15 percent) is the lower than Franklin County (approximately 17 percent), but higher than Pickaway County (approximately 13 percent) (USCB 2010g).

Table 3.5.11-1. Population within the Vicinity of Rickenbacker ANGS[1]

Geographic Area	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*	*Children Under Age 18*	*Percent Children*
Ohio	11,536,504	1,997,067	17.3	1,707,403	14.8	2,730,751	23.7
Franklin County	1,163,414	357,797	30.8	202,434	17.4	278,542	23.9
Pickaway County	55,698	3,043	5.5	7,296	13.1	13,157	23.6
Groveport Village	5,363	962	17.9	493	9.2	1,271	23.7
Lockbourne Village	237	5	2.1	14	5.8	58	24.5
Hamilton Township	8,260	621	7.5	942	11.4	1,897	23.0
Harrison Township	7,593	266	3.5	1,496	19.7	2,141	28.2
Madison Township	23,509	3,856	16.4	2,092	8.9	5,953	25.3

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Source: USCB 2010g.

Currently there are no residential populations, including minority or low-income populations, located within the vicinity of Rickenbacker IAP within the baseline DNL greater than 65 dB or above.

3.5.11.2 Protection of Children

In 2010, the number of children under the age of 18 living in Franklin County was approximately 278,542 (approximately 24 percent of the population). In 2010, the number of children under the age of 18 living in Pickaway County was approximately 13,157 (approximately 24 percent of the population) (Table 3.5.11-1). The state of Ohio has a similar percentage population of children compared to the counties (approximately 24 percent). There are no on-installation housing or facilities for children located at the 121 ARW installation. Currently there are no schools exposed to DNL of 65 dB or above.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

The resource analyses presented in this chapter are based on an examination of potential effects that the various alternatives, including the No Action Alternative may have on existing environmental conditions. The alternatives are described in Chapter 2, and the existing environmental conditions for each resource are described in Chapter 3. This chapter examines the potential environmental consequences for each of the resource areas in the same sequence as presented in Chapter 3. The sections that follow present an evaluation of potential impacts within the specific ROI as a result of implementation of each of the alternatives using the analytical methodology presented in Appendix A.

4.1 ALTERNATIVE #1 -- FORBES AIR NATIONAL GUARD STATION

4.1.1 Noise

In this section, noise associated with flying operations and construction activities related to Alternative #1 are considered and compared with current conditions to assess potential impacts. Details of the methodologies used for this section can be found in Appendix A, Section A.1.2.

The DNL noise contours for Forbes ANGS were generated using the NOISEMAP computer model and represent the most current noise data available for establishing baseline conditions and for which to analyze changes to the noise environment in the Forbes ANGS ROI. DNL noise contours for the KC-46A under Alternative #1 were also generated using NOISEMAP through the removal of all KC-135 operations and the insertion of the proposed KC-46A operations using the substitute KC-46A noise data and flight profile data provided by Air Force Civil Engineer Center (AFCEC) and applying the data to the current KC-135 flight tracks and operational procedures.

4.1.1.1 Aircraft Noise

Under Alternative #1, 12 KC-46As would be based at Forbes ANGS, replacing the current 12 KC-135 aircraft. There would be no change in the number or type of other aircraft using the airfield and KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures in which the aircraft climbs or descends in the immediate vicinity of the airfield. Tactical training prepares aircrews for operations in forward operating locations in which flying at low-altitudes over land not controlled by friendly forces exposes the aircraft to ground-based threats. This procedure is currently being flown with the KC-135. Aircrews associated with the KC-46A would continue

to practice closed patterns, including tactical procedures; however, most tactical procedures would be accomplished in the simulator and at other locations away from Forbes Field Airport.

Under Alternative #1, the 190 ARW would have an increase in flying hours generating an increase in annual airfield operations by 4,110 from 10,452 to 14,562 operations (a 39 percent increase). Aircraft operations per average busy flying day (arrivals and departures [3.64] and closed patterns [16.64]) would increase under Alternative #1 to 4.94 arrivals and departures and 23.1 closed patterns/day. The percentage of 190 ARW annual aircraft operations occurring during environmental night (10 p.m. to 7 a.m.) would remain at the same 15 percent as under baseline conditions. The total number of operations flown by all other aircraft at Forbes Field Airport would not change from previously identified airfield activities (Table 4.1.1-1). There would be no change to any other aircraft types or aircraft flight tracks and profiles from the baseline condition.

Table 4.1.1-1. Forbes Field Airport Annual Aircraft Operations with Proposed KC-46A

Aircraft	Departures		Arrivals		Total[1]		*Grand Total[1]*
	Day	*Night[2]*	*Day*	Night[2]	*Day*	*Night[2]*	
KC-46A	6,322	959	6,118	1,163	12,440	2,122	14,562
Other Aircraft[3]	6,848	241	6,848	241	13,696	482	14,178
Total	**13,170**	**1,200**	**12,966**	**1,404**	**26,136**	**2,604**	**28,740**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other based military and civilian aircraft and transient aircraft (multiple type aircraft); example aircraft include: L-1011, MD-80, Lear 35, and HH-60.

Source: FAA 2012a, Forbes ANGS 2013.

Figure 4.1.1-1 depicts the noise exposure area from aircraft operations after the conversion from the current 12 KC-135 aircraft to 12 KC-46A aircraft, and Figure 4.1.1-2 compares baseline noise contours with Alternative #1 contours. The aircraft operations modeled include all transient aircraft, and general and commercial aircraft operations depicted in the most current Forbes Field Airport 2013 noise modeling update using 2012 data. Table 4.1.1-2 shows changes to the acreage of land within each noise contour under Alternative #1.

Table 4.1.1-2. Land Areas within DNL Contours at Forbes Field Airport Affected by DNL Greater than 65 dB under Baseline and Alternative #1

Noise Contour (dB DNL)	Baseline (KC-135) Total (acres)			Alternative #1 (KC-46A) Total (acres)			*Change Total (Acres)*
	On Airport	*Off Airport*	*Total*	*On Airport*	*Off Airport*	*Total*	
65-70	448	165	613	430	111	541	-72
70-75	308	0	308	286	0	286	-22
75-80	50	0	50	103	0	103	53
80-85	0	0	0	0	0	0	0
>85	0	0	0	0	0	0	0
Total	**806**	**165**	**971**	**819**	**111**	**930**	**-41**

Notes: DNL = Day Night Average Sound Level; dB = decibel

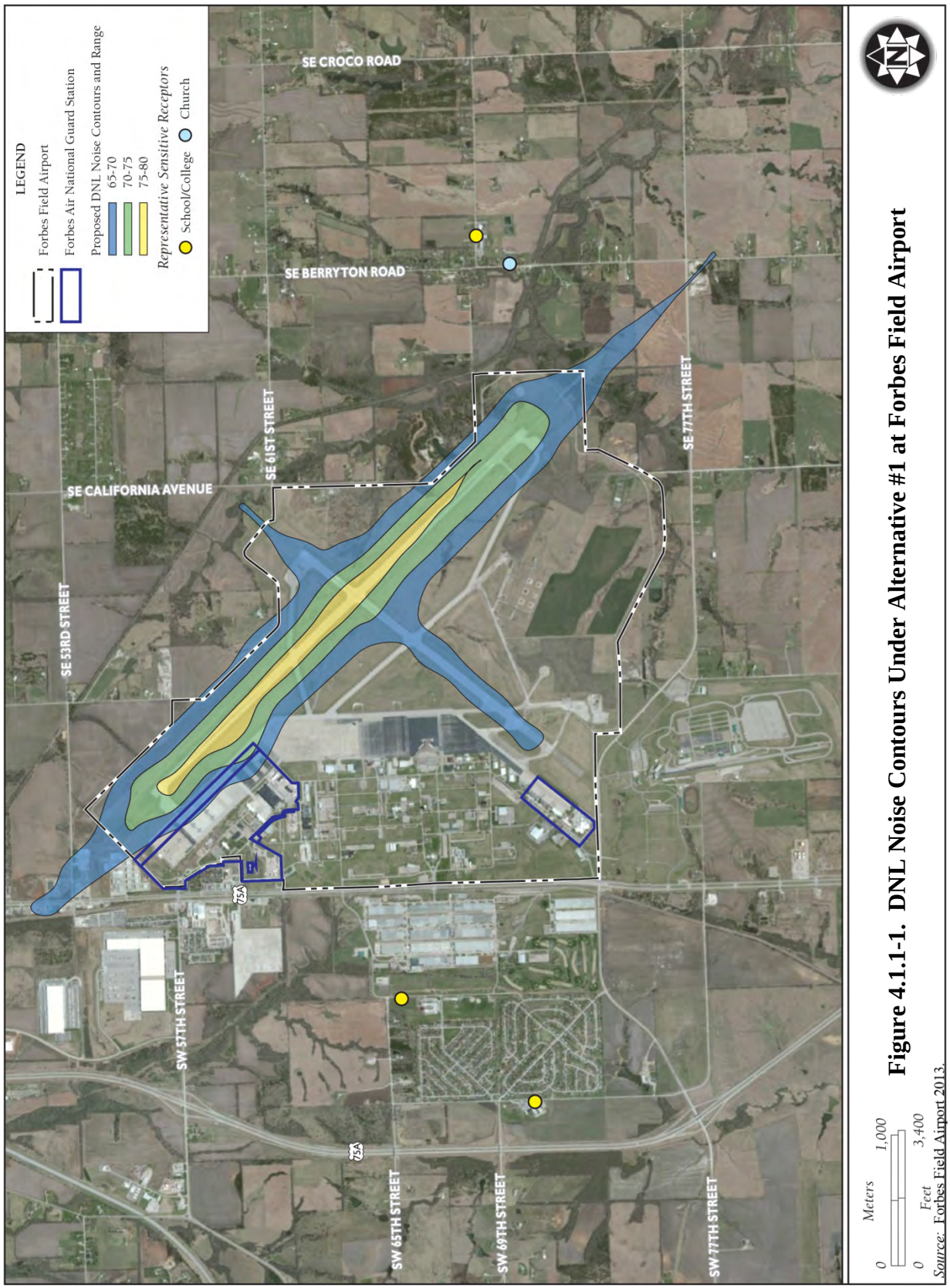
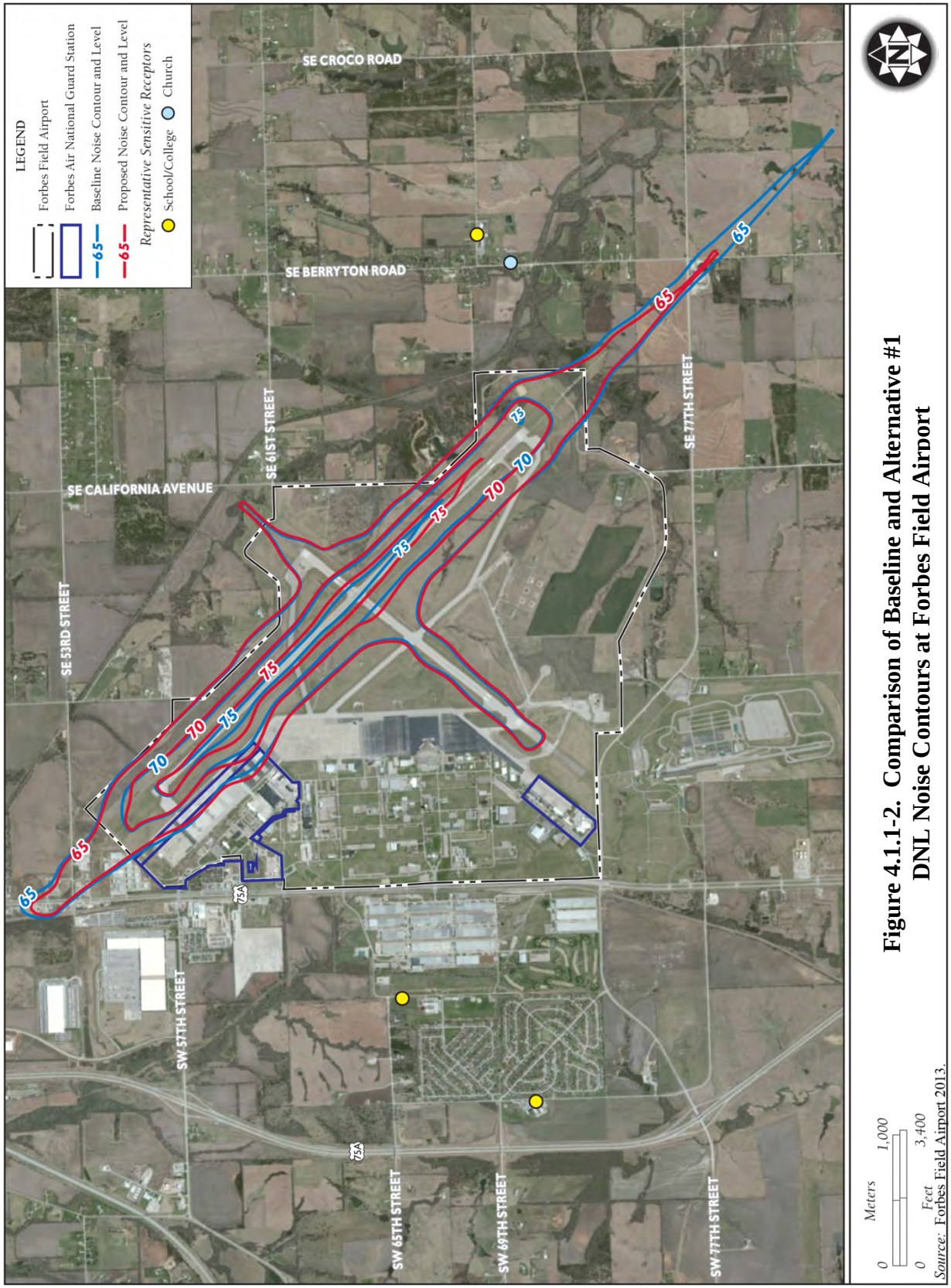


Figure 4.1.1-1. DNL Noise Contours Under Alternative #1 at Forbes Field Airport

Source: Forbes Field Airport 2013.



Source: Forbes Field Airport 2013.

Figure 4.1.1-2. Comparison of Baseline and Alternative #1 DNL Noise Contours at Forbes Field Airport

While the operations increase under Alternative #1, the DNL noise contours would reduce slightly from the baseline DNL noise contours because the KC-46A is generally a quieter aircraft (5 dB quieter on landing and 1 dB louder on take-off) than the KC-135 and other aircraft such as the F-18 and E-3 contributing more to the DNL levels than the KC-46A. Overall, the number of acres contained within the 65 dB DNL and greater exposure area would decrease by approximately 41 acres, or 4 percent, and would remain primarily on airport property with approximately 111 of the acres off the airport property. Information regarding the number of people residing in this area can be found in Section 4.1.11, *Environmental Justice and the Protection of Children*; and information regarding the area of residential use is located in Section 4.1.7, *Land Use*.

Percent of the Population Expected to be Highly Annoyed

The percentage of the population expected to be highly annoyed under Alternative #1 would not be expected to change from baseline conditions because there are no additional residences exposed to levels above 65 dB DNL.

Single Event Sound Analysis

Under Alternative #1, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Section A.1.2, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #1, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with less than 15 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.).

Per the ANG mission, the KC-46A would be operated Monday through Friday for a total of approximately 260 operational days per year, mirroring the operational patterns of current KC-135 operations. Based on the average annual day, aircrews would fly 4.94 sorties (initial departure and initial arrival) and approximately 23.1 additional practice approaches (closed patterns) at the airfield. The KC-46A mission would add an additional 4,110 airfield operations per year at the airport with approximately 15 percent conducted between 10:00 p.m. and 7:00 a.m.

Potential Hearing Loss

As shown in Table 4.1.1-1, there is no property off the Forbes Field Airport that falls within the 80+ dB DNL noise contour; therefore, there would be no potential hearing loss risk associated with these areas.

4.1.1.2 Construction Noise

There would be some minor noise from construction equipment associated with construction activities that would occur intermittently during the construction period (beginning FY 2015). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (Federal Highway Administration [FHWA] 2006) (Appendix C, *Noise*, Section A.1.2.2). Aviation-related activities at Forbes Field Airport dominate the local noise environment for brief times on some days. Equipment used during the facility construction would contribute little to the general background noise levels around the airfield. Therefore, impacts from construction under Alternative #1 would be negligible.

4.1.1.3 Summary of Impacts

While the number of annual airfield operations would increase by 4,110 (39 percent increase in 190 ARW operations, 17 percent increase in total airfield operations), the acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres. There would be no potential for hearing loss off the airport and no increase in the percent population highly annoyed. Construction noise would be localized and temporary and would not add to the overall noise environment. Impacts from noise would be negligible.

4.1.2 Air Quality

The air quality analysis estimated the magnitude of emissions that would result from implementation of the proposed KC-46A construction and operational activities at the 190 ARW of the KS ANG at Forbes Field Airport in Topeka, Kansas. The estimation of proposed operational emissions is based on the net change in emissions between existing aircraft operations and projected KC-46A operations.

As discussed in Appendix A.2.3, air quality impacts from the beddown of the KC-46A aircraft at Forbes Field Airport were reviewed for significance relative to the Prevention of Significant Deterioration (PSD) threshold for new major sources for attainment pollutants, and the General Conformity *de minimis* thresholds for nonattainment pollutants. Because the project region within Shawnee County attain all of the NAAQS, the PSD threshold of 250 tpy (100,000 tpy for greenhouse gases [GHGs]) was used as an indicator of the potential significance of the emissions from Alternative #1.

4.1.2.1 Operational Emissions

Sources associated with operation of the proposed KC-46A beddown at Forbes Field Airport include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) off-site POV commutes; and (4) AGE. It was assumed that other sources, including nonroad mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged.

Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the project noise analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (AFCEC 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were estimated based on the proposed personnel for the existing and proposed scenarios, using emission factors for vehicles from AFCEC 2013.

Table 4.1.2-1 summarizes the annual operational emissions that would result from KC-46A operations at Forbes Field Airport. Table 4.1.2-1 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at Forbes Field Airport. As shown in Table 4.1.2-1, the net emissions increases are below the PSD thresholds for all pollutants.

Table 4.1.2-1. Comparison of Baseline and Proposed Annual Operational Emissions, 190 ARW

	ANNUAL EMISSIONS, TONS/YEAR					
Baseline	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-135 Aircraft Operations	3.63	54.09	99.23	8.48	0.45	0.45
AGE	0.01	0.02	0.02	0.00	0.00	0.00
Engine Tests	0.17	2.52	0.69	0.11	0.01	0.01
POVs	1.94	26.38	1.46	0.02	0.06	0.03
Total	**5.75**	**83.00**	**101.39**	**8.61**	**0.53**	**0.49**
Proposed Action	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-46A Aircraft Operations	22.27	83.94	253.12	14.22	0.95	0.81
AGE	0.01	0.02	0.02	0.00	0.01	0.01
Engine Tests	1.27	4.33	1.17	0.14	0.01	0.01
POVs	1.59	23.99	1.11	0.02	0.06	0.03
Total	**25.14**	**112.28**	**255.42**	**14.38**	**1.04**	**0.86**
Net Increase	**19.40**	**29.28**	**154.03**	**5.77**	**0.51**	**0.37**
MOB 2 Net Emissions Increase Fraction of Existing Emissions	**3.47**	**0.35**	**1.52**	**0.67**	**0.96**	**0.76**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle; PSD = Prevention of Significant Deterioration

In addition to criteria pollutant emissions, the beddown of the KC-46A aircraft at Forbes Field Airport would result in emissions of HAPs and GHGs. Operational activities would result in a net increase of HAPs that is below 1 tpy.

Table 4.1.2-2 summarizes the annual operational greenhouse gas (GHG) emissions that would result from KC-46A operations at Forbes Field Airport, along with the net increase in comparison with the baseline. As shown in Table 4.1.2-2, emissions are below the PSD thresholds for GHGs.

Table 4.1.2-2. Comparison of Baseline and Proposed Annual Operational GHG Emissions, 190 ARW

	ANNUAL GHG EMISSIONS, METRIC TONS/YEAR			
Baseline	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-135 Aircraft Operations	23,347	0.65	0.73	23,585
AGE	2,421	0.07	0.08	2,446
Engine Tests	296	0.01	0.01	299
POVs	993	0.00	0.00	993
Total	**27,056**	**0.72**	**0.81**	**27,324**
Proposed Action	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-46A Aircraft Operations	38.724	1.02	1.15	39,102
AGE	3,291	0.09	0.11	3,326
Engine Tests	384	0.01	0.01	388
POVs	1,015	0.00	0.00	1,015
Total	**43,413**	**1.13**	**1.27**	**43,831**
Net Increase	**16,359**	**0.41**	**0.46**	**16,507**
PSD Threshold	**100,000**	**100,000**	**100,000**	**100,000**

Notes: Numbers may not add precisely due to rounding.
GHG = greenhouse gas; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; AGE = aerospace ground equipment; POV = privately owned vehicle

4.1.2.2 Construction Emissions

The KC-46A beddown at Forbes Field Airport would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would occur from (1) combustion emissions from heavy equipment and vehicles; and (2) fugitive dust emissions due to operation of equipment on exposed soil. Table 4.1.2-3 presents a summary of the annual construction emissions for the beddown of the KC-46A aircraft at Forbes Field Airport. As shown in Table 4.1.2-3, emissions would be below the PSD thresholds for all pollutants. For construction emissions, the project option with the greatest potential to emit was used in the analysis (see Table 2.3-5).

Table 4.1.2-3. Annual Construction Emissions Under Alternative #1

Construction Project	*CO*	*NO_x*	*VOC*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*	*Total CO_2, Metric tons/year*
Project #1 (Option 1) - Addition to Hangar 662	0.94	1.49	0.26	0.03	1.34	1.12	498.26
Project #2 (Option 2) - Addition to Building 665	1.52	2.42	0.43	0.05	2.45	1.88	808.91
Project #3 - Internal Renovations to Building 679	0.30	0.47	0.06	0.01	0.04	0.04	122.59
Project #4 (Option 2) - Pave Apron/Hydrants and Airfield Hold Ramp	5.38	12.98	1.32	0.66	10.93	4.59	3,319.19
Total Maximum Emissions	**8.14**	**17.36**	**2.07**	**0.75**	**14.76**	**7.63**	**4,748.95**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**100,000**

Note: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide; PSD = Prevention of Significant Deterioration

4.1.2.3 Summary of Impacts

Forbes ANGS is located in an attainment area for all criteria pollutants. While there would be increases in operational criteria pollutant emissions, they would be below the PSD threshold, and would not be significant. Operational GHG emissions would be within thresholds in the PSD tailoring. Impacts from construction emissions and operational HAP emissions would be negligible.

4.1.3 Safety

4.1.3.1 Ground Safety

Existing facilities at Forbes Field Airport for fire response and crash recovery meet KC-46A beddown requirements (Headquarters AMC and NGB 2013c).

Providing new and renovated facilities for the 190 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 190 ARW.

Proposed renovation and infrastructure improvement projects related to Alternative #1 would not impact aircraft take-off and landings or penetrate any RPZs. New building construction is not proposed, only existing building renovation and minor additions; therefore, construction activity would not result in any greater safety risk or obstructions to navigation. Operations would fall within the same general types as those that have historically occurred at Forbes Field Airport.

For example, the KC-46A would follow established local approach and departure patterns used. Therefore, flight activity and subsequent operations would not require changes to RPZs.

Planned construction at Forbes Field Airport comprises additions to existing buildings and internal modifications only; no new facilities are proposed. Therefore, none of the construction or demolition would be in conflict with the current QD arcs. Per Air Force Manual (AFMAN) 91-201, *Explosive Safety Standards*, there would be no public transportation route or inhabited building located within the proposed QD arcs. No explosives would be handled during construction or demolition activities. Therefore, no additional risk would be expected as a result of implementation of this alternative.

To support the aircraft beddown at Forbes ANGS, some facilities would require renovation/modification. However, no construction activities would involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures, including AFI 13-213, *Airfield Driving* (2011), would further minimize the relatively low risk associated with these construction activities.

The proposed construction projects meet all criteria specified in the ANG Handbook 32-1084, *Facility Space Standards.* AT/FP requirements have also been addressed to the extent practicable in all projects. Projects would use AT/FP site design standards for siting of facilities, parking, walkways, and other features. Renovations would bring the facilities into compliance with Unified Facilities Criteria (UFC) 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, providing additional protection for the personnel based there.

4.1.3.2 Flight Safety

Although the KC-46A is a new aircraft, it is a military derivative of the commercial Boeing 767 aircraft. First flown commercially in 1982, more than 1,000 commercial Boeing 767 aircraft have been produced and it is a proven commercial airliner, freighter, and tanker already in service (Boeing 2012). Mishap statistics for the commercial Boeing 767 show 14 total aircraft losses (similar to a Class A military mishap definition) during its 31 year lifetime (Aviation Safety Network [ASN] 2013).

Although no facilities are proposed that would affect navigable airspace, Forbes ANGS would comply with 14 CFR Part 77, *Objects Affecting Navigable Airspace*, as appropriate, should they be selected to host the KC-46A.

To augment airborne training missions, pilots flying the KC-46A would use simulators extensively. Simulator training includes all facets of flight operations and comprehensive emergency procedures. The sophistication and fidelity of current simulators and related computer programs are commensurate with the advancements made in aircraft technology and are extremely realistic. These factors should minimize risk associated with mishaps due to pilot error.

Under Alternative #1, there would be an increase of approximately 39 percent 190 ARW operations (17 percent in total airfield operations) at Forbes Field Airport airfield operations compared to existing conditions. Even after the proposed increase, however, the total airfield operations would remain fewer than many of the state's other commercial airfields, including Salina Regional Airport, Hutchinson Municipal Airport, Philip Billard Municipal (Topeka) Airport, and New Century (Olathe) AirCenter (FAA 2013). This increase in take-offs, landings, proficiency training, and other flights would result in a commensurate increase in the safety risk to aircrews and personnel.

The proposed increase in airfield flight operations would be expected to increase the opportunity for aircraft mishaps, including BASH incidents; however, the expected rate of mishaps or BASH incidents would not be expected to change from current conditions. Both the KC-135 and the commercial Boeing 767 have very low mishap rates, and with a new airframe and technological improvements, the KC-46A would be expected to have a similar safety record. In addition, current airfield safety procedures discussed previously would continue to be implemented and additional airfield flight operations would adhere to established safety procedures (190 ARW 2012b). In addition, KC-46A aircrews would be required to follow applicable procedures outlined in the 190 ARW BASH Plan (2012); adherence to this program has minimized bird/wildlife aircraft strikes. When risk increases, limits are placed on low-altitude flights and some types of training (e.g., multiple approaches, closed pattern work). Furthermore, special briefings are provided to pilots whenever the potential exists for greater bird/wildlife strike risks within the airspace; KC-46A pilots would also be subject to these procedures.

Given the low likelihood for an aircraft accident or BASH mishap to occur in the local airfield area and even lower likelihood for civilians to be impacted, impacts to safety in the vicinity of Forbes Field Airport as a result of Alternative #1 are expected to be negligible.

The KC-46A will have the capability to jettison fuel for emergency situations. Military policy is to avoid fuel jettisons, unless safety of flight dictates an immediate jettison, and requires senior officer approval before fuel jettison, unless under emergency situations. Records of KC-135 fuel jettison events reveal that such circumstances are rare, occurring in slightly less than two sorties per thousand (Headquarters AMC 2013). Additionally, unlike the KC-135, the KC-46A will

have the capability to land fully loaded with fuel so long as adequate runway length and braking capability are available (Headquarters AMC 2013), which could potentially lessen the need to jettison fuel in certain circumstances. Based on information provided by Boeing, landing the KC-46A above maximum landing weight is not prohibited; however, it does drive costly inspection requirements. To land above maximum landing weight routinely could reduce the fatigue life of the airplane (Headquarters AMC 2013).

4.1.3.3 Summary of Impacts

There would be a 39 percent increase in actual 190 ARW airfield operations (17 percent increase in total airfield operations) at Forbes Field Airport with commensurate increase in mishap and BASH potential. Construction activities would involve no unusual or extraordinary techniques. During construction, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.

4.1.4 Soils and Water

4.1.4.1 Soils

Under Alternative #1, new construction would consist of four separate projects resulting in up to 258,149 SF (5.9 acres) of new construction footprint and no new impervious surface. There are two construction scenarios for the aircraft conversion under consideration; only one of these options for each project would be implemented. The total construction footprint analyzed represents the largest possible footprint of each of the options (Table 2.3-5). These proposed construction projects would meet all criteria specified in ANG Handbook 32-1084, *Facility Space Standards*.

Proposed construction under Alternative #1 would occur on Ladysmith silty clay loam (0 to 1 percent slopes). This soil type is rated by the NRCS Web Soil Survey as very limited for roads and small commercial building development due to high shrink swell potential, low strength, ponding, frost action, and depth to saturated zone (NRCS 2013). In addition, this soil is designated as Prime Farmland under the Farmland Protection Policy Act. However, there would be no new impervious surface as a result of Alternative #1 and construction would occur on previously paved ground. In addition, as the construction is for national defense purposes and the surrounding land is already in urban development, the Farmland Protection Policy Act does not apply to this alternative.

To minimize potential impacts to soil and water resources associated with erosion, runoff, and sedimentation during construction activity, standard construction practices as described in the 190 ARW SWPPP (190 ARW 2012a) would be implemented during and following the construction period. Such practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate. A site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls is an effective way of controlling erosion while soil is exposed and subject to construction activity. An NOI must be filed with the state of Kansas to obtain coverage under the General Permit for Stormwater Runoff from Construction Activities (General Permit No. S-MCST-0312-1) prior to implementation of individual projects. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation. Implementation of these measures, as necessary and appropriate, would ensure that impacts to earth resources as a result of implementation of Alternative #1 would be minimal.

4.1.4.2 Surface Water

As a result of implementation of Alternative #1, there would be up to 258,149 SF (5.9 acres) of temporary soil disturbance from the proposed facility construction; however, there would be no increase in impervious surface (Figure 4.1.4-1). In accordance with UFC 3-210-10, *Low Impact Development* (LID) (as amended, 2010) and *Energy and Independence Security Act* (EISA) Section 438, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features. However, EISA does not apply in this instance since there would be no increase in impervious surface. Temporary soil disturbance could result in localized increases in total suspended particulates to nearby surface waters. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices as described above and in the 190 ARW SWPPP (190 ARW 2012a) would be implemented during and following the construction period. Implementation of these measures, as necessary and appropriate, would ensure that impacts to surface water as a result of implementation of Alternative #1 would be minimal.

4.1.4.3 Groundwater

As a result of Alternative #1, there would be no increase in the amount of impervious surface as a result of proposed construction. Therefore, impacts to groundwater would be negligible.

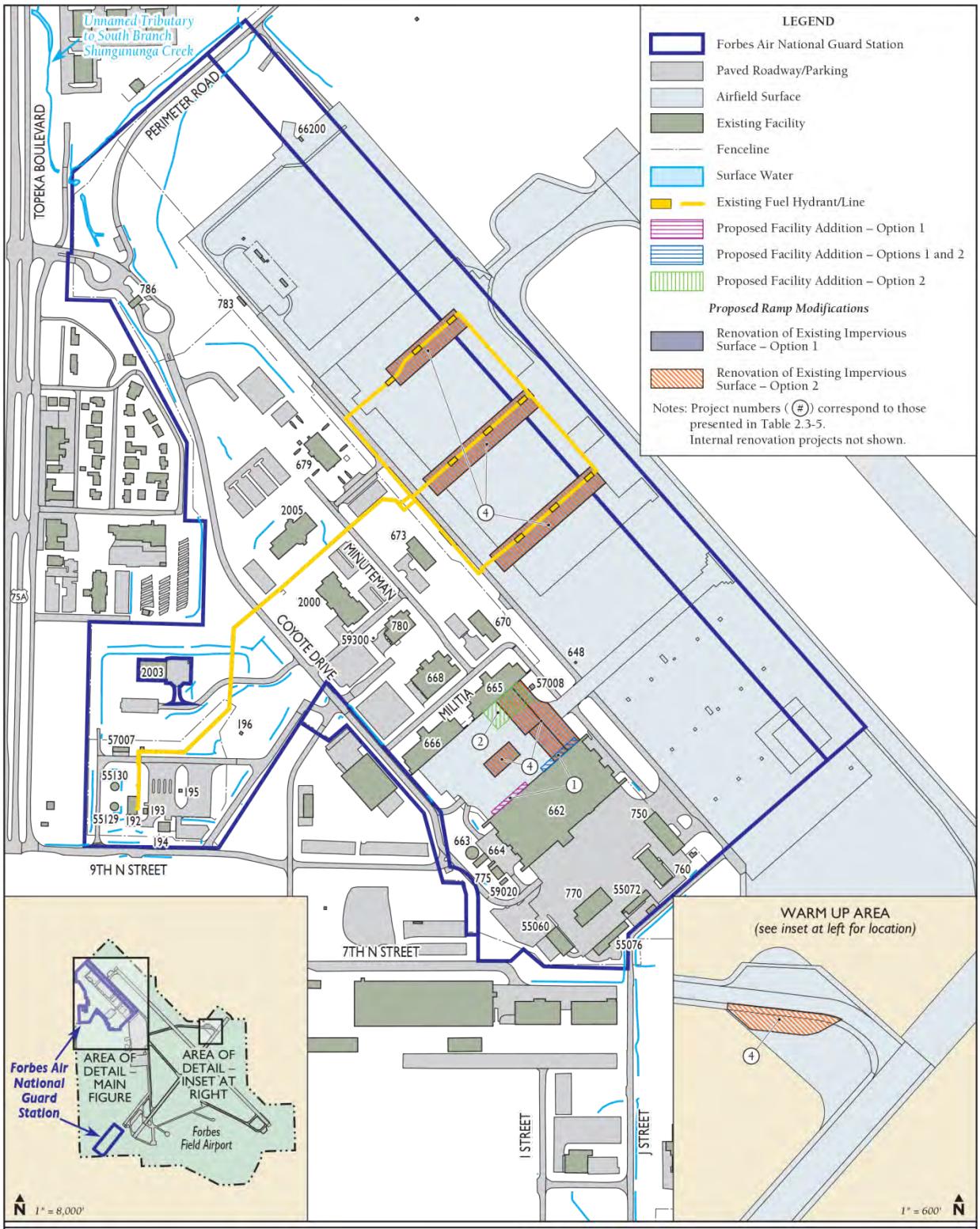


Figure 4.1.4-1. Surface Water Features and Proposed Construction in the Vicinity of Forbes ANGS

Source: NRCS 2012a, NGB 2013a, 190 ARW 2008c.

4.1.4.4 Floodplains

Proposed construction activities at the installation would not occur within the 100-year floodplain zone. As such, there would be no impacts to floodplains under this alternative.

4.1.4.5 Summary of Impacts

There would be approximately 5.9 acres of temporary soil disturbance and no new impervious surface as a result of the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. In addition, as the construction is for national defense purposes and the surrounding land is already in urban development, the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.

4.1.5 Biological Resources

4.1.5.1 Vegetation

Construction of new facilities associated with Alternative #1 at the 190 ARW installation would occur on currently paved areas and would not result in an increase of impervious surfaces. Therefore, there would be no impacts to the vegetation at the installation.

4.1.5.2 Wildlife

Under Alternative #1, impacts to wildlife due to construction would be minor. Noise and human activity associated with construction could evoke reactions to wildlife, including those that are protected under the MBTA, and may cause them to temporarily avoid the area. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. A study conducted by Strasser and Heath (2013) suggested that cavity nesting birds, such as kestrels, who inhabit noisy environments may compensate for decreased auditory cues by increasing vigilance behavior, leading to changes in energy allocation or extended periods away from the nest during incubation. This behavior appeared to be followed, at a high rate, by nest abandonment. However, bird and wildlife populations in the vicinity of the airport where project components would occur are accustomed to elevated noise associated with aircraft and general military industrial use. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications.

Under Alternative #1, impacts to wildlife due to proposed operations would be minor. Operational noise levels would be expected to decrease slightly from baseline with the

conversion to the KC-46A aircraft. Bird/wildlife aircraft strikes are also an inevitable hazard associated with military aircraft training. Under Alternative #1, the KC-46A would operate in the same airfield environment as the current aircraft. Annual operations for the KC-46A at Forbes Field Airport would be projected to increase by approximately 39 percent over the KC-135 baseline operations (17 percent increase in total airfield operations). An increase in airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Adherence to the existing BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.1.3, *Safety*). The 190 ARW has developed procedures designed to minimize the occurrence of bird/wildlife aircraft strikes, and has documented detailed procedures to monitor and react to heightened risk of bird/wildlife aircraft strikes. When risk increases, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed pattern work) in the airport environment. Special briefings are provided to pilots whenever the potential exists for increased bird/wildlife aircraft strikes within the airspace.

4.1.5.3 Special Status Species

No special status species are currently known to occur on Forbes Field Airport and there is only a low potential for them to occur within the vicinity due to the lack of habitat. In addition, noise levels would be expected to decrease slightly from baseline with the conversion to the KC-46A aircraft. Therefore, under Alternative #1, there would be no effect to special status species. The USFWS Kansas Ecological Services Field Office stated in a letter sent on March 13, 2014 that they have no concerns regarding the Proposed Action.

4.1.5.4 Wetlands

There are no wetland areas that occur within the vicinity of the proposed project footprints. Therefore, no impacts to wetlands would occur as a result of Alternative #1.

4.1.5.5 Summary of Impacts

There would be no impacts to vegetation and wetlands under this alternative. Impacts to wildlife species from operational noise would be imperceptibly beneficial due to the slight decrease in noise. A 39 percent increase in 190 ARW (17 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to wildlife due to construction would be negligible. No special status species or critical habitat is known to occur on Forbes Field Airport; therefore, there would be no impacts to these species.

4.1.6 Cultural Resources

Potential direct impacts to cultural resources examined in this analysis include effects to archaeological sites due to ground disturbing activities during construction or modification to buildings. Indirect impacts from an increase in personnel from 1,242 to 1,436 would be negligible as personnel would primarily be confined to the developed areas on the installation, which lack cultural resources.

4.1.6.1 Archaeological Resources

Based on previous archaeological surveys that identified no archaeological resources, the installation is considered to have low to no potential of containing buried archaeological resources (KS ANG 2008). The Kansas SHPO has concurred with these findings (Zollner 2008, 2013). In the unlikely event that archaeological or human remains are identified during construction, the 190 ARW would immediately cease all activities in the area of the discovery and contact the 190 ARW Environmental Manager who would contact a qualified archaeologist to evaluate the discovery. Because there are no significant archaeological resources (prehistoric or historic) on the 190 ARW installation, the implementation of Alternative #1 would have no impact to archaeological resources.

4.1.6.2 Architectural Resources

Two of the buildings proposed for alteration (Hangars 662 and 665) are not eligible for listing in the NRHP (Zollner 2008). The third building (Building 679) is eligible for listing in the NRHP. However, Building 679 has been demolished and completely rebuilt. These actions were mitigated by a Memorandum of Agreement between the Kansas SHPO, Kansas ANG, and 190 ARW for a previous project (Air National Guard Readiness Center *et al.* 2009). The current proposed Alternative #1 would not affect the existing agreement. The interpretive display located in the entry corridor of the new building that was the major component of the Memorandum of Agreement would not be altered (KS ANG 2010). Therefore, the NGB has determined that there would be no effect to historic properties as a result of the Proposed Action. The Kansas SHPO concurs that no historic properties would be affected by the Proposed Action (see Zollner 2013 in Appendix B3). Therefore, the implementation of Alternative #1 would have no impact to architectural resources.

4.1.6.3 Traditional Resources

There are no known traditional resources on the 190 ARW installation. Given the extensive development on the installation, it is considered unlikely that there are traditional resources located at the 190 ARW. Government-to-government consultation for this action was conducted with each federally-recognized Tribe in recognition of their status as sovereign nations, and to

provide information regarding tribal concerns per Section 106 of the National Historic Preservation Act as well as information on traditional resources that may be present on or near the installation. Two responses from federally-recognized tribes have been received (the Kaw Nation and the Wichita and Affiliated Tribes). The Kaw Nation and the Wichita and Affiliated Tribes stated that they have no objection to the Proposed Action. Letters and written correspondence to Tribes were followed up with telephone calls and emails in an effort to increase accessibility and encourage communication in the event a Tribe would have any concerns regarding the Proposed Action or land below the affected or proposed airspace areas. Correspondence sent to the tribes and follow-up efforts are located in Appendix B2. Additional efforts were made to contact non-responsive tribes without success (see Appendix B2). While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Forbes ANGS is now complete.

4.1.6.4 Summary of Impacts

Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements, where no archaeological resources are known. Interior modifications to Building 679 would not affect the NRHP-eligibility of the building. Other architectural resources are not eligible for listing in the NRHP. The Kansas SHPO has concurred with the determination that no historic properties would be affected (Zollner 2013). No traditional resources are known to occur at the installation. Therefore, no impacts to cultural resources at the 190 ARW installation are anticipated under Alternative #1.

4.1.7 Land Use

The primary source of impacts to land use resulting from Alternative #1 would be from noise. As shown in Table 4.1.7-1 and Figure 4.1.7-1, areas outside of the airport boundaries currently exposed to DNL of 65 dB to 70 dB would decrease by 55 acres, overall. By zoning districts, the PUD area affected by DNL of 65 dB to 70 dB would decrease by approximately 3 acres; Industrial areas would decrease by approximately 8 acres; and Residential Reserve areas would decrease by approximately 42 acres. No houses, churches, schools, or other known noise sensitive receptors would be located within the 65 dB DNL noise contour. Therefore, Alternative #1 is compatible with current land use and zoning designations and would result in minor beneficial impacts. A more detailed discussion of aircraft operations and noise can be found in Section 4.1.1, *Noise*.

Table 4.1.7-1. Change in Acres Affected by Noise Levels Above 65 dB DNL Outside the Forbes Field Airport Boundary

Land Use	*Baseline Total (acres)*	*Proposed Total (acres)*	*Change Total (acres)*
Planned Unit Development	24.0	21.4	-2.6
Industrial	36.0	28.3	-7.7
Residential Reserve	97.4	55.4	-42.0
Non-designated	8.1	5.8	-2.3
Total Area	**165.5**	**110.9**	**-54.6**

4.1.7.1 Summary of Impacts

While the number of total annual airfield operations would increase by 4,110 (17 percent), the acreage within the 65 dB DNL (and greater) noise contour would decrease by 41 acres (55 acres off airport property). Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would be compatible with current land use and zoning designations and would result in imperceptibly beneficial impacts by reducing the off-airport areas currently exposed to noise levels between 65 dB and 70 dB DNL. Airport Hazard Areas would not be affected.

Meters 0 900
Feet 0 3,000

Figure 4.1.7-1. DNL Noise Contours and Land Use Under Alternative #1 at Forbes Field Airport

Source: Shawnee County Zoning 2007, Forbes Field Airport 2013.

4.1.8 Infrastructure and Transportation

4.1.8.1 Potable Water

Water consumption would be expected to increase slightly under Alternative #1 as a result of the increase in personnel; however, an increase in 181 personnel on the installation would not be expected to impact regional water supply. Additionally, the demand for water (e.g., if used to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact regional water supply.

4.1.8.2 Wastewater

Wastewater generation would be expected to increase slightly as a result of the increase in 181 personnel on the installation. However, there have been no deficiencies identified with the existing system, and it is expected that the existing sanitary sewer system is generally adequate to serve the facilities proposed under this alternative.

4.1.8.3 Stormwater

Under Alternative #1, there would be up to 258,149 SF (5.9 acres) of temporary soil disturbance and no new impervious surface as a result of proposed construction. The proposed construction activities could temporarily impact the quality of stormwater runoff (see Section 4.1.4, *Soils and Water*); however, through implementation of appropriate standard construction practices (as described previously), preventative maintenance, and periodic inspections and sampling to detect risk to stormwater, especially during active construction activity, no impacts would be expected to the existing stormwater drainage system as a result of the proposed construction.

4.1.8.4 Electrical and Natural Gas Systems

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel, and the building space and facilities to be constructed would require additional electricity. However, any new facilities and additions associated with Alternative #1 would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities.

Construction activity associated with Alternative #1 could result in some temporary interruption of utility services during construction. These impacts would be temporary, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

4.1.8.5 Solid Waste Management

The building space and facilities to be constructed would generate construction and demolition debris requiring landfill disposal. Construction activities would result in approximately 258,149 SF of additions and alterations to existing facilities. Using a multiplier provided by the USEPA to determine solid waste generation, it was estimated that proposed renovations at Forbes ANGS would generate 3,043,577 pounds (1,522 tons) of renovation debris requiring landfill disposal (USEPA 2009).

Solid waste generated as a result of the proposed construction could result in impacts to solid waste management facilities in the area. The Rolling Meadows Landfill has a remaining life expectancy of 15 years and a permitted throughput of 321,000 tons per year (Rolling Meadows Waste Management 2009). The 1,522 tons of proposed construction debris generated at Forbes ANGS would represent approximately 0.5 percent of the yearly capacity of the landfill. In addition, Shawnee County has a remaining municipal solid waste capacity of 20-40 years (Kansas Department of Health and Environment 2010). Impacts to local landfills would not be expected to exceed the permitted throughput or contribute significantly to the remaining capacity.

Off-installation contractors completing construction and demolition projects at the 190 ARW installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled or reused, or otherwise diverted from landfills. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, sets a target diversion rate of 50 percent for recycling and waste diversion for DoD facilities by 2015, including construction and demolition waste; compliance with EO 13514 would further minimize the increase in solid waste generation as a result of the proposed construction. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (2009).

4.1.8.6 Transportation

Construction equipment would be driven to proposed construction areas and would be kept on-site for the duration of the respective activity. Construction workers would drive daily in their personal vehicles to and from the construction site. In general, construction traffic would result in increases in the use of on-installation roadways during construction activities; however, increases would be temporary and intermittent, occurring only during active construction periods.

The number of authorized personnel on the installation would increase by 181 under Alternative #1 (see Table 2.3-6). The increase in personnel would create a potential 181 additional one-way vehicle trips to and from the installation during morning and evening peak periods for these additional personnel. Assuming that each person makes two trips per day, the implementation of Alternative #1 would add an additional 362 trips onto the existing roadway network after the construction phase is complete. However, regional roads used to access the installation as well as those located on the installation have sufficient capacity to manage this increase in traffic without substantial impacts to circulation. Therefore, impacts to transportation infrastructure would not be significant under Alternative #1.

4.1.8.7 Summary of Impacts

Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increase demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.

4.1.9 Hazardous Materials and Waste

4.1.9.1 Hazardous Materials

A Hazardous Materials Management Program has been developed for the KC-46A program. Training activities and other functions would be expected to remain similar between the KC-46A and existing KC-135 aircraft. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. However, unlike the KC-135, the KC-46A aircraft will be free of ozone depleting substances (ODSs). ODSs were typically used as part of the fire suppression systems on aircraft; ODS use and/or storage would no longer be required under Alternative #1.

The KC-46A aircraft has been designed with a focus on reduction of hazardous materials such that hazardous materials currently required for maintenance, operations, and materials on or associated with the new aircraft would be less than or equal to the existing aircraft (Boeing 2011). In addition, it is anticipated that the amount of hazardous waste generated for one KC-46A aircraft for maintenance activities would be slightly less than that generated for one KC-135 aircraft since the KC-46A has two engines as opposed to the four engines for the KC-135. Furthermore, the KC-46A is a newer aircraft and is expected to need less maintenance than the older KC-135 aircraft.

Under Alternative #1, the total number of annual flying hours for the 190 ARW would increase from 4,868 to 8,040 (a 65 percent increase); therefore, the throughput of petroleum substances (e.g., fuels, oils) used during operations would be expected to increase commensurately from what is currently used to maintain the KC-135 fleet (see Appendix A, Section A.1, for more details). Additionally, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities, because various fuels (e.g., diesel, gasoline) would be required to run earth moving equipment and power tools and to provide electricity and lighting as conditions warrant. Procedures for hazardous material management established for the 190 ARW installation would continue to be followed in future operations associated with Alternative #1 and as required during all construction and renovation activities.

Toxic Substances

Under Alternative #1, additions to Hangars 662 and 665 are proposed, and internal renovations to Building 679 are proposed. ACM is known to occur in Hangar 665 and Building 679. An LBP survey has not been conducted at the 190 ARW installation. However, Hangar 662 and 665, and Building 669 were constructed prior to 1978 and therefore may contain LBP. Any structures proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. All ACM would be properly removed and disposed of prior to or during demolition in accordance with 40 CFR 61.40 through 157. All LBP would be managed and disposed of in accordance with the Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA) regulations, Kansas requirements (regarding site work practices for buildings with LBP), and established ANG procedures. Materials, especially discarded oil products, would be screened for PCB contamination prior to disposal.

4.1.9.2 Hazardous Waste Management

The type of hazardous waste streams generated by KC-46A operations would be expected to remain similar to those being generated by the existing KC-135 aircraft, with the exception of ODSs. Additionally, the two aircraft require the same types of hazardous materials for their

maintenance and operations (e.g., fuels, oils). Under Alternative #1, the total number of flying hours for the 190 ARW would increase approximately 65 percent; therefore, hazardous waste streams would be expected to increase commensurately (see Appendix A, Section A.9, for more details). However, the increase in hazardous waste streams is supportable by the current infrastructure at the installation. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations.

4.1.9.3 Environmental Restoration Program

In accordance with AFI 32-7020, *The Environmental Restoration Program*, construction, modifications and/or additions to existing buildings can occur on or in proximity to existing ERP sites. Accordingly, the appropriate organizations (e.g., installation planners, ERP managers, design engineers) must consider a compatible land use based on current site conditions and the selected or projected remedial action alternatives. Construction should be sited and designed to minimize life-cycle costs to include those associated with impacts from existing contaminated sites. If the potential for uncharacterized ERP sites exist, the installation is responsible for identifying existing contamination at the proposed construction sites to avoid unknowingly locating construction projects in areas with contamination. The installation is responsible for performing necessary environmental baseline surveys, accomplishing environmental impact analysis process requirements, and for otherwise informing itself about existing site conditions and their associated cost impacts in preparation for a construction project. When warranted by the site history, environmental restoration funds may be used to accomplish Resource Conservation and Recovery Act (RCRA) facility assessments, or preliminary assessments and site inspections undertaken in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, or similar site investigations in accordance with applicable state laws for suspected releases. To the extent that a construction project generates actions to address contamination, or a need to change the timing of ERP-generated actions to address contamination, the costs of such actions are not Environmental Restoration Account-eligible and shall be funded as part of the construction project. This includes the handling, mitigation, and disposal or other disposition of contamination discovered before or during the construction activity.

The removal and disposal of contamination unexpectedly encountered within the construction project footprint during the execution of a construction project will be undertaken as part of the construction project using construction project funds which may include other military construction (MILCON) funds reprogrammed to a MILCON construction project. Construction

contractor costs (such as direct delay costs and unabsorbed or extended overhead) incidental to discovery and removal of the contamination will be construction project funded to the extent that the government is responsible and liable for such costs.

Vapor intrusion should be evaluated when volatile chemicals are present in soil, soil gas, or groundwater that underlies existing structures or has the potential to underlie future buildings and there may be a complete human exposure pathway. Due to their physical properties, volatile chemicals can migrate through unsaturated soil and into the indoor air of buildings located near zones of subsurface contamination.

One site, ERP Site 8, overlaps with a portion of the proposed renovation of the existing pervious surfaces on the parking apron (Figure 4.1.9-1). This site is closed and monitoring conducted during 1990-1993 was completed with no contaminants reported above detection limits; therefore, it is not expected to pose a vapor intrusion concern. However, it is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations.

If contaminated media (e.g., soil, vapor, groundwater) are encountered during the course of site preparation (e.g., clearing, grading) or site development (e.g., excavation for installation of building footers) for proposed construction activities, work would cease until 190 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met, and to arrange for agency consultation as necessary if existing ERP sites are affected. Also, prior to construction activities, the construction contractors would be notified of the nature and extent of known contamination so that they can inform their employees in advance of on-site activities and take appropriate precautions to protect health and safety, and to prevent the spread of contamination. The construction contractors would be responsible for ensuring their workers follow appropriate health and safety requirements.

4.1.9.4 Summary of Impacts

There would not be an increased risk of hazardous waste releases or exposure from this alternative. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations. There would be no expected impact from ERP sites, as the ERP site that overlaps proposed construction is closed. However, if contaminated media were encountered during the course of site preparation or site development, work would cease until 190 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.

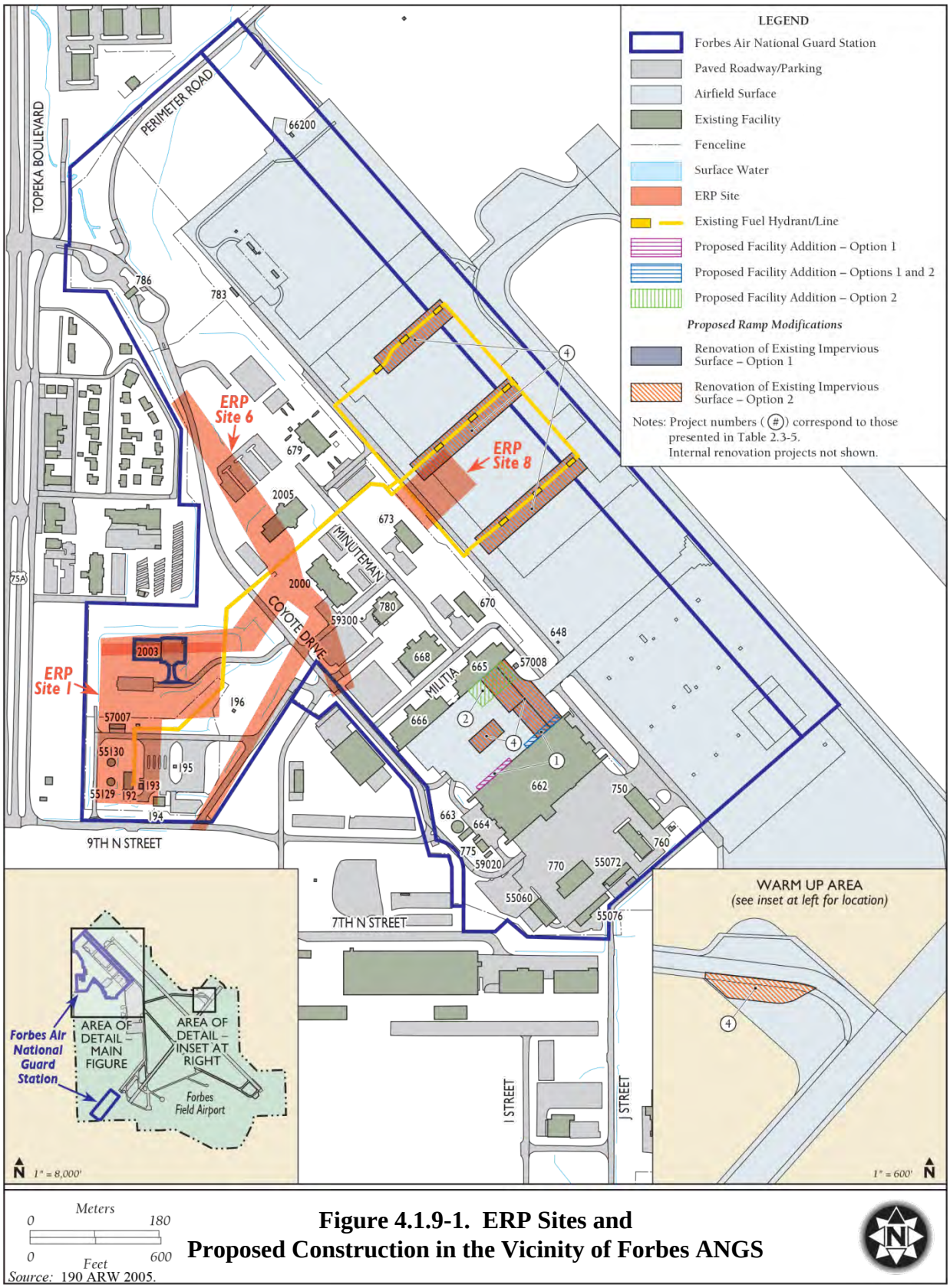


Figure 4.1.9-1. ERP Sites and Proposed Construction in the Vicinity of Forbes ANGS

Source: 190 ARW 2005.

4.1.10 Socioeconomics

Under Alternative #1, construction activities would be contained entirely within the boundaries of Forbes Field Airport. Economic activity associated with proposed construction activities at the 190 ARW installation, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased would be negligible on a regional scale.

The proposed aircraft beddown and related activities would result in a change in staffing requirements for the 190 ARW. Currently, the 190 ARW is authorized 1,242 personnel. Under Alternative #1, the KC-46A mission would add an additional 194 military positions (increase in 212 full-time positions and reduction of 18 traditional Guard positions) (see Table 2.3-6). Combined with their approximately 264 family members, this would represent less than 0.1 percent of Shawnee County population. Of the 264 family members, approximately 114 would be anticipated to be of school age. The students entering the local schools would be expected to be enrolled in various grades and live in different areas within Shawnee County. It is anticipated that there is enough capacity within the schools in Shawnee County to absorb this minimal increase in school age children.

An increase in 194 military personnel positions would amount to an increase of approximately 16 percent to the existing 190 ARW personnel. Total payroll associated with the 212 additional full-time personnel would amount to an estimated annual salary increase of approximately $16 million for full-time employees.

All 190 ARW personnel live off-installation as there is no on-installation housing. A conservative scenario would result in 194 homes purchased at the same time as personnel relocate to the area. This would represent less than 0.2 percent of the total housing units in Shawnee County. However, not all the military personnel who would relocate would own homes.

4.1.10.1 Summary of Impacts

Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.

4.1.11 Environmental Justice and the Protection of Children

4.1.11.1 Minority and Low-Income Populations

Under Alternative #1, there would be no residential populations, including no minority or low-income populations, located within the vicinity of Forbes Field Airport exposed to 65 dB DNL or above. Therefore, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Forbes Field Airport.

4.1.11.2 Protection of Children

There are no facilities on the installation where children may be encountered on a regular basis. Currently there are no off-installation Kindergarten through Grade 12 schools that are exposed to 65 dB DNL or above. Under Alternative #1 there would be no new Kindergarten through Grade 12 schools exposed to 65 dB DNL or above. Therefore, under Alternative #1 there would be no special health or safety risks to children.

4.1.11.3 Summary of Impacts

Given that the acreage within the 65 dB DNL noise contour would be reduced, there would be no residential populations, including no minority or low-income populations, and no additional schools located within the vicinity of Forbes Field Airport exposed to 65 dB DNL or above; thus, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Forbes Field Airport. In addition, there would be no special health or safety risks to children.

4.2 ALTERNATIVE #2 -- JOINT BASE MCGUIRE-DIX-LAKEHURST

4.2.1 Noise

In this section, noise associated with flying operations and construction activities related to Alternative #2 are considered and compared with baseline conditions to assess potential impacts. Details of the methodologies used for this section can be found in Appendix A, Section A.1.2.

The DNL noise contours for this alternative were generated using the NOISEMAP computer model and represent the most current noise data available for establishing baseline conditions and for which to analyze changes to the noise environment in the McGuire Field ROI. The DNL noise contours for the KC-46A under Alternative #2 were also generated using NOISEMAP through the removal of all KC-135 operations and the insertion of the proposed KC-46A operations using the substitute KC-46A noise data and flight profile data provided by AFCEC and applying the data to the current KC-135 flight tracks and operational procedures.

4.2.1.1 Aircraft Noise

Under Alternative #2, 12 KC-46As would be based at JB MDL, replacing the current 8 KC-135 aircraft. There would be no change in the number or type of other aircraft using the airfield and KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures in which the aircraft climbs or descends in the immediate vicinity of the airfield. Tactical training prepares aircrews for operations in forward operating locations in which flying at low-altitudes over land not controlled by friendly forces exposes the aircraft to ground-based threats. This procedure is currently being flown with the KC-135. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures; however, most tactical procedures would be accomplished in the simulator or at other locations away from JB MDL. The percentage of aircraft operations occurring during the night (10 p.m. to 7 a.m.) would decrease from that in the baseline conditions. Under Alternative #2, JB MDL would have an increase in flying hours generating an increase in KC-46A airfield operations.

Following the aircraft beddown under Alternative #2, the 108 WG would have an increase in total flying hours resulting in 1,508 sorties being flown at McGuire Field. This would be an increase of 81 percent over the baseline 834 sorties identified in the McGuire Field Noise Study (it is assumed that the same percentage of the sorties found under current baseline conditions would be flown at McGuire Field under this alternative) (JB MDL 2013a). Based on 1,508 annual home-station sorties and an average of 11.68 operations per sortie, there would be 17,608 annual home-station operations, or an additional 9,268 airfield operations annually at McGuire

Field (an increase of 111 percent for the 108 WG, and 15 percent increase in total JB MDL annual operations) (Table 4.2.1-1). This would increase the average daily airfield operations from 23 to 48. The 108 WG KC-46A operations would be approximately 24 percent of all aircraft operations at the airfield.

All operations would remain as described under existing conditions (with the exception of a decrease in published night operations [JB MDL 2013a]); however, the KC-135 would be replaced by the KC-46A. There would be no changes expected to departure/arrival patterns and tracks, and use of runways. Current noise abatement procedures would continue to be followed as documented in Section 3.2.1.4.

Table 4.2.1-1. McGuire Field Annual Aircraft Operations with Proposed KC-46A

Aircraft	Departures		Arrivals		Total[1]		*Grand Total*[1]
	Day	*Night*[2]	*Day*	Night[2]	*Day*	*Night*[2]	
KC-46A	8,047	764	7,863	934	15,910	1,698	17,608
Other Aircraft[3]	18,803	8,316	15,855	11,293	34,658	19,609	54,267
Total	**26,850**	**9,080**	**23,718**	**12,227**	**50,568**	**21,307**	**71,875**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other Based aircraft and Transient Aircraft (multiple type aircraft) including: KC-10, C-17, and C-32.

KC-135 aircraft operations per average annual day (arrivals and departures [2.28] and closed patterns [9.14]) would increase with the KC-46A to 11.6 arrivals and departures and 12.5 closed patterns/day. There would be approximately 10 percent of the KC-46A airfield operations flown during environmental night. The total number of operations flown by all other aircraft at JB MDL would not change from previously identified airfield activities. There would be no change to any other aircraft types or aircraft flight tracks and profiles from the baseline condition.

Figure 4.2.1-1 depicts the noise exposure area from aircraft operations after the conversion from the current 8 KC-135 aircraft to 12 KC-46A aircraft, and Figure 4.2.1-2 compares baseline noise contours with Alternative #2 contours. The aircraft operations modeled include all current based and transient aircraft operations depicted in the 2012 JB MDL noise update. Table 4.2.1-2 shows changes to the acreage of land within each noise contour under Alternative #2.

Table 4.2.1-2. Land Areas within DNL Contours at JB MDL Affected by DNL Greater than 65 dB under Baseline and Alternative #2

Noise Contour (dB DNL)	Baseline (KC-135) Total (acres)			Alternative #2 (KC-46A) Total (acres)			*Change Total (Acres)*
	On Base	*Off Base*	*Total*	*On Base*	*Off Base*	*Total*	
65-70	1,375	311	1,686	1,943	661	2,604	918
70-75	1,186	21	1,207	1,636	90	1,726	519
75-80	370	0	370	655	0	655	285
80-85	222	0	222	253	0	253	31
>85	76	0	76	154	0	154	78
Total	**3,229**	**332**	**3,561**	**4,641**	**751**	**5,392**	**1,831**

Notes: DNL = Day Night Average Sound Level; dB = decibel

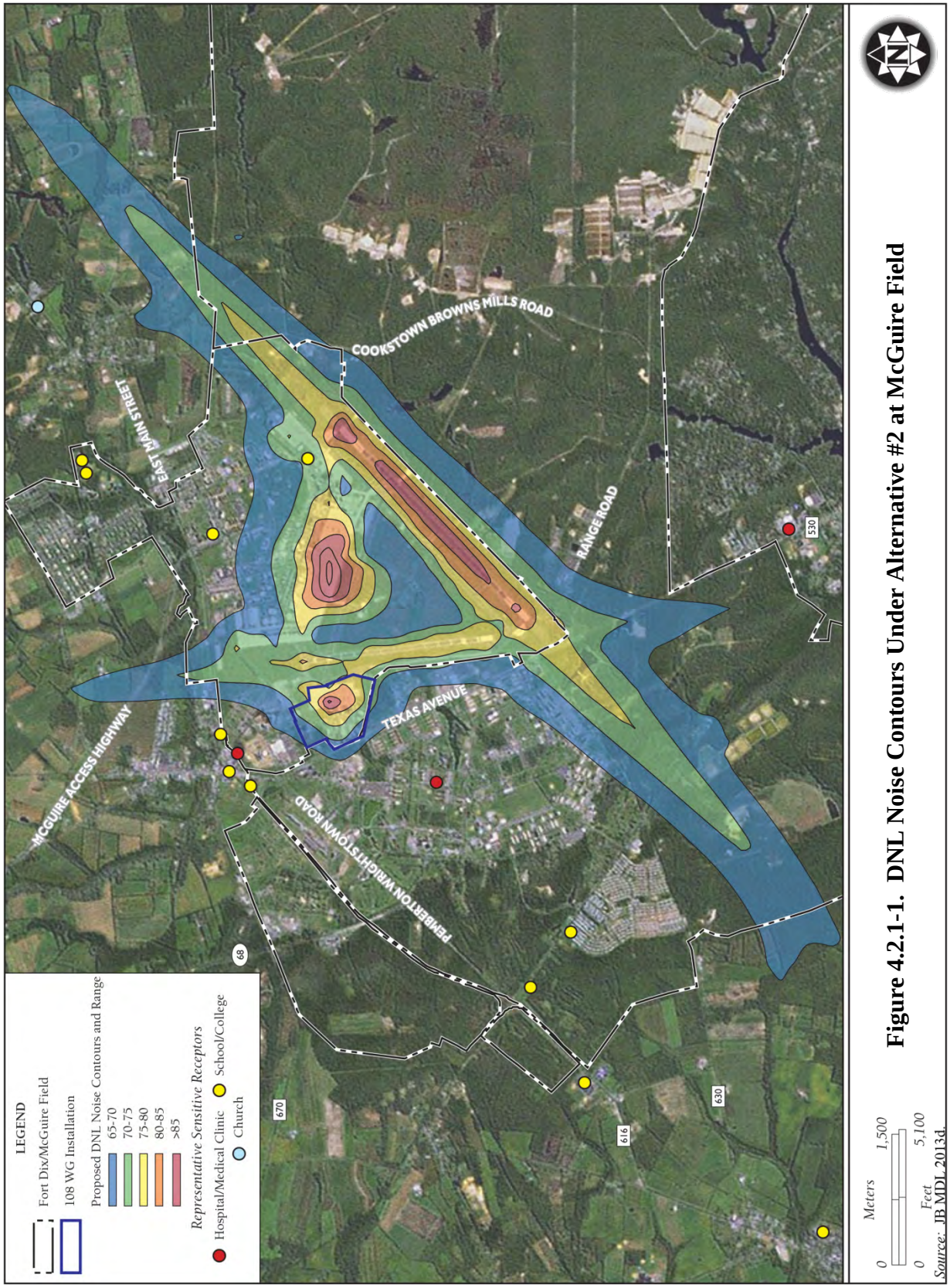


Figure 4.2.1-1. DNL Noise Contours Under Alternative #2 at McGuire Field

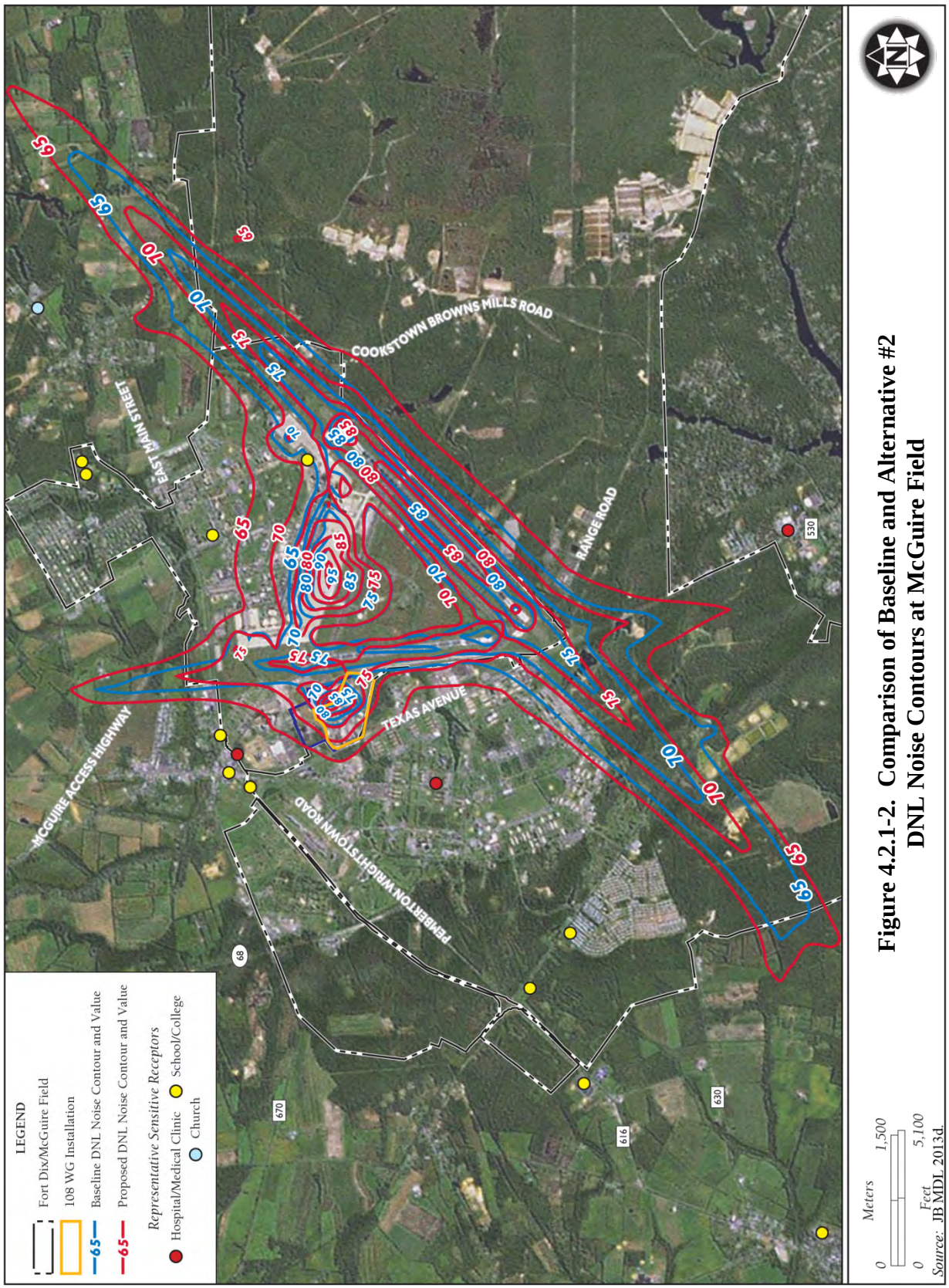


Figure 4.2.1-2. Comparison of Baseline and Alternative #2 DNL Noise Contours at McGuire Field

Under Alternative #2, the DNL noise contours would expand slightly in all directions from the baseline DNL noise contours. Overall, the number of acres contained within the 65 dB DNL and greater exposure area would increase by approximately 1,831 acres, or 51 percent, but would remain primarily on McGuire Field with approximately 751 of these acres off the base property (an increase of 419 acres off base). Information regarding number of people residing in this area can be found in Section 4.2.11, *Environmental Justice and the Protection of Children*; and information regarding the area of residential use is located in Section 4.2.7, *Land Use*.

Percent of the Population Expected to be Highly Annoyed

The percentage of the population expected to be highly annoyed under Alternative #2 would increase slightly from baseline conditions because there would be an expected 48 additional individuals living in residences exposed to levels above a DNL of 65 dB.

Single Event Sound Analysis

Under Alternative #2, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1-1 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #2, flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with less than 10 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.).

Potential Hearing Loss

As shown in Table 4.2.1-2, there is no property off the JB MDL that falls within the 80+ dB DNL noise contour; therefore, there would be no potential hearing loss risk associated with these areas. In addition, the on-base housing area lies outside of the 65 dB DNL contour; therefore, there would be no potential hearing loss risk associated with these areas.

4.2.1.2 Construction Noise

There would be some minor temporary noise from construction equipment associated with construction activities that would occur intermittently during the construction period (beginning FY 2015). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (FHWA 2006) (see Appendix C, *Noise*, Section A.1.2.2). Aviation-related activities at JB MDL dominate the local noise environment. Equipment used during the facility construction would contribute little to the general background noise levels around the airfield and would be only temporary. Therefore, impacts from construction under Alternative #2 would be negligible.

4.2.1.3 Summary of Impacts

The number of annual airfield operations would increase by 9,268 (111 percent increase in 108 WG operations, 15 percent increase in total airfield operations), and the acreage within the 65 dB DNL (and greater) noise contour would increase by 1,831 acres. Of this increase in acreage, 419 acres would be off DoD-controlled property. There would be no potential for hearing loss off the airport and only a slight increase in the percent of the population highly annoyed. Construction noise would be localized and temporary and would not add to the overall noise environment. Impacts from noise would be negligible.

4.2.2 Air Quality

The air quality analysis estimated the magnitude of emissions that would result from implementation of the proposed KC-46A construction and operational activities at the 108 WG installation. The estimation of proposed operational emissions is based on the net change in emissions between existing aircraft operations and projected KC-46A operations.

As discussed in Appendix A.2.3, air quality impacts from the beddown of the KC-46A aircraft at JB MDL were reviewed for significance relative to the PSD threshold for new major sources for attainment pollutants, and the General Conformity *de minimis* thresholds for nonattainment pollutants. Because the project region within Burlington and Ocean counties are part of the Philadelphia-Wilmington-Atlantic City nonattainment area for O_3 (marginal nonattainment), and is a maintenance area for $PM_{2.5}$ and CO, the *de minimis* threshold of 100 tpy for O_3 precursors NO_x and VOCs, $PM_{2.5}$, and CO was used as an indicator of the potential significance of the emissions from the KC-46A conversion. For attainment pollutants PM_{10} and SO_2, the PSD threshold of 250 tpy (100,000 tpy for GHGs) was used as an indicator of the potential significance of the emissions from Alternative #2.

4.2.2.1 Operational Emissions

Sources associated with operation of the proposed KC-46A beddown at the 108 WG installation include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) offsite POV commutes; and (4) AGE. It was assumed that other sources, including non-road mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged. Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the project noise analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (AFCEC 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were estimated based on total personnel for the existing and proposed scenarios, using emission factors for vehicles from AFCEC 2013.

Table 4.2.2-1 summarizes the annual operational emissions that would result from KC-46A operations at 108 WG installation. Table 4.2.2-1 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at JB MDL. As shown in Table 4.2.2-1, the net emissions increases are below the PSD/*de minimis* thresholds for all pollutants except NO_x. Emissions of NO_x would exceed the *de minimis* threshold, and this alternative would therefore require a Conformity Determination under the General Conformity Rule (Appendix F).

The ANG has prepared a Draft Conformity Determination that demonstrates that emissions associated with Alternative #2 would be within the SIP NO_x emissions budget for McGuire AFB (now JB MDL), should this alternative be selected. The ANG is coordinating with the NJDEP regarding the 2011 SIP emissions budget and the proposed increase in NO_x emissions associated with Alternative #2 to ensure that the 2011 budget is still effective. If Alternative #2 is selected, it is anticipated that the ANG will obtain an affirmative General Conformity Determination prior to signing of the ROD.

Table 4.2.2-1. Comparison of Baseline and Proposed Annual Operational Emissions, 108 WG Installation

	ANNUAL EMISSIONS, TONS/YEAR					
Baseline	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-135 Aircraft Operations	3.21	49.03	83.34	7.43	0.39	0.39
AGE	0.01	0.01	0.09	0.00	0.00	0.00
Engine Tests	0.14	2.01	0.55	0.09	0.01	0.01
POVs	5.12	110.72	5.20	0.07	0.21	0.12
Total	**8.48**	**161.78**	**89.18**	**7.59**	**0.61**	**0.53**
Proposed Action	***VOC***	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-46A Aircraft Operations	26.19	100.37	294.03	17.32	1.13	0.96
AGE	0.01	0.02	0.17	0.00	0.01	0.01
Engine Tests	1.53	5.23	1.38	0.17	0.02	0.01
POVs	4.75	126.34	3.97	0.09	0.22	0.12
Total	**32.48**	**231.97**	**299.54**	**17.58**	**1.38**	**1.11**
Net Increase	**24.01**	**70.19**	**210.36**	**9.99**	**0.77**	**0.58**
MOB 2 Net Emissions Increase Fraction of Existing Emissions	**2.83**	**0.43**	**2.36**	**1.32**	**1.26**	**1.09**
PSD/*de minimis* Threshold	**100**	**100**	**100**	**250**	**250**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle; PSD = Prevention of Significant Deterioration

In addition to criteria pollutant emissions, the beddown of the KC-46A aircraft under Alternative #2 would result in emissions of HAPs and GHGs. Operational activities would result in a net increase of HAPs that is below 1 ton per year.

Table 4.2.2-2 summarizes the annual operational GHG emissions that would result from KC-46A operations at JB MDL, along with the net increase in comparison with the baseline. As shown in Table 4.2.2-2, emissions are below the PSD thresholds for GHGs.

Table 4.2.2-2. Comparison of Baseline and Proposed Annual Operational GHG Emissions, 108 WG

	ANNUAL GHG EMISSIONS, METRIC TONS/YEAR			
Baseline	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-135 Aircraft Operations	20,450	0.57	0.64	20,659
AGE	2,134	0.06	0.07	2,157
Engine Tests	237	0.01	0.01	239
POVs	3,543	0.00	0.00	3,543
Total	**26,363**	**0.63**	**0.71**	**26,597**
Proposed Action	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-46A Aircraft Operations	47,195	1.25	1.41	47,657
AGE	3,859	0.11	0.12	3,900
Engine Tests	459	0.01	0.01	464
POVs	4,359	0.00	0.00	4,359
Total	**55,872**	**1.37**	**1.54**	**56,379**
Net Increase	**29,509**	**0.74**	**0.83**	**29,782**
PSD Threshold	**100,000**	**100,000**	**100,000**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; AGE = aerospace ground equipment; POV = privately owned vehicle

4.2.2.2 Construction Emissions

The KC-46A beddown at JB MDL would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would occur from (1) combustion emissions from heavy equipment and vehicles; and (2) fugitive dust emissions due to operation of equipment on exposed soil. Table 4.2.2-3 presents a summary of the annual construction emissions for the beddown of the KC-46A aircraft at JB MDL. As shown in Table 4.2.2-3, emissions would be below the PSD/*de minimis* thresholds for all pollutants.

For construction emissions the project option with the greatest potential to emit was used in the analysis (see Table 2.3-11).

Table 4.2.2-3. Annual Construction Emissions Under Alternative #2

Construction Project	*CO*	*NO_x*	*VOC*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*	*Total CO_2, Metric tons/year*
Project #1 - Addition to Hangar 3333	1.43	2.28	0.40	0.04	2.27	1.77	762.34
Project #2 - Addition to Hangar 3336	1.46	2.32	0.41	0.04	2.32	1.80	775.72
Project #3 - Internal Renovations to Hangar 3322	0.30	0.47	0.06	0.01	0.04	0.04	122.59
Project #4 - New Simulator Building	0.54	0.85	0.15	0.02	0.71	0.63	285.47
Project #5 - Modifications to Existing Parking Ramp and Taxiway	4.28	10.18	1.06	0.51	6.15	3.00	2,529.83
Project #6 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	0.01	0.01	0.00	0.00	0.00	0.00	3.88
Total Option 1	**8.01**	**16.11**	**2.08**	**0.62**	**11.48**	**7.23**	**4,479.82**
PSD/*de minimis* Threshold	**100**	**100**	**100**	**250**	**250**	**100**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide; PSD = Prevention of Significant Deterioration

4.2.2.3 Summary of Impacts

The 108 WG installation is in a nonattainment area for O_3 (marginal nonattainment), and maintenance area for CO and $PM_{2.5}$, and is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants, except NO_x, which would be above the *de minimis* threshold of 100 tpy. A conformity determination must be prepared. Operational GHG emissions are within thresholds in the PSD tailoring rule. Impacts from construction emissions and operational HAP emissions are negligible.

The ANG has prepared a Draft Conformity Determination that demonstrates that emissions associated with Alternative #2 would be within the 2011 SIP NO_x emissions budget for McGuire AFB (JB MDL), should this alternative be selected. The ANG is coordinating with the NJDEP regarding the 2011 SIP emissions budget and the proposed increase in NO_x emissions associated with Alternative #2 to ensure that the 2011 budget is still effective. If Alternative #2 is selected, it is anticipated that the ANG will obtain an affirmative General Conformity Determination prior to signing of the ROD.

4.2.3 Safety

4.2.3.1 Ground Safety

Existing facilities at McGuire Field for fire response and crash recovery meet KC-46A beddown requirements (JB MDL 2013b).

Proposed renovation and infrastructure improvement projects related to this alternative would not penetrate any APZs or impact aircraft take-off or landings (JB MDL 2013b). New construction and building renovation activity would not result in any greater safety risk or obstructions to navigation. Operations would fall within the same general types as those that have historically occurred at JB MDL. For example, the KC-46A would follow established local approach and departure patterns. Therefore, flight activity and subsequent operations would not require changes to APZs. Planned construction at JB MDL would be sited to be in compliance with the current QD arcs and no unauthorized construction would occur within the proposed QD arcs. None of the construction or demolition would be in conflict with the QD arcs. Per AFMAN 91-201, *Explosive Safety Standards*, there would be no public transportation route or inhabited building located within the proposed QD arcs. No explosives would be handled during construction or demolition activities. Therefore, no additional risk would be expected as a result of implementation of this alternative.

To support the aircraft beddown at JB MDL, some facilities would require renovation/modification. However, no construction activities would involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures, including AFI 13-213, *Airfield Driving* (2011), would further minimize the relatively low risk associated with these construction activities.

The proposed construction projects meet all criteria specified in the ANG Handbook 32-1084, *Facility Space Standards.* AT/FP requirements have also been addressed to the extent practicable in all projects. Projects would use AT/FP site design standards for siting of facilities, parking, walkways, and other features. Renovations would bring the facilities into compliance with UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, providing additional protection for the personnel based there.

4.2.3.2 Flight Safety

Although the KC-46A is a new aircraft, it is a military derivative of the commercial Boeing 767 aircraft. First flown commercially in 1982, more than 1,000 commercial Boeing 767 aircraft have been produced and it is a proven commercial airliner, freighter, and tanker already in service (Boeing 2012). Mishap statistics for the commercial Boeing 767 show 14 total aircraft losses (similar to a Class A military mishap definition) during its 31 year lifetime (ASN 2013).

Although no facilities are proposed that would affect navigable airspace, JB MDL would comply with 14 CFR Part 77, *Objects Affecting Navigable Airspace*, as appropriate, should they be selected to host the KC-46A.

To augment airborne training missions, pilots flying the KC-46A would use simulators extensively. Simulator training includes all facets of flight operations and comprehensive emergency procedures. The sophistication and fidelity of current simulators and related computer programs are commensurate with the advancements made in aircraft technology and are extremely realistic. These factors should minimize risk associated with mishaps due to pilot error.

Under Alternative #2, there would be an increase of approximately 111 percent 108 WG operations (15 percent in total JB MDL airfield operations) for the Proposed Action compared to existing conditions. This increase in take-offs, landings, proficiency training, and other flights would result in a commensurate increase in the safety risk to aircrews and personnel.

The proposed increase in airfield flight operations would be expected to increase the opportunity for aircraft mishaps, including BASH incidents; however, the expected rate of mishaps or BASH incidents would not be expected to change from current conditions. Both the KC-135 and the commercial Boeing 767 have very low mishap rates, and with a new airframe and technological improvements the KC-46A would be expected to have a similar safety record. In addition, current airfield safety procedures discussed previously would continue to be implemented and additional airfield flight operations would adhere to established safety procedures (JB MDL 2010).

Given the low likelihood for an aircraft accident or BASH mishap to occur in the local airfield area and even lower likelihood for civilians to be impacted, impacts to safety in the vicinity of JB MDL as a result of Alternative #2 are expected to be negligible.

The KC-46A will have the capability to jettison fuel for emergency situations. Military policy is to avoid fuel jettisons, unless safety of flight dictates an immediate jettison, and requires senior officer approval before fuel jettison, unless under emergency situations. Records of KC-135 fuel jettison events reveal that such circumstances are rare, occurring in slightly less than two sorties per thousand (Headquarters AMC 2013). Additionally, unlike the KC-135, the KC-46A will have the capability to land fully loaded with fuel so long as adequate runway length and braking capability are available (Headquarters AMC 2013), which could potentially lessen the need to jettison fuel in certain circumstances. Based on information provided by Boeing, landing the KC-46A above maximum landing weight is not prohibited; however, it does drive costly

inspection requirements. To land above maximum landing weight routinely could reduce the fatigue life of the airplane (Headquarters AMC 2013).

4.2.3.3 Summary of Impacts

There would be a 111 percent increase in actual 108 WG airfield operations (15 percent in total airfield operations) at JB MDL with a commensurate increase in mishap and BASH potential. Construction activities would involve no unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.

4.2.4 Soils and Water

4.2.4.1 Soils

Under Alternative #2, new construction would consist of six separate projects resulting in up to 204,009 SF (4.7 acres) of new construction footprint and up to 104,884 SF (2.4 acres) of new impervious surface. There are two construction scenarios for the aircraft conversion under consideration; only one of these options would be implemented. The total construction footprint analyzed represents the largest possible footprint of each of the options (Table 2.3-11). These proposed construction projects would meet all criteria specified in ANG Handbook 32-1084, *Facility Space Standards.*

Proposed construction under Alternative #2 would occur primarily on Adelphia-Urban land complex (0 to 5 percent slopes), with a small amount (approximately 0.5 acre) of the new construction footprint on Sassafras sandy loam and Udorthents. Adelphia-Urban land complex is rated by the NRCS Web Soil Survey as somewhat limited for small commercial building development due to shrink-swell potential and depth to saturated zone and very limited for roadway development due to frost action and depth to saturated zone (NRCS 2013). In addition, Sassafras sandy loam (*2 to 5 percent slopes*) is designated as Prime Farmland under the Farmland Protection Policy Act; however, only 3 percent of the proposed construction footprint would occur on this soil type. The proposed construction is for national defense purposes and the surrounding land is already in urban development. Pursuant to the Farmland Protection Policy Act, the USAF determined that the land is not farmland subject to the Farmland Protection Policy Act; therefore, the Farmland Protection Policy Act does not apply to this alternative.

To minimize potential impacts to soil and water resources associated with erosion, runoff, and sedimentation during construction activity, standard construction practices as described in the 108 WG SWPPP (USAF School of Aerospace Medicine 2010) would be implemented during and following the construction period. Such practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate. A site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls is an effective way of controlling erosion while soil is exposed and subject to construction activity. The contractor would also submit a Burlington County Erosion and Sediment Control Plan and receive certification of the plan prior to commencing site work. An NOI must be filed with the state of New Jersey to obtain coverage under the Construction Activity Stormwater General Permit (General Permit No. NJ0088323) prior to implementation of individual projects. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation. Implementation of these measures, as necessary and appropriate, would ensure that impacts to earth resources as a result of implementation of Alternative #2 would be minimal.

4.2.4.2 Surface Water

As a result of implementation of Alternative #2, there would be a maximum of 104,884 SF (2.4 acres) of new impervious surface from the proposed construction (Figure 4.2.4-1). This could result in localized increases in stormwater runoff volume and intensity, in addition to increases in total suspended particulates to nearby surface waters. However, in accordance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features. The integration of LID design concepts incorporates site design and stormwater management to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Increased runoff and peak discharge volumes as a result of increases to impervious surface can be managed by appropriately designed conveyance structures (such as roadways, channels, and culverts) in accordance with site-specific engineering standards that take into consideration the influence of surface water drainage within, adjacent to, and downstream of the project. In addition, implementing features that manage surface water runoff into the design of the project would avoid or minimize conflicts with city, county, state, or federal regulations and prevent adversely affecting adjacent properties and/or the project area itself. Such measures could include:

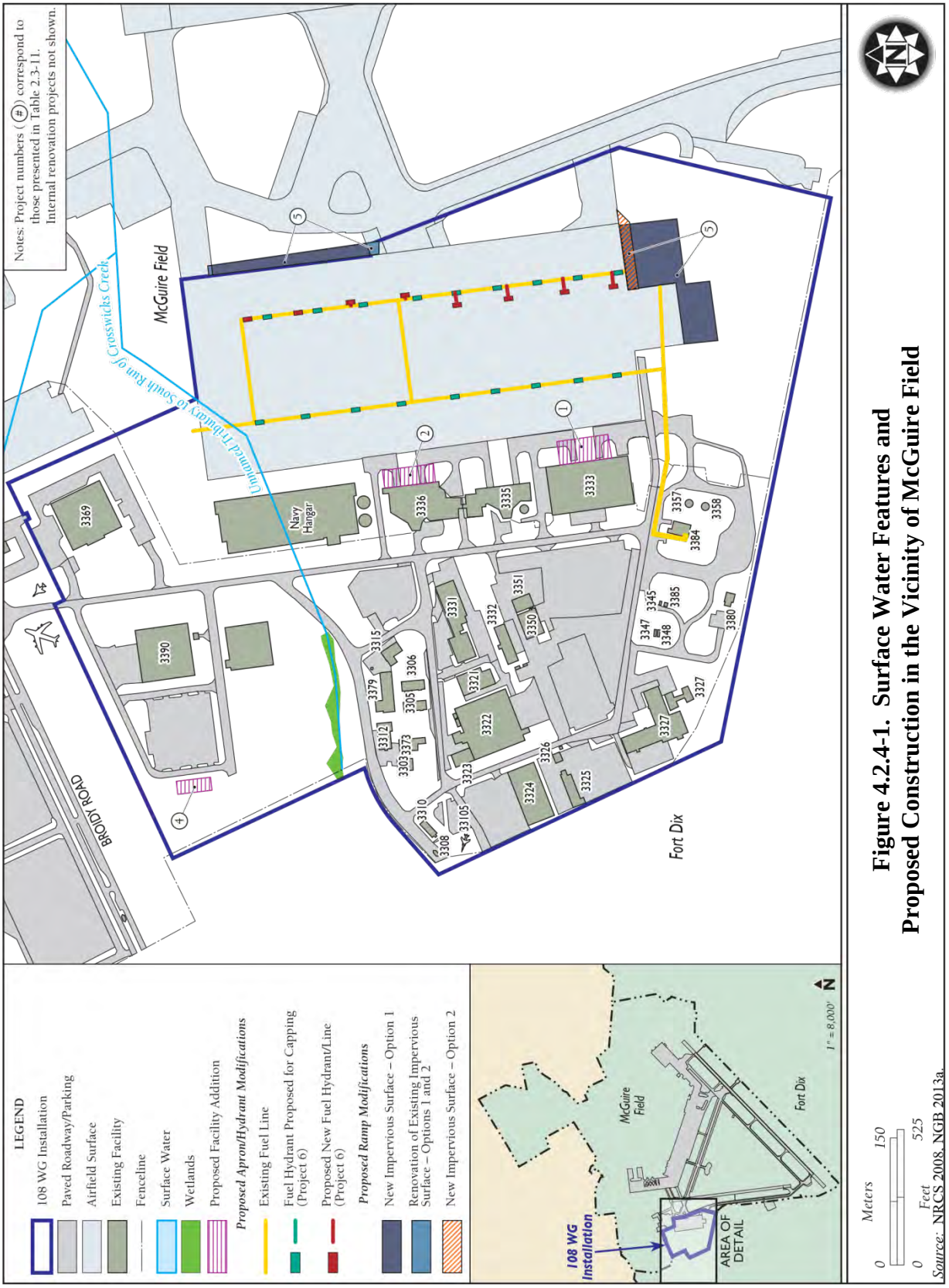


Figure 4.2.4-1. Surface Water Features and Proposed Construction in the Vicinity of McGuire Field

- water harvesting and natural open space,
- installation of detention basins for water recharge or for release of runoff at predetermined times to minimize peak discharges,
- the use of porous materials, such as pavers or gravel, for driveway and walkway construction, and
- directing runoff toward permeable areas, such that discharge exiting each site post-construction would be equal to or less than existing conditions.

Implementation of these measures, as necessary and appropriate, would ensure that impacts to surface water as a result of implementation of Alternative #2 would be minimal.

4.2.4.3 Groundwater

As a result of Alternative #2, the increase in the amount of impervious surface (2.4 acres) would also result in a decrease in groundwater recharge. However, as noted above, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of permit-related temporary and/or permanent drainage management features such as detention/retention basins and standard construction practices as described above. The integration of water harvesting and natural open space into project design would further minimize potential adverse impacts due to increased impervious surface. The use of these features would also increase groundwater recharge through direct percolation offsetting the loss of pervious surface due to future construction. Additionally, the impervious surface area resulting from the proposed activities would not be one continuous, hardened surface. Rather, the impervious surfaces would occupy several smaller areas, which would further minimize localized impacts to groundwater recharge.

4.2.4.4 Floodplains

Proposed construction activities at the installation would not occur within the 100-year floodplain zone. As such, there would be no impacts to floodplains under this alternative.

4.2.4.5 Summary of Impacts

There would be approximately 4.7 acres of temporary soil disturbance and 2.4 acres of new impervious surface as a result of the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. In addition, as the construction is for national defense purposes and the surrounding land is already in urban development, the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.

4.2.5 Biological Resources

4.2.5.1 Vegetation

Construction of new facilities associated with Alternative #2 at the 108 WG installation would primarily occur on currently paved areas or actively managed (i.e., mowed and landscaped) areas. In addition, approximately 0.15 acre (6,700 SF) of forest on the 108 WG installation (< 0.001 percent of the total forested area on JB MDL) would be removed in order to build the new simulator. However, this forested area is a small isolated fragmented parcel, and provides limited quality wildlife habitat. Alternative #2 would result in an increase of 104,884 SF (2.4 acres) of impervious surfaces. Impacts to the vegetation at the installation would be minor due to the lack of sensitive vegetation in the project area.

4.2.5.2 Wildlife

Under Alternative #2, minor impacts to wildlife would occur as a result of construction. Noise and human activity associated with construction could evoke reactions to wildlife, including those that are protected under the MBTA, and may cause them to temporarily avoid the area. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. However, bird and wildlife populations in the vicinity of the 108 WG installation where project components would occur are accustomed to human activity and elevated noise associated with aircraft and general military industrial use. In addition, to the extent possible, construction would not occur during the breeding season for grassland birds (April 15 to July 31). As a result, indirect impacts from construction are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications. Additionally, any tree clearing would be performed outside the migratory bird breeding season (March 15 to July 31) to avoid any impacts to migratory birds.

Under Alternative #2, impacts to wildlife due to proposed operations would be minor. DNL noise contours would be expected to increase slightly from baseline with the conversion to the KC-46A aircraft; however, these noise levels would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with existing aircraft and military operations. Bird/wildlife aircraft strikes are also an inevitable hazard associated with military aircraft training. Under Alternative #2, the KC-46A would operate in the same airfield environment as the current aircraft. Annual operations for the 108 WG would be projected to increase by approximately 111 percent over the KC-135 baseline operations (15 percent increase in total airfield operations). An increase in airfield operations would increase the potential for bird/wildlife aircraft strikes to occur. The 108 WG has developed procedures designed to

minimize the occurrence of bird/wildlife aircraft strikes, and has documented detailed procedures to monitor and react to heightened risk of bird/wildlife aircraft strikes. Adherence to the existing, effective BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.2.3, *Safety*). When risk increases, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed pattern work) in the airport environment. Special briefings are provided to pilots whenever the potential exists for increased bird/wildlife aircraft strikes within the airspace.

4.2.5.3 Special Status Species

No federally listed species are currently known to occur on the 108 WG installation and there is only a low potential for them to occur within the vicinity due to the lack of habitat. Six state listed species have been observed on McGuire Field. Grassland habitat located within the potential ramp expansion area could provide habitat for these species. However, to the extent possible, construction would not occur during the breeding season for grassland birds (March 15 to July 31). Operational noise levels under Alternative #2 would be expected to increase slightly from baseline with the conversion to the KC-46A aircraft. Under Alternative #2, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #2, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 4 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.). An additional 419 acres of land off the airport property would be exposed to DNL between 65 dB and 70 dB. However, since ambient noise levels within the vicinity are relatively high under existing conditions, the Proposed Action under Alternative #2 would be unlikely to substantially increase enough to preclude wildlife from utilizing the area as they currently do. Therefore, there would be no effect to federally listed species and impacts to state listed species would be minor under Alternative #2. The USFWS New Jersey Field Office sent an e-mail on September 27, 2013 stating that they have no objection to the Proposed Action.

4.2.5.4 Wetlands

There are no wetland areas that occur within the vicinity of the proposed project footprints. Therefore, no impacts to wetlands would occur as a result of Alternative #2.

4.2.5.5 Summary of Impacts

Impacts to vegetation under this alternative would be minor due to the lack of sensitive vegetation in the project area. There would be no impacts to wetlands. Impacts to wildlife from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. A 111 percent increase in 108 WG (15 percent increase in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally listed species or critical habitat is known to occur on McGuire Field; therefore, there would be no impacts to federally listed species. Six state listed species have been observed on McGuire Field. Impacts to state listed species would be minor.

4.2.6 Cultural Resources

Potential impacts to cultural resources examined in this analysis include effects to archaeological sites due to ground disturbing activities during construction or modification to buildings. Indirect impacts that would come from an increase in personnel from 1,329 to 1,616 necessary for the KC-46A beddown would be negligible as personnel would primarily be confined to the developed areas on the installation, which lack cultural resources.

4.2.6.1 Archaeological Resources

The area of McGuire Field was occupied during the late eighteenth through early twentieth century by rural homesteads outlying the nearby towns such as Pointville and Wrightstown. Both Texas Avenue and McGuire Road lie on the alignment of historic roads known to have been used as through routes during the nineteenth century. However, military development of Camp Dix Army Airfield in the early twentieth century, as well as Rudd Field and McGuire Air Force Base during the mid to late twentieth century, led to large scale disturbance of previously occupied historic landscapes. Nonetheless, there are pockets of historic archaeological resources extant within the installation boundaries including the three NRHP eligible sites mentioned in Section 3.2.6. None of these sites are within the area of potential disturbance for Alternative #2. A small amount of construction (0.15 acre) for a new simulator building off of Broidy Road would occur in a stand of trees near this developed area. This area was the location of barracks in the 1940s and 1950s and likely has some buried foundations dating to that period. However, those barracks remains are not considered eligible to the NRHP (Duryee 2013). Therefore, based on previous archaeological surveys at McGuire Field and the historic land use patterns of the installation, the area of proposed construction does not contain any known NRHP-eligible sites and this area is considered to have a low potential for containing buried archaeological materials (87th Civil Engineering Squadron 2013). In the unlikely event that archaeological or human

remains are identified during construction, all activities in the area of the discovery would cease and the JB MDL Cultural Resources Manager would be immediately contacted for further instruction. Because the 108 WG installation has been inventoried for archaeological resources and no such resources were encountered within the area of disturbance of Alternative #2, there would be no impacts to archaeological resources (prehistoric or historic) under Alternative #2. The New Jersey SHPO has concurred that there would be no historic properties affected under Alternative #2 (Saunders 2013).

4.2.6.2 Architectural Resources

Alternative #2 would include additions to Hangars 3333 and 3336 and interior renovations to Hangar 3322. Hangars 3333 and 3336 were built in the late 1990s and are not historic; therefore, they are not eligible to the NRHP as they are not yet 50 years old and they do not meet criterion G for exceptional significance under the Cold War or any other event. Hangar 3322, built in 1957, was evaluated for NRHP eligibility in 2013 and determined not eligible for listing in the NRHP (JB MDL 2013d). The New Jersey SHPO concurred that there would be no historic properties affected under the proposed action and that Section 106 consultation was complete (see Saunders 2013 in Appendix B3). Therefore, based on current information, there would be no adverse impact to Hangars 3333, 3336, and 3322 under Alternative #2.

4.2.6.3 Traditional Resources

The 108 WG installation contains no known traditional resources. Given the extensive development on much of the installation, it is considered unlikely that there are traditional resources located at the 108 WG. Government-to-government consultation for this action has been conducted with the Delaware Nation and the Delaware Tribe of Indians in recognition of their status as sovereign nations. This consultation also provides information regarding tribal concerns per Section 106 of the NRHP and information on traditional resources that may be present on or near the installation. The Delaware Tribe of Indians sent a response on October 4, 2013 stating that their review indicated no religious or culturally significant sites in the area and that they have no objection to the Proposed Action (see Obermeyer 2013 in Appendix B2). The Delaware Nation stated via telephone on April 3, 2014 that they had no objection to the Proposed Action. The NGB and the USAF values its relationship with tribes and will continue to seek opportunities to consult on other planning efforts or matters of known/potential interest to tribes.

4.2.6.4 Summary of Impacts

Construction activities associated with this alternative would be primarily limited to the developed areas of the installation in the areas of the aircraft hangars and airfield pavements,

where no archaeological resources are known. A small amount of construction (0.15 acre) for a new simulator building off of Broidy Road would occur in a stand of trees near this developed area. This area was the location of barracks in the 1940s and 1950s and likely has some buried foundations dating to that period. However, those barracks remains are not considered eligible to the NRHP (Duryee 2013). Therefore, based on previous archaeological surveys and historic land use patterns at McGuire Field, the area of proposed construction does not contain any known NRHP-eligible archaeological sites and is considered to have a low potential for containing buried archaeological materials. The New Jersey SHPO has concurred that there would be no historic properties affected under Alternative #2. No traditional resources have been identified. Therefore, no impacts to cultural resources are anticipated at the 108 WG installation under Alternative #2.

4.2.7 Land Use

The primary source of impacts to land use resulting from Alternative #2 would be from noise. As shown in Table 4.2.7-1 and Figure 4.2.7-1, areas outside of JB MDL boundaries currently exposed to DNLs of 65 dB to 70 dB would increase by approximately 350 acres, overall. By zoning districts, Recreation areas affected by DNL of 65 dB to 70 dB would increase by approximately 6 acres. Agricultural areas would increase by approximately 213 acres; Commercial areas would increase by approximately 7 acres, Residential areas would increase by approximately 2 acres, Open Space areas would increase by approximately 109 acres, and non-designated areas would increase by approximately 13 acres. Areas outside of the airport boundaries currently exposed to DNL of 70 dB to 75 dB would increase by approximately 69 acres, overall. By zoning districts, Recreation, Commercial, and other non-designated areas affected by DNL of 70 dB to 75 dB would remain approximately the same; Agricultural areas would increase by approximately 51 acres; Residential areas would increase by approximately 6 acres, and Open Space areas would increase by approximately 11 acres.

Table 4.2.7-1. Change in Acres Affected by Noise Levels Above 65 dB DNL Outside the McGuire Field Boundary

	65 dB TO 70 dB DNL			70 dB TO 75 dB DNL			
Land Use	*Baseline (acres)*	*Proposed (acres)*	*Change (acres)*	*Baseline (acres)*	*Proposed (acres)*	*Change (acres)*	*Total Change (acres)*
Recreation	<1	6	6	0	0	0	6
Agricultural	214	427	213	10	61	51	264
Commercial	2	9	7	0	<1	<1	7
Residential	13	15	2	7	13	6	8
Open Space	73	182	109	4	16	11	119
Non-designated	9	22	13	0	<1	<1	13
Total Area	**311**	**661**	**350**	**21**	**90**	**69**	**419**

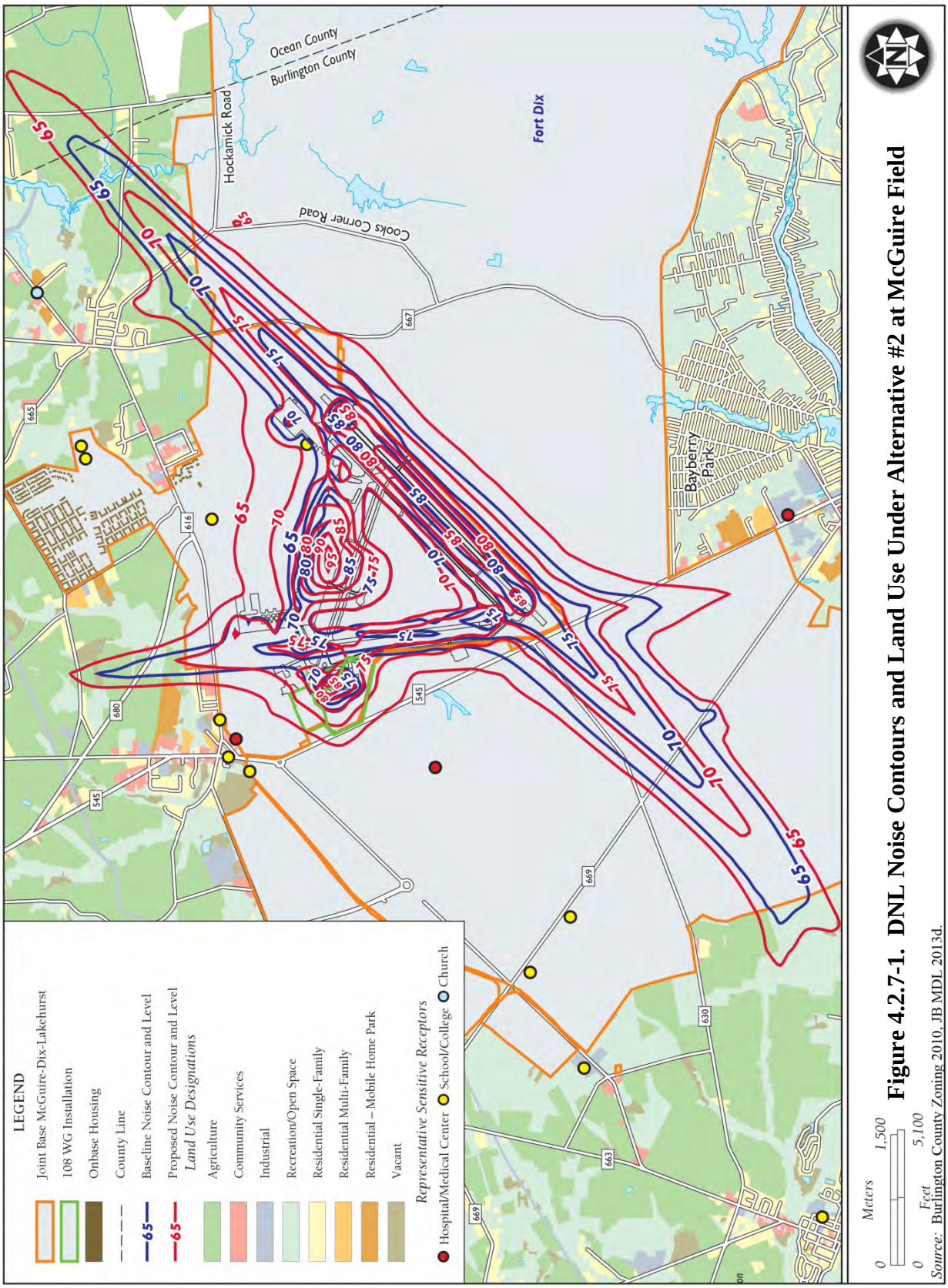


Figure 4.2.7-1. DNL Noise Contours and Land Use Under Alternative #2 at McGuire Field

Source: Burlington County Zoning 2010, JB MDL 2013d.

Agricultural areas would be most likely to be exposed to increases in noise levels, but those levels (60-75 dB DNL) would remain compatible as per FICUN standards (Appendix A, Section A.7). An additional 8 acres of residential use areas would be exposed to DNL above 65 dB, levels considered incompatible as per FICUN standards. With the exception of residences associated with 48 additional people, no churches, schools, or other known noise sensitive receptors would be located within the 65 dB DNL noise contour. The minimal increase in incompatible noise levels would result in minor impacts to land use. A more detailed discussion of aircraft operations and noise can be found in Section 4.2.1, *Noise*.

4.2.7.1 Summary of Impacts

The number of total annual airfield operations would increase by 9,268 (15 percent), and the acreage within the 65 dB DNL (and greater) noise contour off DoD-controlled property would increase by 419 acres. An additional 8 acres of residential use areas would be exposed to DNL greater than 65 dB. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in minor adverse impacts due to an increase in off-airport areas (including residential areas) exposed to noise levels between 65 dB and 75 dB DNL. Airport Hazard Areas would not be affected.

4.2.8 Infrastructure and Transportation

4.2.8.1 Potable Water

Water consumption would be expected to increase slightly under Alternative #2 as a result of the increase in personnel; however, an increase in 255 personnel on the installation would not be expected to impact regional water supply. Additionally, the demand for water (e.g., if used to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact regional water supply.

4.2.8.2 Wastewater

Wastewater generation would be expected to increase slightly as a result of the increase in 255 personnel on the installation. However, there have been no deficiencies identified with the existing system, and it is expected that the existing sanitary sewer system is generally adequate to serve the facilities proposed under this alternative.

4.2.8.3 Stormwater

Under Alternative #2, there would be up to 204,009 SF (4.7 acres) of temporary soil disturbance as a result of proposed construction. The proposed construction activities could temporarily impact the quality of stormwater runoff (see Section 4.2.4, *Soils and Water*); however, through implementation of appropriate standard construction practices (as described previously), preventative maintenance, and periodic inspections and sampling to detect risk to stormwater, especially during active construction activity, no impacts would be expected to the existing stormwater drainage system as a result of the proposed construction.

In addition, there would be an increase in up to 104,884 SF (2.4 acres) of new impervious surface. The addition of new impervious surfaces would potentially increase stormwater runoff volume and peak discharge rates; however, as discussed in further detail in Section 4.2.4, *Soils and Water*, stormwater runoff increases would be managed such that discharge exiting each site post-construction would be equal to or less than existing conditions in accordance with UFC 3-210-10 and EISA Section 438. Implementation of these measures would ensure that impacts to the stormwater drainage system as a result of implementation of Alternative #2 would be minimal.

4.2.8.4 Electrical and Natural Gas Systems

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel, and the building space and facilities to be constructed would require additional electricity. However, any new facilities and additions associated with Alternative #2 would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities.

Construction activity associated with Alternative #2 could result in some temporary interruption of utility services during construction. These impacts would be temporary, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

4.2.8.5 Solid Waste Management

The building space and facilities to be constructed would generate construction and demolition debris requiring landfill disposal. Construction activities would result in approximately 204,009 SF of additions and alterations to existing facilities and 104,884 SF of new building construction. Using a multiplier provided by the USEPA to determine solid waste generation, it was estimated proposed renovations at JB MDL would generate 2,405,266 pounds (1,203 tons) of renovation debris requiring landfill disposal and proposed new construction at JB MDL would generate 455,197 pounds (228 tons) of construction debris (USEPA 2009). Therefore, the total amount of construction and demolition debris generated at JB MDL would be 1,431 tons.

Solid waste generated as a result of the proposed construction could result in impacts to solid waste management facilities in the area. The Burlington County Resource Recovery Complex has a remaining life expectancy of 5 years and a permitted throughput of 360,000 tons per year (Burlington County 2009). The 1,507 tons of proposed construction debris generated at JB MDL would represent approximately 0.4 percent of the yearly capacity of the landfill. In addition, Burlington County Resource Recovery Complex has room for expansion to meet the needs for future growth (Burlington County 2009). Impacts to local landfills would not be expected to exceed the permitted throughput or contribute significantly to the remaining capacity.

Off-installation contractors completing construction and demolition projects at the 108 WG installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled or reused, or otherwise diverted from landfills. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, sets a target diversion rate of 50 percent for recycling and waste diversion for DoD facilities by 2015, including construction and demolition waste; compliance with EO 13514 would further minimize the increase in solid waste generation as a result of the proposed construction. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (2009).

4.2.8.6 Transportation

Construction equipment would be driven to proposed construction areas and would be kept on-site for the duration of the respective activity. Construction workers would drive daily in their personal vehicles to and from the construction site. In general, construction traffic would result in increases in the use of on-installation roadways during construction activities; however,

increases would be temporary and intermittent, occurring only during active construction periods.

The number of authorized personnel on the installation would increase by 255 under Alternative #2 (see Table 2.3-12). The increase in personnel would create a potential 255 additional one-way vehicle trips to and from the installation during morning and evening peak periods for these additional personnel. Assuming that each person makes two trips per day, the implementation of Alternative #2 would add an additional 510 trips onto the existing roadway network after the construction phase is complete. However, regional roads used to access the installation as well as those located on the installation have sufficient capacity to manage this increase in traffic without substantial impacts to circulation. Therefore, impacts to transportation infrastructure would not be significant under Alternative #2.

4.2.8.7 Summary of Impacts

Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increase demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.

4.2.9 Hazardous Materials and Waste

4.2.9.1 Hazardous Materials

A HMMP has been developed for the KC-46A program. Training activities and other functions would be expected to remain similar between the KC-46A and existing KC-135 aircraft. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. However, unlike the KC-135, the KC-46A aircraft will be free of ODSs. ODSs were typically used as part of the fire suppression systems on aircraft; ODS use and/or storage would no longer be required under Alternative #2.

The KC-46A aircraft has been designed with a focus on reduction of hazardous materials such that hazardous materials currently required for maintenance, operations, and materials on or associated with the new aircraft would be less than or equal to the existing aircraft (Boeing 2011). In addition, it is anticipated that the amount of hazardous waste generated for one KC-46A aircraft for maintenance activities would be slightly less than that generated for one KC-135 aircraft since the KC-46A has two engines as opposed to the four engines for the

KC-135. Furthermore, the KC-46A is a newer aircraft and is expected to need less maintenance than the older KC-135 aircraft.

Under Alternative #2, the total number of flying hours for the 108 WG would increase from 3,687 to 8,040 (an increase of 118 percent); therefore, the throughput of petroleum substances (e.g., fuels, oils) used during operations would be expected to increase commensurately from what is currently used to maintain the KC-135 fleet (see Appendix A, Section A.9, for more details). Additionally, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities, because various fuels (e.g., diesel, gasoline) would be required to run earth moving equipment and power tools and to provide electricity and lighting as conditions warrant. Procedures for hazardous material management established for the 108 WG installation would continue to be followed in future operations associated with Alternative #2 and as required during all construction and renovation activities.

Toxic Substances

Under Alternative #2, additions to Hangars 3333 and 3336 are proposed, and internal renovations to Hangar 3322 are proposed. An asbestos survey was performed at the 108 WG installation in 2007. According to the 2007 asbestos report, Hangar 3322 was found to contain ACM in the insulation, floor tiles, and mastic. An LBP survey has not been conducted at the 108 WG installation. However, Hangar 3322 was constructed prior to 1978, and therefore may contain LBP. Hangars 3333 and 3336 were built after 1978 and therefore are assumed to contain no LBP. Any structures proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. All ACM would be properly removed and disposed of prior to or during demolition in accordance with 40 CFR 61.40 through 157. All LBP would be managed and disposed of in accordance with TSCA, OSHA regulations, State of New Jersey requirements (regarding site work practices for buildings with LBP), and established ANG procedures. Materials, especially discarded oil products, would be screened for PCB contamination prior to disposal.

4.2.9.2 Hazardous Waste Management

The type of hazardous waste streams generated by KC-46A operations would be expected to remain similar to those being generated by the existing KC-135 aircraft, with the exception of ODSs. Additionally, the two aircraft require the same types of hazardous materials for their maintenance and operations (e.g., fuels, oils). Under Alternative #2, the total number of flying hours for the 108 WG would increase approximately 118 percent; therefore, hazardous waste streams would be expected to increase commensurately (see Appendix A, Section A.9, for more details). However, the increase in hazardous waste streams is supportable by the current

infrastructure at the installation. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's large quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations.

4.2.9.3 Environmental Restoration Program

In accordance with AFI 32-7020, *The Environmental Restoration Program*, construction, modifications and/or additions to existing buildings can occur on or in proximity to existing ERP sites. Accordingly, the appropriate organizations (e.g., installation planners, ERP managers, design engineers) must consider a compatible land use based on current site conditions and the selected or projected remedial action alternatives. Construction should be sited and designed to minimize life-cycle costs to include those associated with impacts from existing contaminated sites. If the potential for uncharacterized ERP sites exist, the installation is responsible for identifying existing contamination at the proposed construction sites to avoid unknowingly locating construction projects in areas with contamination. The installation is responsible for performing necessary environmental baseline surveys, accomplishing environmental impact analysis process requirements, and for otherwise informing itself about existing site conditions and their associated cost impacts in preparation for a construction project. When warranted by the site history, environmental restoration funds may be used to accomplish RCRA facility assessments, or preliminary assessments and site inspections undertaken in accordance with the CERCLA process, or similar site investigations in accordance with applicable state laws for suspected releases. To the extent that a construction project generates actions to address contamination, or a need to change the timing of ERP-generated actions to address contamination, the costs of such actions are not Environmental Restoration Account-eligible and shall be funded as part of the construction project. This includes the handling, mitigation, and disposal or other disposition of contamination discovered before or during the construction activity.

The removal and disposal of contamination unexpectedly encountered within the construction project footprint during the execution of a construction project will be undertaken as part of the construction project using construction project funds which may include other MILCON funds reprogrammed to a MILCON construction project. Construction contractor costs (such as direct delay costs and unabsorbed or extended overhead) incidental to discovery and removal of the contamination will be construction project funded to the extent that the government is responsible and liable for such costs.

Vapor intrusion should be evaluated when volatile chemicals are present in soil, soil gas, or groundwater that underlies existing structures or has the potential to underlie future buildings and there may be a complete human exposure pathway. Due to their physical properties, volatile chemicals can migrate through unsaturated soil and into the indoor air of buildings located near zones of subsurface contamination.

One of the ERP Sites, SS-39, overlaps with a portion of the existing fuel hydrants that would be capped, as well as the proposed addition to Hangar 3336, under Alternative #2 (Figure 4.2.9-1). Remedial investigation is on-going with this site. It is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations.

If contaminated media (e.g., soil, vapor, groundwater) are encountered during the course of site preparation (e.g., clearing, grading) or site development (e.g., excavation for installation of building footers) for proposed construction activities, work would cease until 108 WG Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met, and to arrange for agency consultation as necessary if existing ERP sites are affected. Also, prior to construction activities, the construction contractors would be notified of the nature and extent of known contamination so they can inform their employees in advance of on-site activities and take appropriate precautions to protect health and safety, and to prevent the spread of contamination. The construction contractors would be responsible for ensuring their workers follow appropriate health and safety requirements.

4.2.9.4 Summary of Impacts

There would not be an increased risk of hazardous waste releases or exposure from this alternative. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations. There would be no expected impact from ERP sites. Impacts relative to hazardous materials and wastes would be negligible.

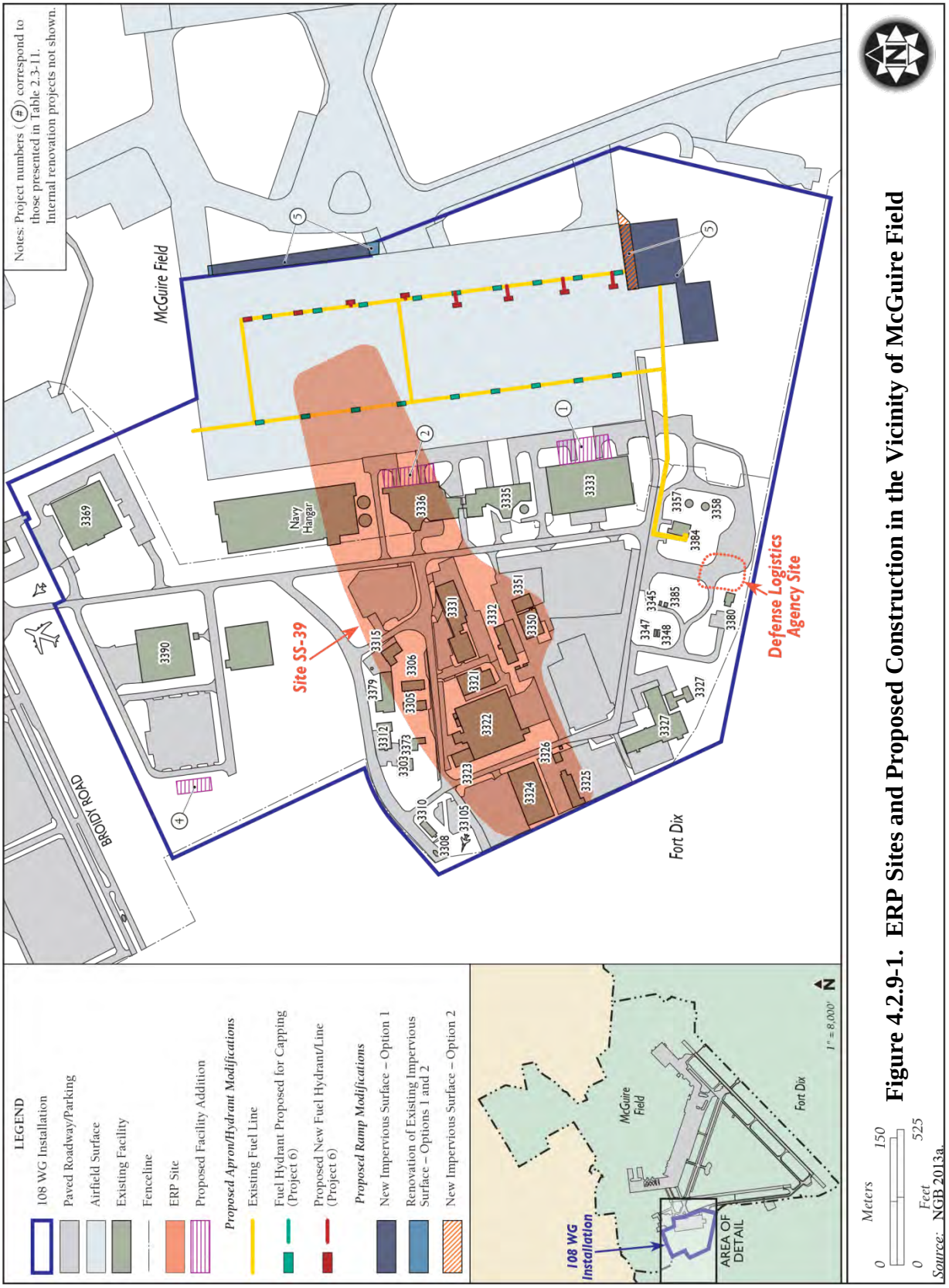


Figure 4.2.9-1. ERP Sites and Proposed Construction in the Vicinity of McGuire Field

4.2.10 Socioeconomics

Under Alternative #2, construction activities would be contained entirely within the boundaries of JB MDL. Economic activity associated with proposed construction activities at the 108 WG installation, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased would be negligible on a regional scale.

The proposed aircraft beddown and related activities would result in a minor change in staffing requirements for the 108 WG. Currently, the 108 WG is authorized 1,329 personnel. Under Alternative #2, the KC-46A mission would add an additional 287 military positions (increase in 231 full-time positions and an increase of 56 traditional Guard position) (see Table 2.3-12). Combined with their approximately 390 family members, this would represent less than 0.09 percent of Burlington County and 0.07 percent of Ocean County (assumes 100 percent of increase in off-base population living in each county). Of the 390 family members, approximately 156 would be anticipated to be of school age. The students entering the local schools would be expected to be enrolled in various grades and live in different areas within Ocean and Burlington counties. It is anticipated that there is enough capacity within the schools in these counties to absorb this minimal increase in school age children.

An increase in 287 military personnel positions would amount to an increase of approximately 21.6 percent to the existing 108 WG personnel. Total payroll associated with the 231 full-time personnel would amount to an estimated total annual salary increase of approximately $21 million.

While there is housing located on JB MDL, currently all 108 WG personnel live off-installation. Under Alternative #2, there is ample on-base housing to accommodate the 199 new active associate personnel should they choose to live on base. However, currently only 20 percent of active duty personnel live on base. Therefore, it is assumed that approximately 20 percent of the 199 proposed active associate personnel (approximately 40 individuals) and their families would live on base. This could in turn result in approximately 247 personnel living off the installation and purchasing 247 homes as personnel relocate to the area. This would represent less than 0.2 percent of the total housing units in Burlington County and less than 0.1 percent of Ocean County. However, not all the military personnel who would relocate would own homes and personnel would most likely be distributed between the two counties.

4.2.10.1 Summary of Impacts

Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.

4.2.11 Environmental Justice and the Protection of Children

4.2.11.1 Minority and Low-Income Populations

As presented in Table 4.2.11-1, of the roughly 128 persons (48 more than baseline) that would be affected by a DNL above 65 dB, approximately 23 would be minority (18 percent). This is an increase of 11 people, or 3 percent, of minorities affected. The number of low-income persons affected by a DNL greater than 65 dB would be approximately 6 (an increase of 2 people and less than 1 percent). Overall, the number of persons affected by a DNL of 65 dB and greater would increase slightly under this alternative, and the increase in the percentage of minority and low-income persons affected would be minor. Therefore, impacts to minority or low-income populations in the vicinity of JB MDL would not be significant and there would be no disproportionate impacts to minority or low-income populations.

Table 4.2.11-1. Population within Alternative #2 Noise Contours, JB MDL[1]

Noise Contour	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*
65-70	77	14	18	4	5
70-75	51	9	18	2	4
75-80	0	0	0	0	0
80-85	0	0	0	0	0
85+	0	0	0	0	0
Total	**128**	**23**	**18**	**6**	**5**

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Sources: USCB 2010b and 2011c.

4.2.11.2 Protection of Children

There are no facilities on the installation where children may be encountered on a regular basis. Currently there are no Kindergarten through Grade 12 off-installation schools that are exposed to a DNL of 65 dB or above; however, there is one child development center located within the 65 dB contour. Under Alternative #2 there would be no new Kindergarten through Grade 12 schools exposed to a DNL of 65 dB or above; however, the child development center that is currently under the 65 dB contour would be located under the 70 dB contour.

4.2.11.3 Summary of Impacts

Although the acreage and the number of persons within the 65 dB DNL noise contours would increase slightly under this alternative, the percentage of minority and low-income persons affected would remain approximately the same as baseline, and no additional schools would be located within the vicinity of JB MDL exposed to DNL of 65 dB or above; thus, there would be no disproportionate impacts to minority or low-income populations and no special health or safety risks to children.

4.3 ALTERNATIVE #3 -- PEASE AIR NATIONAL GUARD STATION

4.3.1 Noise

In this section, noise associated with flying operations and construction activities related to Alternative #3 are considered and compared with current conditions to assess potential impacts at Portsmouth IAP. Details of the methodologies used for this section can be found in Appendix A, Section A.1.2.

DNL noise contours for the KC-46A under Alternative #3 were generated using INM. Based KC-135 operations were removed and replaced with KC-46A operations using the B-767-300 and the standard flight profile data provided with INM as substitute data and applying the data to the current based KC-135 flight tracks and operational procedures (INM does not have a standard profile or noise curve data for the KC-46A). Using the standard flight profile data provided for this substitute aircraft in INM provides an accurate analysis of noise contour comparisons that would be expected with the new KC-46A. Flight profiles, flight tracks, and operational procedures currently being used by the KC-135 were used in this INM program.

4.3.1.1 Aircraft Noise

Under Alternative #3, 12 KC-46As would be based at Pease ANGS, replacing the current 8 KC-135 aircraft. There would be no change in the number or type of other aircraft using the airfield and the KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures in which the aircraft climbs or descends in the immediate vicinity of the airfield. Tactical training prepares aircrews for operations in forward operating locations in which flying at low-altitudes over land not controlled by friendly forces exposes the aircraft to ground-based threats. This procedure is currently being flown with the KC-135. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures; however, most tactical procedures would be accomplished primarily in the simulator or at other locations away from Portsmouth IAP.

Under Alternative #3, the 157 ARW would have an increase in flying hours generating an increase in airfield operations by 2,700 from 6,140 to 8,840 operations (a 44 percent increase). Aircraft operations per average annual day (arrivals and departures [1.68] and closed patterns [6.73]) would increase under Alternative #3 to 2.42 arrivals and departures and 9.7 closed patterns/day. The percentage of 157 ARW aircraft operations occurring during environmental night (10 p.m. to 7 a.m.) would remain at the same 4 percent as under baseline conditions. The

total number of operations flown by all other aircraft at Portsmouth IAP would not change from previously identified airfield activities. There would be no change to any other aircraft types or aircraft flight tracks and profiles from the baseline condition (Table 4.3.1-1).

Table 4.3.1-1. Portsmouth IAP Annual Aircraft Operations with Proposed KC-46A

Aircraft	Departures		Arrivals		Total[1]		*Grand Total[1]*
	Day	*Night[2]*	*Day*	Night[2]	*Day*	*Night[2]*	
KC-46A	4,231	189	4,231	189	8,462	378	8,840
Other Aircraft[3]	14,541	1,094	14,853	782	29,394	1,876	31,270
Total	**18,772**	**1,283**	**19,084**	**971**	**37,856**	**2,254**	**40,110**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other based military and civilian aircraft and transient aircraft (multiple type aircraft) including: Lear 25, 35, and Airbus 319.

Source: 157 ARW 2013a.

Figure 4.3.1-1 depicts the noise exposure area from aircraft operations after the conversion from the current 8 KC-135 aircraft to 12 KC-46A aircraft, and Figure 4.3.1-2 compares baseline noise contours with Alternative #3 contours. The aircraft operations modeled include all transient aircraft, and general and commercial aircraft operations depicted in the most current Portsmouth IAP 2012 noise modeling update. Table 4.3.1-2 shows changes to the acreage of land within each noise contour under Alternative #3.

Table 4.3.1-2. Land Areas within DNL Contours at Portsmouth IAP Affected by DNL Greater than 65 dB under Baseline and Alternative #3

Noise Contour (dB DNL)	Baseline (KC-135) Total (acres)			Alternative #3 (KC-46A) Total (acres)			*Change Total (Acres)*
	On Airport	*Off Airport*	*Total*	*On Airport*	*Off Airport*	*Total*	
65-70	237	0	237	334	4	338	101
70-75	81	0	81	101	0	101	21
75-80	16	0	16	27	0	27	11
80-85	1	0	1	3	0	3	2
>85	0	0	0	0	0	0	0
Total	**334**	**0**	**334**	**465**	**4**	**469**	**135**

Notes: Numbers may not add precisely due to rounding.
DNL = Day Night Average Sound Level; dB = decibel

Figure 4.3.1-1. DNL Noise Contours Under Alternative #3 at Portsmouth IAP

Source: Pease International Tradeport 2013.

Figure 4.3.1-2. Comparison of Baseline and Alternative #3 DNL Noise Contours at Portsmouth IAP

Under Alternative #3, the DNL noise contours would expand slightly in all directions from the baseline DNL noise contours. Overall, the number of acres contained within the 65 dB DNL and greater exposure area would increase by approximately 135 acres, or 40 percent, but would remain primarily on airport property with approximately 4 of these acres off the airport property. Information regarding number of people residing in this area can be found in Section 4.3.11, *Environmental Justice and the Protection of Children*; and information regarding the area of residential use is located in Section 4.3.7, *Land Use*.

Percent of the Population Expected to be Highly Annoyed

The percentage of the population expected to be highly annoyed under Alternative #3 would not be expected to change from baseline conditions because there are no additional residences exposed to levels above DNL65 dB.

Single Event Sound Analysis

Under Alternative #3, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #3, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 4 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.).

Potential Hearing Loss

As shown in Table 4.3.1-1, there is no property off the Portsmouth IAP that falls within the 80+ dB DNL noise contour; therefore, there would be no potential hearing loss risk associated with these areas.

4.3.1.2 Construction Noise

There would be some minor noise from construction equipment associated with construction activities that would occur intermittently during the construction period (beginning FY 2015). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (FHWA 2006) (see Appendix C, *Noise*, Section A.1.2.2). Aviation-related activities at Portsmouth IAP dominate the local noise environment. Equipment used during the facility construction would contribute little to the general background noise levels around the airfield. Therefore, impacts from construction under Alternative #3 would be negligible.

4.3.1.3 Summary of Impacts

The number of annual airfield operations would increase by 2,700 (44 percent increase in 157 ARW operations, 7 percent increase in total airfield operations), and the acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Of this increase in acreage, 4 acres would be off airport-controlled property. There would be no potential for hearing loss off the airport and no increase in the percent of the population highly annoyed. Construction noise would be localized and temporary and would not add to the overall noise environment. Impacts from noise would be negligible.

4.3.2 Air Quality

The air quality analysis estimated the magnitude of emissions that would result from implementation of the proposed KC-46A construction and operational activities at the 157 ARW of the NH ANG at Pease ANGS, in Newington, New Hampshire. The estimation of proposed operational emissions is based on the net change in emissions between existing aircraft operations and projected KC-46A operations.

As discussed in Appendix A.2.3, air quality impacts from the beddown of the KC-46A aircraft at Pease ANGS were reviewed for significance relative to the PSD threshold for new major sources for attainment pollutants, and the General Conformity *de minimis* thresholds for nonattainment pollutants. Because the project region within Rockingham County is a maintenance area for O_3, the *de minimis* threshold of 100 tpy for O_3 precursors NO_x and VOCs was used as an indicator of the potential significance of the emissions from the KC-46A conversion. For attainment pollutants, the PSD threshold of 250 tpy (100,000 tpy for GHGs) was used as an indicator of the potential significance of the emissions from Alternative #3.

4.3.2.1 Operational Emissions

Sources associated with operation of the proposed KC-46A beddown at Pease ANGS include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) offsite POV commutes; and (4) AGE. It was assumed that other sources, including nonroad mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged. Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the project noise analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (AFCEC 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest

3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were estimated based on the proposed personnel for the existing and proposed scenarios, using emission factors for vehicles from AFCEC 2013.

Table 4.3.2-1 summarizes the annual operational emissions that would result from KC-46A operations at Pease ANGS. Table 4.3.2-1 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at Pease ANGS. As shown in Table 4.3.2-1, the net emissions increases are below the PSD/*de minimis* thresholds for all pollutants.

Table 4.3.2-1. Comparison of Baseline and Proposed Annual Operational Emissions, 157 ARW

	Annual Emissions, tons/year					
Baseline	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-135 Aircraft Operations	2.41	36.29	73.94	6.29	0.33	0.33
AGE	0.00	0.01	0.07	0.00	0.00	0.00
Engine Tests	0.10	1.47	0.40	0.06	0.01	0.01
POVs	1.11	19.06	0.91	0.01	0.04	0.02
Total	**3.62**	**56.84**	**75.32**	**6.36**	**0.37**	**0.35**
Proposed Action	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-46A Aircraft Operations	15.24	56.95	157.41	8.96	0.61	0.52
AGE	0.01	0.01	0.10	0.00	0.00	0.00
Engine Tests	0.77	2.63	0.71	0.08	0.01	0.01
POVs	0.91	17.45	0.70	0.01	0.04	0.02
Total	**16.93**	**77.05**	**158.92**	**9.06**	**0.66**	**0.55**
Net Increase	**13.31**	**20.21**	**83.60**	**2.70**	**0.28**	**0.19**
MOB2 Net Emissions Increase Fraction of Existing Emissions	**3.68**	**0.36**	**1.11**	**0.42**	**0.76**	**0.54**
PSD/*de minimis* Threshold	**100**	**250**	**100**	**250**	**250**	**250**

Notes: Numbers may not add precisely due to rounding.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle; PSD = Prevention of Significant Deterioration

In addition to criteria pollutant emissions, the beddown of the KC-46A aircraft at Pease ANGS would result in emissions of HAPs and GHGs. Operational activities would result in a net increase of HAPs that is below 1 ton per year.

Table 4.3.2-2 summarizes the annual operational GHG emissions that would result from KC-46A operations at Pease ANGS, along with the net increase in comparison with the baseline. As shown in Table 4.3.2-2, emissions are below the PSD thresholds for GHGs.

Table 4.3.2-2. Comparison of Baseline and Proposed Annual Operational GHG Emissions, 157 ARW

	ANNUAL GHG EMISSIONS, METRIC TONS/YEAR			
Baseline	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-135 Aircraft Operations	17,303	0.48	0.54	17,480
AGE	1,571	0.04	0.05	1,588
Engine Tests	172	0.00	0.01	174
POVs	597	0.00	0.00	597
Total	**19,643**	**0.53**	**0.59**	**19,839**
Proposed Action	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-46A Aircraft Operations	24,391	0.64	0.72	24,629
AGE	2,262	0.06	0.07	2,286
Engine Tests	233	0.01	0.01	235
POVs	612	0.00	0.00	612
Total	**27,499**	**0.71**	**0.80**	**27,762**
Net Increase	**7,855**	**0.18**	**0.21**	**7,924**
PSD Threshold	**100,000**	**100,000**	**100,000**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; AGE = aerospace ground equipment; POV = privately owned vehicle; GMV = government motor vehicle

4.3.2.2 Construction Emissions

The KC-46A beddown at Pease ANGS would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would occur from (1) combustion emissions from heavy equipment and vehicles; and (2) fugitive dust emissions due to operation of equipment on exposed soil. Table 4.3.2-3 presents a summary of the annual construction emissions for the beddown of the KC-46A aircraft at Pease ANGS. As shown in Table 4.3.2-3, emissions would be below the PSD/*de minimis* thresholds for all pollutants. For construction emissions, the project option with the greatest potential to emit, was used in the analysis (see Table 2.3-17).

Table 4.3.2-3. Annual Construction Emissions Under Alternative #3

Construction Project	*CO*	*NOx*	*VOC*	*SOx*	*PM_{10}*	*$PM_{2.5}$*	*Total CO_2, Metric tons/year*
Project #1 (Option 2) - Renovation/Addition to Building 264	0.93	1.48	0.26	0.03	1.33	1.11	494.25
Project #2 - Addition to Building 166	0.35	0.55	0.10	0.01	0.44	0.41	185.26
Project #3 - Internal Renovations to Hangar 251	0.30	0.47	0.06	0.01	0.04	0.04	122.59
Project #4 (Option 1) - Addition/Alteration to Hangar 253	1.52	2.42	0.43	0.05	2.45	1.88	808.91
Project #5 - (Option 1) - Demolition/Addition/Alteration to Hangar 254	1.48	2.36	0.41	0.04	2.37	1.83	789.52
Project #6 - Alter Aircraft Taxiway	0.31	0.75	0.08	0.04	0.18	0.16	185.62
Project #7 - Demolition/Modify/Install Aprons and Hydrants	0.07	0.16	0.02	0.01	0.04	0.04	42.16
Project #8 - Repave Quad Apron	1.16	2.80	0.28	0.14	1.01	0.71	715.98
Total maximum emissions	**6.12**	**10.99**	**1.64**	**0.33**	**7.86**	**6.18**	**3,344.29**
PSD/*de minimis* Threshold	**250**	**100**	**100**	**250**	**250**	**250**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide; PSD = Prevention of Significant Deterioration

4.3.2.3 Summary of Impacts

The Pease ANGS installation is in a maintenance area for O_3, and is therefore subject to *de minimis* thresholds. While there are increases in operational criteria pollutant emissions, they are below the PSD/*de minimis* thresholds for all pollutants and are not significant. Operational GHG emissions are within thresholds in the PSD tailoring rule. Impacts from construction emissions and operational HAP emissions are negligible.

4.3.3 Safety

4.3.3.1 Ground Safety

Existing facilities at Pease ANGS for fire response and crash recovery meet KC-46A beddown requirements (Headquarters AMC and NGB 2013a).

Proposed renovation and infrastructure improvement projects related to this alternative would not penetrate any RPZs or impact aircraft takeoff or landing (Headquarters AMC and NGB 2013a). New construction and building renovation activity would not result in any greater safety risk or obstructions to navigation. Operations would fall within the same general types as those that have historically occurred at Portsmouth IAP. For example, the KC-46A would follow established local approach and departure patterns used. Therefore, flight activity and subsequent operations would not require changes to RPZs.

Under this alternative, no new facilities are proposed for Pease ANGS. Planned construction at the installation comprises renovation and additions to several hangars; construction and upgrades to the taxiway; and demolition and installation of new fuel hydrants and lines on the parking apron. None of the construction or demolition would be in conflict with the current QD arcs.

Providing new and renovated facilities for the 157 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 157 ARW.

Construction activities would not involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures, including AFI 13-213, *Airfield Driving* (2011), would further minimize the relatively low risk associated with these construction activities.

The proposed construction projects meet all criteria specified in the ANG Handbook 32-1084, *Facility Space Standards.* AT/FP requirements have also been addressed to the extent practicable in all projects. Projects would use AT/FP site design standards for siting of facilities, parking, walkways, and other features. Renovations would bring the facilities into compliance with UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, providing additional protection for the personnel based there.

4.3.3.2 Flight Safety

Although the KC-46A is a new aircraft, it is a military derivative of the commercial Boeing 767 aircraft. First flown commercially in 1982, more than 1,000 commercial Boeing 767 aircraft have been produced and it is a proven commercial airliner, freighter, and tanker already in service (Boeing 2012). Mishap statistics for the commercial Boeing 767 show 14 total aircraft losses (similar to a Class A military mishap definition) during its 31 year lifetime (ASN 2013).

Although no facilities are proposed that would affect navigable airspace, Pease ANGS would comply with 14 CFR Part 77, *Objects Affecting Navigable Airspace*, as appropriate, should they be selected to host the KC-46A.

To augment airborne training missions, pilots flying the KC-46A would use simulators extensively. Simulator training includes all facets of flight operations and comprehensive emergency procedures. The sophistication and fidelity of current simulators and related computer programs are commensurate with the advancements made in aircraft technology and

are extremely realistic. These factors should minimize risk associated with mishaps due to pilot error.

Under Alternative #3, there would be an increase of approximately 44 percent 157 ARW airfield operations (7 percent in total Portsmouth IAP operations) at Portsmouth IAP compared to existing conditions. This increase in take-offs, landings, proficiency training, and other flights would result in a commensurate increase in the safety risk to aircrews and personnel.

The proposed increase in airfield flight operations would be expected to increase the opportunity for aircraft mishaps, including BASH incidents; however, the expected rate of mishaps or BASH incidents would not be expected to change from current conditions. Both the KC-135 and the commercial Boeing 767 have very low mishap rates, and with a new airframe and technological improvements the KC-46A would be expected to have a similar safety record. In addition, current airfield safety procedures discussed previously would continue to be implemented and additional airfield flight operations would adhere to established safety procedures (157 ARW 2011b).

Given the low likelihood for an aircraft accident or BASH mishap to occur in the local airfield area and even lower likelihood for civilians to be impacted, impacts to safety in the vicinity of Portsmouth IAP as a result of Alternative #3 would be expected to be negligible.

The KC-46A will have the capability to jettison fuel for emergency situations. Military policy is to avoid fuel jettisons, unless safety of flight dictates an immediate jettison, and requires senior officer approval before fuel jettison, unless under emergency situations. Records of KC-135 fuel jettison events reveal that such circumstances are rare, occurring in slightly less than two sorties per thousand (Headquarters AMC 2013). Additionally, unlike the KC-135, the KC-46A will have the capability to land fully loaded with fuel so long as adequate runway length and braking capability are available (Headquarters AMC 2013), which could potentially lessen the need to jettison fuel in certain circumstances. Based on information provided by Boeing, landing the KC-46A above maximum landing weight is not prohibited; however, it does drive costly inspection requirements. To land above maximum landing weight routinely could reduce the fatigue life of the airplane (Headquarters AMC 2013).

4.3.3.3 Summary of Impacts

There would be a 44 percent increase in actual 157 ARW airfield operations (7 percent increase in total airfield operations) at Portsmouth IAP with a commensurate increase in mishap and BASH potential. Construction activities would involve no unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and

procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.

4.3.4 Soils and Water

4.3.4.1 Soils

Under Alternative #3, new construction would consist of eight separate projects resulting in up to 130,966 SF (3.0 acres) of new construction footprint and up to 23,617 SF (0.5 acre) of new impervious surface. There are two construction scenarios for the aircraft conversion under consideration; only one of these options for each project would be implemented. The total construction footprint analyzed represents the largest possible footprint of each of the options (Table 2.3-17). These proposed construction projects would meet all criteria specified in ANG Handbook 32-1084, *Facility Space Standards.*

Proposed construction under Alternative #3 would occur primarily on Urban land-Canton complex (3 to 15 percent slopes), with a small amount of the new construction footprint on Urban land and Udorthents. These three soils are either not rated or not limited for road or small commercial building development and may require onsite investigation and evaluation for most land use decisions to identify any potential limitations (NRCS 2013). Proposed construction would not impact prime farmlands; therefore the Farmland Protection Policy Act does not apply.

Under Alternative #3, there would be 130,966 SF (3.0 acres) of temporary soil disturbance as a result of the proposed construction. To minimize potential impacts to soil and water resources associated with erosion, runoff, and sedimentation during construction activity, standard construction practices, as described in the Portsmouth IAP SWPPP (Portsmouth IAP 2011) would be implemented during and following the construction period. Such practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activates during wet weather, and covering of soil stockpiles, as appropriate. A site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls is an effective way of controlling erosion while soil is exposed and subject to construction activity. An NOI must be filed with the USEPA New England Region to obtain coverage under the NPDES General Permit for Discharges from Construction Activities prior to implementation of individual projects. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation. Implementation of these measures, as necessary and appropriate, would ensure that impacts to earth resources as a result of implementation of Alternative #3 would be minimal.

4.3.4.2 Surface Water

As a result of implementation of Alternative #3, there would be approximately 23,617 SF (0.5 acre) of new impervious surface from the proposed construction (Figure 4.3.4-1). This could result in localized increases in stormwater runoff volume and intensity, in addition to increases in total suspended particulates to nearby surface waters. However, in accordance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features. The integration of LID design concepts incorporates site design and stormwater management to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Increased runoff and peak discharge volumes as a result of increases to impervious surface can be managed by appropriately designed conveyance structures (such as roadways, channels, and culverts) in accordance with site-specific engineering standards that take into consideration the influence of surface water drainage within, adjacent to, and downstream of the project. In addition, implementing features that manage surface water runoff into the design of the project would avoid or minimize conflicts with city, county, state, or federal regulations and prevent adversely affecting adjacent properties and/or the project area itself. Such measures could include:

- water harvesting and natural open space,
- installation of retention/detention basins for water recharge or for release of runoff at predetermined times to minimize peak discharges,
- the use of porous materials, such as pavers or gravel, for driveway and walkway construction, and
- directing runoff toward permeable areas, such that discharge exiting each site post-construction would be equal to or less than existing conditions.

Implementation of these measures, as necessary and appropriate, would ensure that impacts to surface water as a result of implementation of Alternative #3 would be minimal.

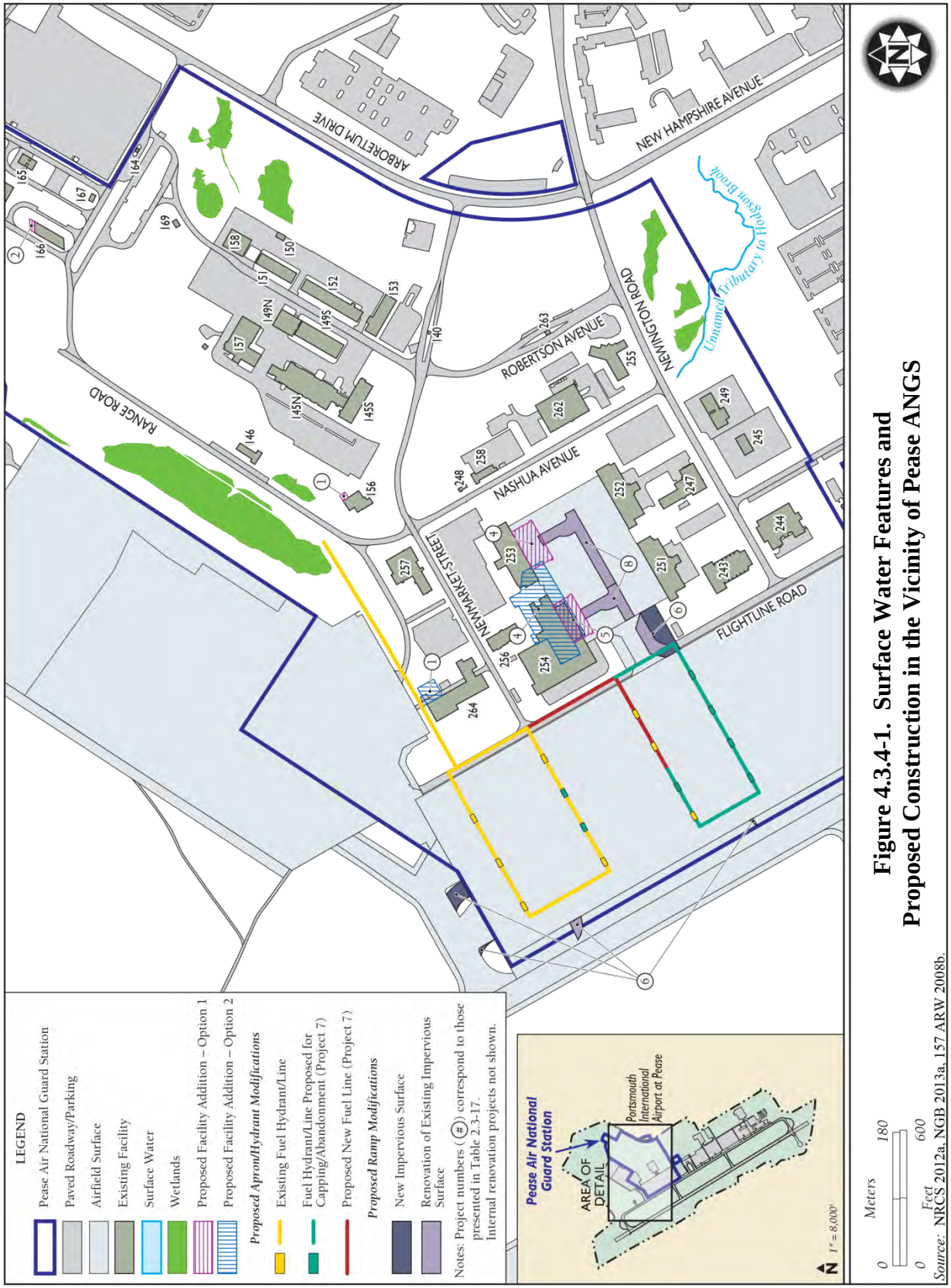


Figure 4.3.4-1. Surface Water Features and Proposed Construction in the Vicinity of Pease ANGS

4.3.4.3 Groundwater

As a result of Alternative #3, the increase in the amount of impervious surface (0.5 acre) would also result in a decrease in groundwater recharge. However, as noted above, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of permit-related temporary and/or permanent drainage management features such as detention/retention basins and standard construction practices, as described above. The integration of water harvesting and natural open space into project design would further minimize potential adverse impacts due to increased impervious surface. The use of these features would also increase groundwater recharge through direct percolation offsetting the loss of pervious surface due to future construction. Additionally, the impervious surface area resulting from the proposed activities would not be one continuous, hardened surface. Rather, the impervious surfaces would occupy several smaller areas, which would further minimize localized impacts to groundwater recharge.

4.3.4.4 Floodplains

Proposed construction activities at the installation would not occur within the 100-year floodplain zone. As such, there would be no impacts to floodplains under this alternative.

4.3.4.5 Summary of Impacts

There would be approximately 3.0 acres of temporary soil disturbance and 0.5 acre of new impervious surface as a result of the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. Proposed construction would not impact prime farmlands; therefore the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.

4.3.5 Biological Resources

4.3.5.1 Vegetation

Construction of new facilities associated with Alternative #3 at the 157 ARW installation would occur primarily on currently paved areas or actively managed (i.e., mowed and landscaped) areas, and would result in an increase of 23,617 SF (0.5 acre) of impervious surfaces. No native vegetation would be impacted. Impacts to the vegetation at the installation would be negligible due to the lack of sensitive vegetation in the project area.

4.3.5.2 Wildlife

Under Alternative #3, impacts to wildlife due to construction would be minor. Noise associated with construction may cause wildlife to temporarily avoid the area, including those that are protected under the MBTA. Noise associated with construction activities, as well as an increase in general industrial activity and human presence, could evoke reactions in birds. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. However, bird and wildlife populations in the vicinity of the airport where project components would occur are accustomed to elevated noise associated with aircraft and general military industrial use. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications.

Operational noise levels under Alternative #3 would be expected to increase slightly from baseline with the conversion to the KC-46A aircraft. Under Alternative #3, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #3, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 4 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.). In addition, an additional 4 acres of land off the airport property would be exposed to DNL between 65 dB and 70 dB. As a result, since ambient noise levels within the vicinity are relatively high under existing conditions, the Proposed Action under Alternative #3 would be unlikely to substantially increase enough to preclude wildlife from utilizing the area as they currently do.

Bird/wildlife aircraft strikes are also an inevitable hazard associated with military aircraft training. Under Alternative #3, the KC-46A would operate in the same airfield environment as the current aircraft. Annual operations for the KC-46A at Portsmouth IAP would increase by approximately 44 percent over the KC-135 baseline operations (7 percent increase in total airfield operations). An increase in airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Adherence to the existing BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.3.3, *Safety*). The 157 ARW has developed procedures designed to minimize the occurrence of bird/wildlife aircraft strikes, and has documented detailed procedures to monitor and react to heightened risk of bird/wildlife aircraft strikes. When risk increases, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches,

closed pattern work) in the airport environment. Special briefings are provided to pilots whenever the potential exists for increased bird/wildlife aircraft strikes within the airspace.

4.3.5.3 Special Status Species

No federally threatened and endangered species and eight state listed species are currently known to occur on Portsmouth IAP. The USFWS New England Field Office concurred in a letter written on March 25, 2014 that no federally listed or proposed, threatened or endangered species or critical habitat are known to occur in the project area. There is only a low potential for additional species to occur within the vicinity due to the lack of habitat. Under Alternative #3, impacts to special status species would be similar to that described under wildlife. Impacts due to construction and proposed operations would be minor. Operational noise levels under Alternative #3 would be expected to increase slightly from baseline with the conversion to the KC-46A aircraft. Under Alternative #3, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #3, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 4 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.). In addition, an additional 4 acres of land off the airport property would be exposed to DNL between 65 dB and 70 dB. As a result, since ambient noise levels within the vicinity are relatively high under existing conditions, the Proposed Action under Alternative #3 would be unlikely to substantially increase enough to preclude wildlife from utilizing the area as they currently do.

Therefore, there would be no effect to federally listed species and impacts to state listed species would be minimal under Alternative #3.

4.3.5.4 Wetlands

There are no wetland areas that occur within the vicinity of the proposed project footprints. Therefore, no impacts to wetlands would occur as a result of Alternative #3.

4.3.5.5 Summary of Impacts

Construction of new facilities associated with this alternative would occur primarily on currently paved areas or actively managed areas. Therefore, impacts to vegetation would be negligible. There would be no impacts to wetlands under this alternative. Impacts to wildlife and sensitive species from operational noise would be expected to be minor due to the slight increase in noise and the temporary nature of construction. A 44 percent increase in 157 ARW (7 percent increase

in total) airfield operations may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Portsmouth IAP, therefore there would be no impacts to federally listed species.

4.3.6 Cultural Resources

Potential direct impacts to cultural resources examined in this analysis include effects to archaeological sites due to ground disturbing activities during construction or modification to buildings. Indirect impacts from an increase in personnel from 1,382 to 1,553 would be negligible as personnel would primarily be confined to the developed areas on the installation, which lack cultural resources.

4.3.6.1 Archaeological Resources

The entire undeveloped 157 ARW installation has been intensively surveyed for archaeological resources and it has been determined that no NRHP-eligible archaeological resources are present on the installation. The New Hampshire SHPO has concurred with this determination (157 ARW 2009, Muzzey 2009). In the unlikely event that archaeological or human remains are identified during construction, all activities in the area of the discovery would cease and the Environmental Manager would contact a qualified archaeologist to evaluate the discovery. Under these conditions, there would be no adverse impact to archaeological resources with implementation of Alternative #3.

4.3.6.2 Architectural Resources

At the 157 ARW installation, six buildings (Buildings 156, 166, 251, 253, 254, and 264) are proposed for additions, interior renovations, or demolition. Buildings 251, 253, and 254 have been inventoried, evaluated, and determined not eligible to the NRHP with concurrence from the New Hampshire SHPO (see Muzzey 2009 and St. Louis 2009 in Appendix B4). Buildings 156, 166, and 264 were all recently constructed and so they are less than 50 years old, are not Cold War-era resources, and would not be eligible under Criteria Consideration G. As such, Buildings 156, 166, and 264 are not eligible to the NRHP. SHPO consultation for this EIS has provided concurrence that no historic resources are present within the proposed project area (see Appendix B3). Therefore, there would be no impact to architectural resources as a result of implementation of Alternative #3.

4.3.6.3 Traditional Resources

The 157 ARW installation contains no known traditional resources. Given the extensive development on the installation, it is unlikely that there are traditional resources located at the

157 ARW. Government-to-government consultation for this action has been conducted with this Tribe in recognition of their status as a sovereign nation. This consultation also provides information regarding tribal concerns per Section 106 of the NRHP and information on traditional resources that may be present on or near the installation. The Penobscot Indian Nation has responded and indicated that they have no issues with the Proposed Action. The NGB and the USAF values its relationship with tribes and will continue to seek opportunities to consult on other planning efforts or matters of known/potential interest to tribes.

4.3.6.4 Summary of Impacts

Construction activities associated with this alternative would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements, where no archaeological resources are known. None of the buildings that would be impacted under the Proposed Action are eligible to the NRHP. The New Hampshire SHPO has concurred with the determination that no historic properties would be affected (Muzzey 2013). No traditional resources are known to occur at the installation. Therefore, no impacts to cultural resources are anticipated at the 157 ARW installation under Alternative #3.

4.3.7 Land Use

Under this alternative, the number of operations at Pease ANGS would increase, resulting in a slight increase in average noise levels as measured as discussed in Section 3.3.1, *Noise*. An additional 4 acres of land off the airport property would be exposed to DNL between 65 dB and 70 dB. The majority of this area is zoned for Open Space/Conservation, which under FAA Regulation 14 CFR Part 150, effective January 18, 1985, is considered a compatible land use up to within this range of noise exposure. The primary source of impacts to land use resulting from Alternative #3 would be from noise. As shown in Table 4.3.7-1 and Figure 4.3.7-1, new areas outside of the airport boundaries would be exposed to DNL of 65 dB to 70 dB. By zoning areas, Recreation areas affected by DNL of 65 dB to 70 dB would remain the same; Open Space areas would increase by approximately 3.6 acres; and non-designated areas would increase by less than 1 acre. However, all of these land uses are considered compatible with this range of DNL under FICUN. No houses, churches, schools or other sensitive noise receptors are located within the 65 dB DNL off-airport noise contour areas. Therefore, Alternative #3 is compatible with current land use and zoning designations and would result in negligible impacts. A more detailed discussion of aircraft operations and noise under Alternative #3 can be found in Section 4.3.1, *Noise*.

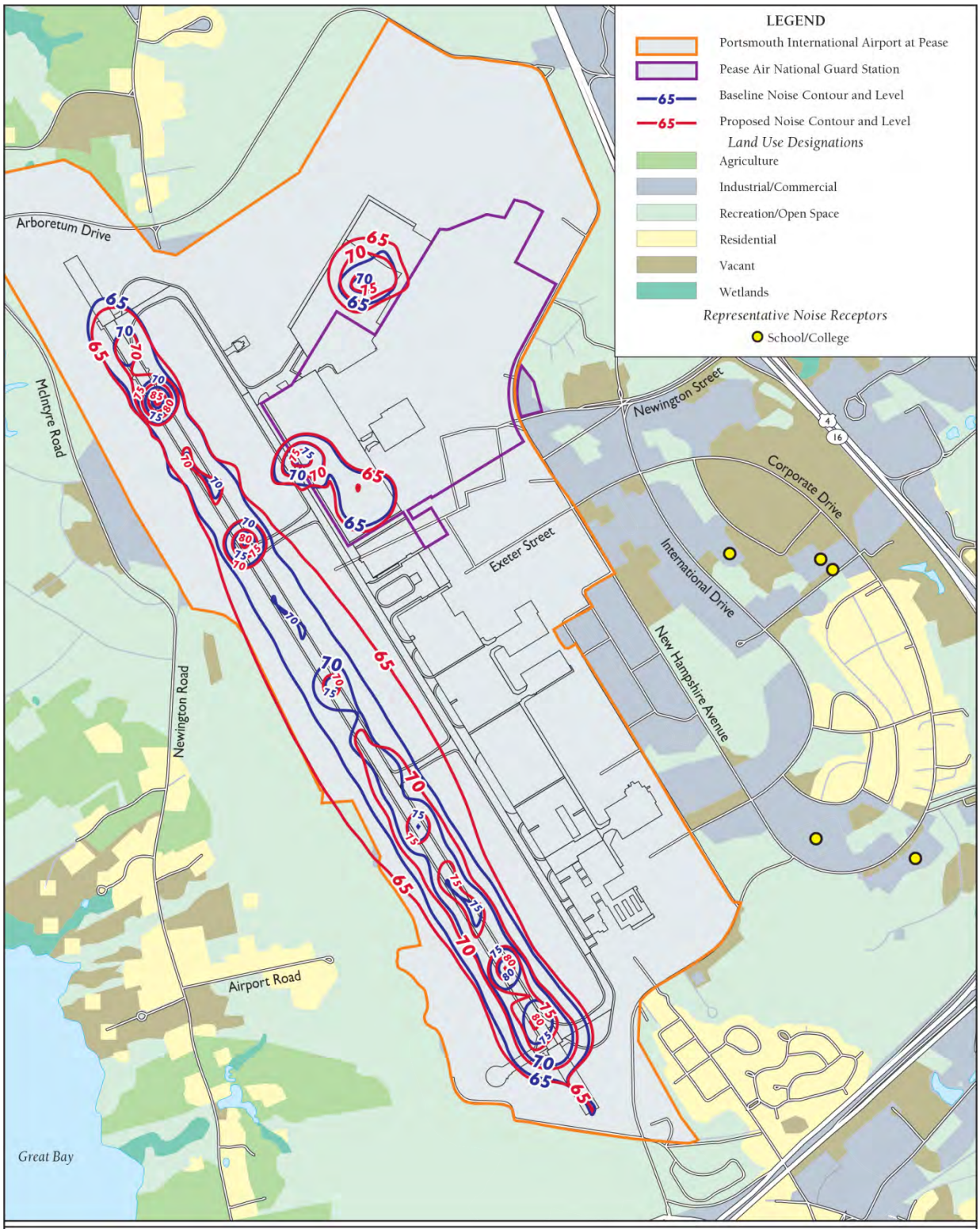


Figure 4.3.7-1. DNL Noise Contours and Land Use Under Alternative #3 at Portsmouth IAP

Source: Plumsted Township Zoning 2013, Pease International Tradeport 2013.

Table 4.3.7-1. Change in Acres Affected by Noise Levels Above 65 dB DNL Outside the Portsmouth IAP

Land Use	*Baseline Total (acres)*	*Proposed Total (acres)*	*Change Total (acres)*
Recreation	0	0	0
Open Space	0	3.6	3.6
Non-designated	0	0.3	0.3
Total Area	**0**	**3.9**	**3.9**

4.3.7.1 Summary of Impacts

The number of total annual airfield operations would increase by 2,700 (7 percent), and the acreage within the 65 dB DNL (and greater) noise contour would increase by 135 acres. Of this increase in acreage, 4 acres would be off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts due to an increase in off-airport areas exposed to noise levels above 65 dB DNL. Airport Hazard Areas would not be affected.

4.3.8 Infrastructure and Transportation

4.3.8.1 Potable Water

Water consumption would be expected to increase slightly under Alternative #3 as a result of the increase in personnel; however, an increase in 128 personnel on the installation would not be expected to impact regional water supply. Additionally, the demand for water (e.g., if used to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact regional water supply.

4.3.8.2 Wastewater

Wastewater generation would be expected to increase slightly as a result of the increase in 128 personnel on the installation. However, there have been no deficiencies identified with the existing system, and it is expected that the existing sanitary sewer system is generally adequate to serve the facilities proposed under this alternative.

4.3.8.3 Stormwater

Under Alternative #3, there would be up to 130,966 SF (3.0 acres) of temporary soil disturbance as a result of proposed construction. The proposed construction activities could temporarily impact the quality of stormwater runoff (see Section 4.3.4, *Soils and Water*); however, through implementation of appropriate standard construction practices, (as described previously),

preventative maintenance, and periodic inspections and sampling to detect risk to stormwater, especially during active construction activity, no impacts would be expected to the existing stormwater drainage system as a result of the proposed construction.

In addition, there would be an increase in up to 23,617 SF (0.5 acre) of new impervious surface. The addition of new impervious surfaces would potentially increase stormwater runoff volume and peak discharge rates; however, as discussed in further detail in Section 4.3.4, *Soils and Water*, stormwater runoff increases would be managed such that discharge exiting each site post-construction would be equal to or less than existing conditions in accordance with UFC 3-210-10 and EISA Section 438. Implementation of these measures would ensure that impacts to the stormwater drainage system as a result of implementation of Alternative #3 would be minimal.

4.3.8.4 Electrical and Natural Gas Systems

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel, and the building space and facilities to be constructed would require additional electricity. However, any new facilities and additions associated with this alternative would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities.

Construction activity associated with Alternative #3 could result in some temporary interruption of utility services during construction. These impacts would be temporary, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

4.3.8.5 Solid Waste Management

The building space and facilities to be constructed would generate construction and demolition debris requiring landfill disposal. Construction activities would result in approximately 130,966 SF of additions and alterations to existing facilities and 23,617 SF of new building construction. Using a multiplier provided by the USEPA to determine solid waste generation, it was estimated that proposed renovations at Pease ANGS would generate 1,544,089 pounds (772 tons) of renovation debris requiring landfill disposal and proposed new construction at Pease ANGS

would generate 102,498 pounds (51 tons) of construction debris (USEPA 2009). Therefore, the total amount of construction and demolition debris generated at Pease ANGS would be 823 tons.

Solid waste generated as a result of the proposed construction could result in impacts to solid waste management facilities in the area. The Turnkey Recycling and Environmental Enterprise Landfill has a remaining life expectancy of 7 years and a permitted throughput of 900,000 tons per year (New Hampshire Department of Environmental Services 2009). The 823 tons of proposed construction debris generated at Pease ANGS would represent less than 1 percent of the yearly capacity of the landfill. Impacts to local landfills would not be expected to exceed the permitted throughput or contribute significantly to the remaining capacity.

Off-installation contractors completing construction and demolition projects at the 157 ARW installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled or reused, or otherwise diverted from landfills. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, sets a target diversion rate of 50 percent for recycling and waste diversion for DoD facilities by 2015, including construction and demolition waste; compliance with EO 13514 would further minimize the increase in solid waste generation as a result of the proposed construction. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (2009).

4.3.8.6 Transportation

Construction equipment would be driven to proposed construction areas and would be kept on-site for the duration of the respective activity. Construction workers would drive daily in their personal vehicles to and from the construction site. In general, construction traffic would result in increases in the use of on-installation roadways during construction activities; however, increases would be temporary and intermittent, occurring only during active construction periods.

The number of authorized personnel on the installation would increase by 128 under Alternative #3 (see Table 2.3-18). The increase in personnel would create a potential 128 additional one-way vehicle trips to and from the installation during morning and evening peak periods for these additional personnel. Assuming that each person makes two trips per day, the implementation of Alternative #3 would add an additional 256 trips onto the existing roadway network after the construction phase is complete. However, regional roads used to access the installation as well

as those located on the installation have sufficient capacity to manage this increase in traffic without substantial impacts to circulation and level of service. Therefore, impacts to transportation infrastructure would not be significant under Alternative #3.

4.3.8.7 Summary of Impacts

Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increased demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.

4.3.9 Hazardous Materials and Waste

4.3.9.1 Hazardous Materials

A HMMP has been developed for the KC-46A program. Training activities and other functions would be expected to remain similar between the KC-46A and existing KC-135 aircraft. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. However, unlike the KC-135, the KC-46A aircraft will be free of ODSs. ODSs were typically used as part of the fire suppression systems on aircraft; ODS use and/or storage would no longer be required under Alternative #3.

The KC-46A aircraft has been designed with a focus on reduction of hazardous materials such that hazardous materials currently required for maintenance, operations, and materials on or associated with the new aircraft would be less than or equal to the existing aircraft (Boeing 2011). In addition, it is anticipated that the amount of hazardous waste generated for one KC-46A aircraft for maintenance activities would be slightly less than that generated for one KC-135 aircraft since the KC-46A has two engines as opposed to the four engines for the KC-135. Furthermore, the KC-46A is a newer aircraft and is expected to need less maintenance than the older KC-135 aircraft.

Under Alternative #3, the total number of flying hours for the 157 ARW would increase from 6,219 to 8,040 (a 29 percent increase); therefore, the throughput of petroleum substances (e.g., fuels, oils) used during operations would be expected to increase commensurately from what is currently used to maintain the KC-135 fleet (see Appendix A, Section A.9, for more details). Additionally, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities, because various fuels (e.g., diesel, gasoline) would be

required to run earth moving equipment and power tools and to provide electricity and lighting as conditions warrant. Procedures for hazardous material management established for the 157 ARW installation would continue to be followed in future operations associated with Alternative #3 and as required during all construction and renovation activities.

Toxic Substances

Under Alternative #3, additions and renovations to Buildings 156, 264, 166 and Hangars 251, 253, and 254 are proposed. According to the 1997 asbestos report, Hangars 251 and 254 were found to contain ACM in the insulation, floor tiles, and mastic. A LBP survey has not been conducted at the 157 ARW installation. However, Hangars 251, 253, and 254 were built prior to 1978 and may contain LBP. Any structures proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. All ACM would be properly removed and disposed of prior to or during demolition in accordance with 40 CFR 61.40 through 157. All LBP would be managed and disposed of in accordance with TSCA, OSHA regulations, New Hampshire requirements (regarding site work practices for buildings with LBP), and established ANG procedures. Materials, especially discarded oil products, would be screened for PCB contamination prior to disposal.

4.3.9.2 Hazardous Waste Management

The type of hazardous waste streams generated by KC-46A operations would be expected to remain similar to those being generated by the existing KC-135 aircraft, with the exception of ODSs. Additionally, the two aircraft require the same types of hazardous materials for their maintenance and operations (e.g., fuels, oils). Under Alternative #3, the total number of flying hours for the 157 ARW would increase approximately 29 percent; therefore, hazardous waste streams would be expected to increase commensurately (see Appendix A, Section A.9, for more details). Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations.

4.3.9.3 Environmental Restoration Program

In accordance with AFI 32-7020, *The Environmental Restoration Program*, construction, modifications and/or additions to existing buildings can occur on or in proximity to existing ERP sites. Accordingly, the appropriate organizations (e.g., installation planners, ERP managers, design engineers) must consider a compatible land use based on current site conditions and the

selected or projected remedial action alternatives. Construction should be sited and designed to minimize life-cycle costs to include those associated with impacts from existing contaminated sites. If the potential for uncharacterized ERP sites exist, the installation is responsible for identifying existing contamination at the proposed construction sites to avoid unknowingly locating construction projects in areas with contamination. The installation is responsible for performing necessary environmental baseline surveys, accomplishing environmental impact analysis process requirements, and for otherwise informing itself about existing site conditions and their associated cost impacts in preparation for a construction project. When warranted by the site history, environmental restoration funds may be used to accomplish RCRA facility assessments, or preliminary assessments and site inspections undertaken in accordance with the CERCLA process, or similar site investigations in accordance with applicable state laws for suspected releases. To the extent that a construction project generates actions to address contamination, or a need to change the timing of ERP-generated actions to address contamination, the costs of such actions are not Environmental Restoration Account-eligible and shall be funded as part of the construction project. This includes the handling, mitigation, and disposal or other disposition of contamination discovered before or during the construction activity.

The removal and disposal of contamination unexpectedly encountered within the construction project footprint during the execution of a construction project will be undertaken as part of the construction project using construction project funds which may include other MILCON funds reprogrammed to a MILCON construction project. Construction contractor costs (such as direct delay costs and unabsorbed or extended overhead) incidental to discovery and removal of the contamination will be construction project funded to the extent that the government is responsible and liable for such costs.

None of the ERP sites overlap the proposed construction projects under Alternative #3 (Figure 4.3.9-1). If contaminated media (e.g., soil, groundwater) are encountered during the course of site preparation (e.g., clearing, grading) or site development (e.g., excavation for installation of building footers) for proposed construction activities, work would cease until 157 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met, and to arrange for agency consultation as necessary if existing ERP sites are affected. Also, prior to construction activities, the construction contractors would be notified of the nature and extent of known contamination so that they can inform their employees in advance of on-site activities and take appropriate precautions to protect health and safety, and to prevent the spread of contamination. The construction contractors would be responsible for ensuring their workers follow appropriate health and safety requirements.

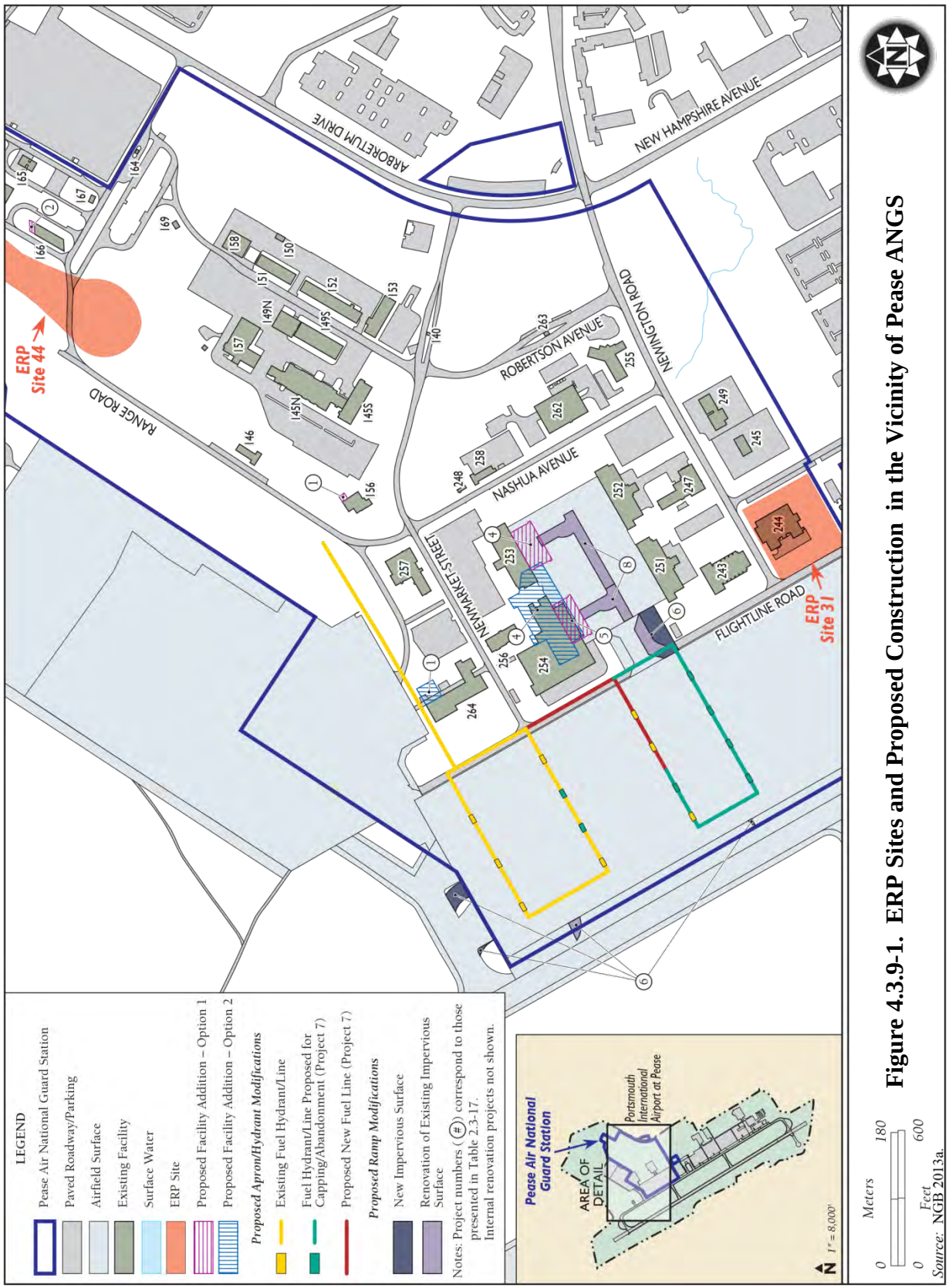


Figure 4.3.9-1. ERP Sites and Proposed Construction in the Vicinity of Pease ANGS

4.3.9.4 Summary of Impacts

There would not be an increased risk of hazardous waste releases or exposure from this alternative. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations. There would be no expected impact from ERP sites as there are no sites that overlap with areas proposed for ground disturbance. Impacts relative to hazardous materials and wastes would be negligible.

4.3.10 Socioeconomics

Under Alternative #3, construction activities would be contained entirely within the boundaries of Portsmouth IAP. Economic activity associated with proposed construction activities at the 157 ARW installation, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased would be negligible on a regional scale.

The proposed aircraft beddown and related activities under this alternative would result in a change in staffing requirements for the 157 ARW. Currently, the 157 ARW is authorized 1,382 personnel. Under Alternative #3, the KC-46A mission would add an additional 171 military positions (increase in 115 full-time positions and 56 traditional Guard positions) (see Table 2.3-18). Combined with their approximately 233 family members, this would represent less than 0.08 percent of Rockingham County. Of the 233 family members, approximately 92 would be anticipated to be of school age. The students entering the local schools would be expected to be enrolled in various grades and live in different areas within Rockingham County. It is anticipated that there is enough capacity within the schools in this county to absorb this minimal increase in school age children.

An increase in 171 military personnel positions would amount to an increase of approximately 12 percent to the existing 157 ARW personnel. Total payroll associated with the 115 full-time personnel would amount to a total estimated annual salary increase of approximately $9.5 million.

All 157 ARW personnel live off-installation as there is no on-installation housing. A conservative scenario would result in 171 homes purchased at the same time as personnel relocate to the area. This would represent less than 0.13 percent of the total housing units in Rockingham County. However, not all the military personnel who would relocate would own homes.

4.3.10.1 Summary of Impacts

Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.

4.3.11 Environmental Justice and the Protection of Children

4.3.11.1 Minority and Low-Income Populations

Under Alternative #3, there would be no residential populations, including no minority or low-income populations, located within the vicinity of Portsmouth IAP exposed to DNL greater than 65 dB. Therefore, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Portsmouth IAP.

4.3.11.2 Protection of Children

There are no facilities on the installation where children may be encountered on a regular basis. Currently there is no off-installation Kindergarten through Grade 12 schools that are exposed to DNL of 65 dB or above. Under Alternative #3 there would be no new Kindergarten through Grade 12 schools exposed to DNL of 65 dB or above. Therefore, under Alternative #3 there would be no special health or safety risks to children.

4.3.11.3 Summary of Impacts

Although the acreage within the 65 dB DNL noise contours would increase slightly under this alternative, there are no residential areas within the noise contours and no additional schools would be located within the vicinity of Portsmouth IAP exposed to DNL of 65 dB or above; thus, there would be no disproportionate impacts to minority or low-income populations and no special health or safety risks to children.

4.4 ALTERNATIVE #4 -- PITTSBURGH AIR NATIONAL GUARD STATION

4.4.1 Noise

In this section, noise associated with flying operations and construction activities related to Alternative #4 are considered and compared with current conditions associated with the most current approved and published baseline noise study to assess potential impacts. Details of the noise modeling methodologies used for this section can be found in Appendix A, Section A.1.2.

Actual 2012 KC-135 airfield operations were identified in Table 2.3-19. This data was used in determining the proposed KC-46A airfield operations based on most current home-station sorties and airfield operations to provide a more accurate determination of the number of airfield operations for the Proposed Action. Under this analysis, the proposed airfield operations are compared to the most current approved and published 2006 baseline noise study for Pittsburgh IAP.

The DNL noise contours for the KC-46A under Alternative #4 were generated using INM. Based KC-135 operations were removed and replaced with KC-46A operations using the B-767-300 and the standard flight profile data provided with INM as substitute data and applying the data to the current based KC-135 flight tracks and operational procedures (INM does not have a standard profile or noise curve data for the KC-46A). Using the standard flight profile data provided for this substitute aircraft in INM provides an accurate analysis of noise contour comparisons that would be expected with the new KC-46A. Flight profiles, flight tracks, and operational procedures currently being used by the KC-135 were used in this INM program.

4.4.1.1 Aircraft Noise

Under Alternative #4, 12 KC-46As would be based at Pittsburgh ANGS, replacing the current 16 KC-135 aircraft. There would be no change in the number or type of other aircraft using the airfield and the KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. KC-46A aircraft flight profiles would continue to fly the same standard flight profiles for departures and arrivals and closed pattern airfield training. KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures in which the aircraft climbs or descends in the immediate vicinity of the airfield. Tactical training prepares aircrews for operations in forward operating locations in which flying at low-altitudes over land not controlled by friendly forces exposes the aircraft to ground-based threats. This procedure is currently being flown with the KC-135; however most tactical procedures would be accomplished in the simulator and at the other locations away from Pittsburgh IAP.

Under Alternative #4, the 171 ARW aircraft would fly a total of 8,040 hours resulting in 2,010 annual sorties of which it is expected that up to 1,186 sorties would be flown at Pittsburgh ANGS. Baseline conditions for the KC-135 are represented here as the same number of the Pittsburgh ANGS airfield operations published in the Pittsburgh IAP FAR Part 150 Study (ACAA 2006). Based on 1,186 annual home-station sorties with an average of 7.78 operations per sortie, there would be 9,226 annual home-station operations, or a reduction of 3,834 airfield operations annually at Pittsburgh IAP. This would decrease the average daily airfield operations from 35.8 to 25.3 as shown in Table 4.4.1-1. The 171 ARW KC-46A operations would be approximately 3 percent of all aircraft operations at the airfield under the current approved FAR Part 150 Noise Compatibility Update.

Table 4.4.1-1. Changes to Pittsburgh IAP Airfield Operations with Proposed KC-46A Based on FAR Part 150 Baseline

Unit	*Total Based KC-135 (Average Daily Airfield Operations)*	*Total Based KC-46A (Average Daily Airfield Operations)*	*Change in Airfield Operations for Proposed KC-46A (% Change)*
171 ARW	13,060[1] (35.8)	9,226 (25.3)	-3,834 (-29.3%)

Note: 1. Operations based on currently approved FAR Part 150.

All operations would remain as described under existing conditions; however, the KC-135 would be replaced by the KC-46A. There would be no changes expected to departure/arrival patterns and tracks, and use of runways. Current noise abatement procedures would continue to be followed as documented in Section 3.4.1.4.

Table 4.4.1-2 provides details on the total airfield operations for Pittsburgh IAP under Alternative #4 using the most current FAR Part 150 as the baseline operations. There would be a 1.2 percent decrease in the overall airfield operations from the current baseline operations. There would be approximately 7 percent of the KC-46A airfield operations flown during environmental night. The total number of operations flown by all other aircraft at Pittsburgh IAP would not change from previously identified airfield activities. There would be no change to any other aircraft types or aircraft flight tracks and profiles from the baseline condition.

Table 4.4.1-2. Pittsburgh ANGS Aircraft Operations with Proposed KC-46A

Aircraft	DEPARTURES		ARRIVALS		TOTAL[1]		*Grand Total[1]*
	Day	*Night[2]*	*Day*	Night[2]	*Day*	*Night[2]*	
KC-46A	4,287	326	4,275	338	8,562	664	9,226
Other Aircraft[3,4]	140,683	13,505	140,683	13,505	281,366	27,010	308,376
Total	**144,970**	**13,831**	**144,958**	**13,843**	**289,928**	**27,674**	**317,602**

Notes:
1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other Based aircraft and Transient Aircraft (multiple type aircraft) including: Boeing 747, 717, and the Airbus 321.
4. Operations based on currently approved FAR Part 150.

Figure 4.4.1-1 depicts the noise exposure area from the aircraft operations after the conversion from the current 16 KC-135 aircraft to 12 KC-46A aircraft, and Figure 4.4.1-2 compares baseline noise contours with Alternative #4 contours. The aircraft operations modeled include all transient aircraft and general and commercial aircraft operations depicted in the current approved 2006 FAR Part 150 Noise Compatibility Update. Table 4.4.1-3 shows changes to the acreage of land within each noise contour under Alternative #4.

Table 4.4.1-3. Land Areas within DNL Contours at Pittsburgh IAP Affected by DNL Greater than 65 dB under Baseline and Alternative #4

Noise Contour (dB DNL)	BASELINE (KC-135) TOTAL (ACRES)			ALTERNATIVE #4 (KC-46A) TOTAL (ACRES)			*Change Total (Acres)*
	On Airport	*Off Airport*	*Total*	*On Airport*	*Off Airport*	*Total*	
65-70	1,331.5	128.6	1,460.1	1,511	106	1,405	-55
70-75	850.7	0	850.7	915	0	915	64
75-80	468.6	0	468.6	418	0	418	-51
80-85	151.5	0	151.5	159	0	159	8
>85	207.5	0	207.5	162	0	162	-46
Total	**3,009.8**	**128.6**	**3,138.4**	**3,165**	**106**	**3,059**	**-79**

Notes: DNL = Day Night Average Sound Level; dB = decibel

Under Alternative #4, the DNL noise contours would decrease slightly in the areas of arrivals and departures from the DNL baseline contours because of fewer KC-46A airfield operations than depicted in the approved FAR Part 150 and the KC-46A is generally a quieter aircraft (5 dB quieter on landing and 1 dB louder on take-off) than the KC-135.

Overall, the number of acres contained within the 65 dB DNL and greater exposure area would decrease by approximately 79 acres, or approximately 2.5 percent, and would remain primarily on airport property with approximately 106 of the acres off airport property. Information regarding the number of people residing in the area can be found in Section 4.4.11, *Environmental Justice and the Protection of Children* and information regarding the area of residential use is located in the Section 4.4.7, *Land Use*.

Percent of the Population Expected to be Highly Annoyed

The percentage of the population expected to be highly annoyed under Alternative #4 would not be expected to change from baseline conditions because there are no additional residences exposed to levels above a DNL of 65 dB.

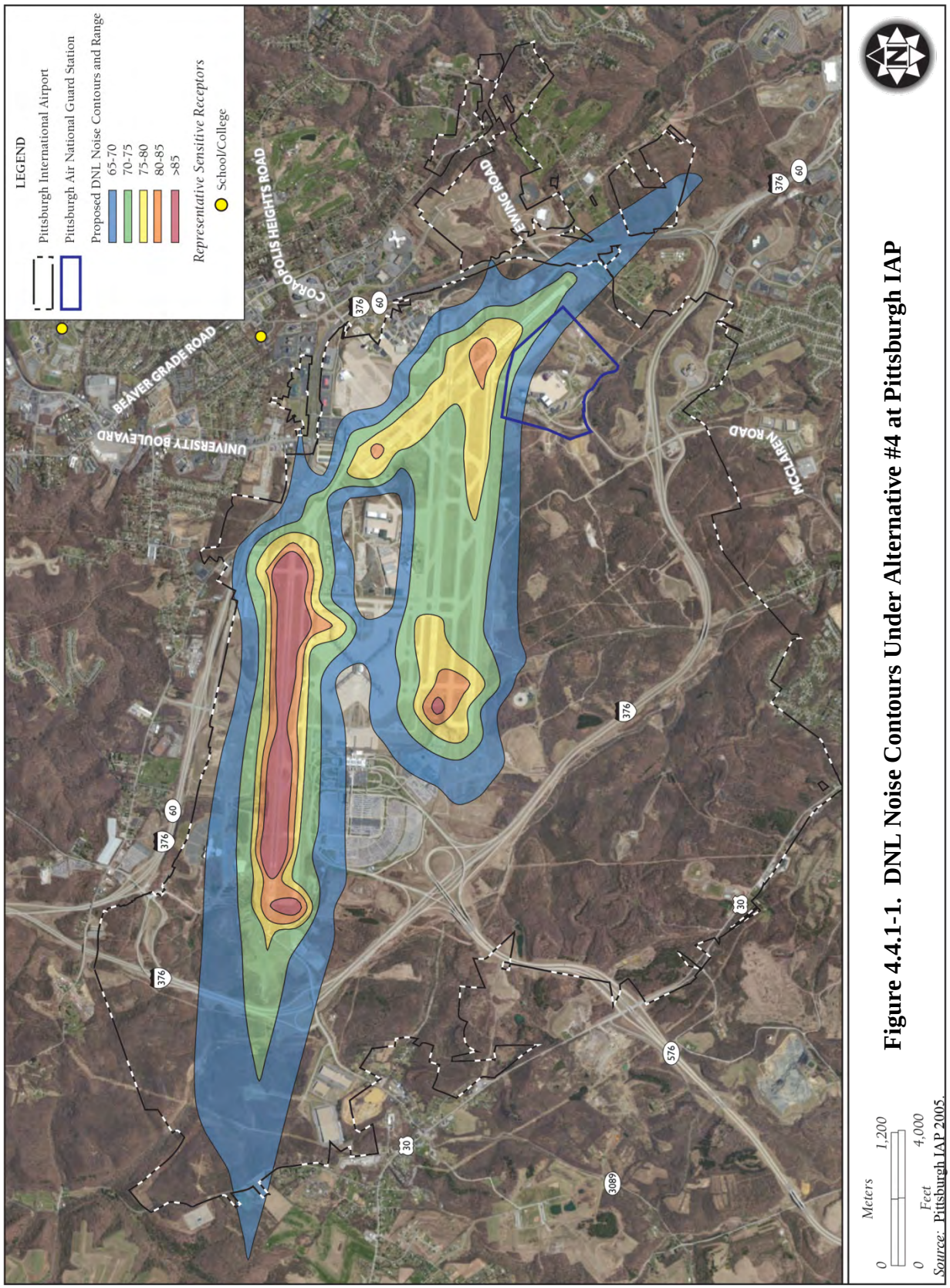


Figure 4.4.1-1. DNL Noise Contours Under Alternative #4 at Pittsburgh IAP

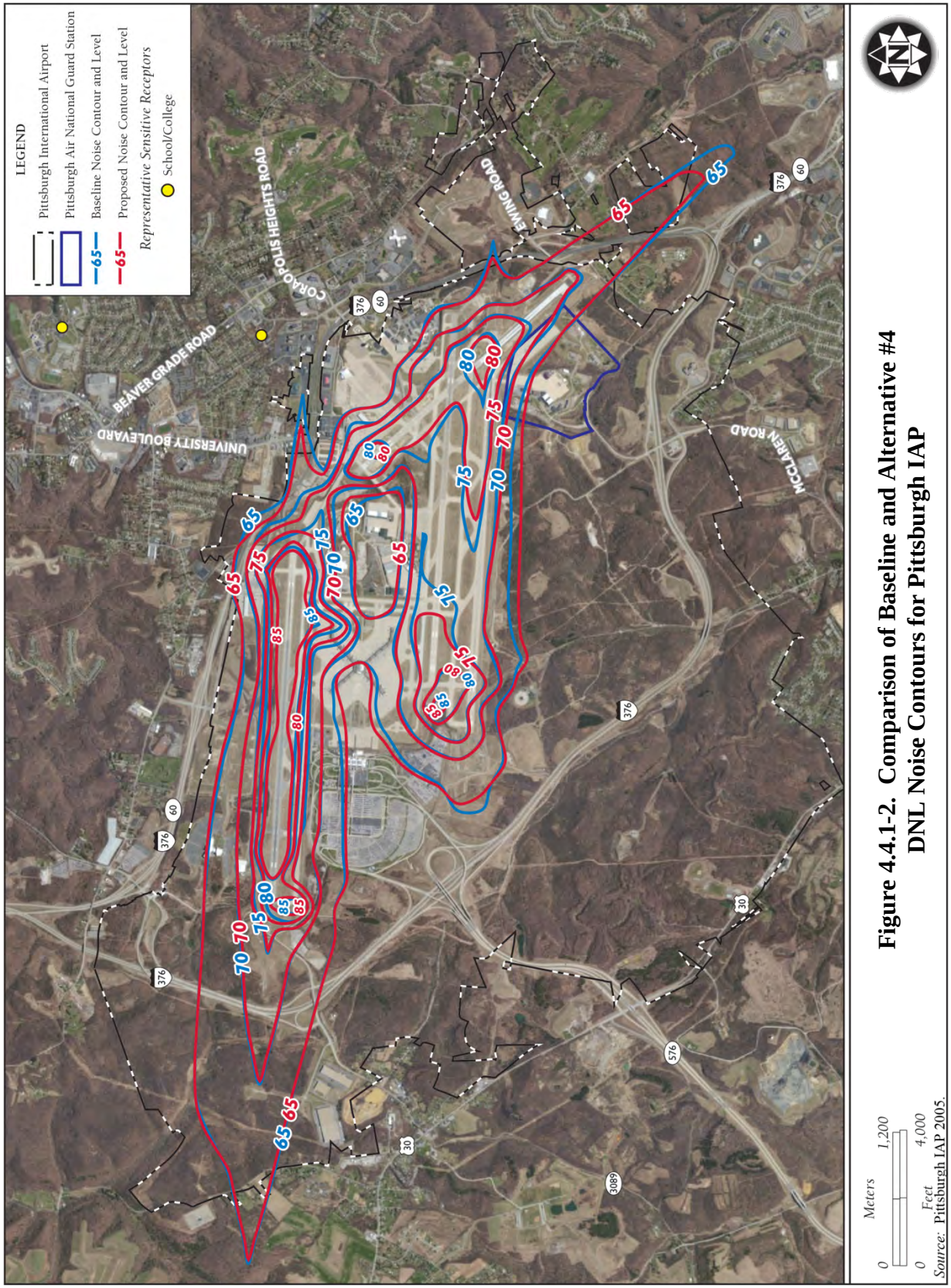


Figure 4.4.1-2. Comparison of Baseline and Alternative #4 DNL Noise Contours for Pittsburgh IAP

Single Event Sound Analysis

Under Alternative #4, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1-1 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #4, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 7 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.).

Potential Hearing Loss

As shown in Table 4.4.1-3, there is no property off the Pittsburgh IAP that falls within the 80+ dB DNL noise contour; therefore, there would be no potential hearing loss risk associated with these areas.

4.4.1.2 Construction Noise

There would be some minor temporary noise from construction equipment associated with construction activities that would occur intermittently during the construction period (beginning 2015). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (FHWA 2006) (see Appendix C, *Noise*, Section A.1.2.2). Aviation-related activities at Pittsburgh IAP dominate the local noise environment. Equipment used during the facility construction would contribute little to the general background noise levels around the airfield. Therefore, impacts from construction under Alternative #4 would be negligible.

4.4.1.3 Summary of Impacts

The number of 171 ARW airfield operations would decrease by 3,834 (29 percent decrease from the currently published FAR Part 150 Noise Compatibility Program; and a 2 percent increase in actual 2012 airfield operations), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 88 acres. There would be a decrease of approximately 23 acres within the 65 dB DNL noise contour that are off airport-controlled property, resulting in 106 acres off airport-controlled property that lie within the 65 dB contour. There would be no potential for hearing loss off the airport and no increase in the percent of the population highly annoyed. Construction noise would be localized and temporary and would not add to the overall noise environment. Impacts from noise would be negligible.

4.4.2 Air Quality

The air quality analysis estimated the magnitude of emissions that would result from implementation of the proposed KC-46A construction and operational activities at the 171 ARW of the PA ANG at Pittsburgh IAP, approximately 12 miles northwest of Pittsburgh, Pennsylvania. The estimation of proposed operational emissions is based on the net change in emissions between existing aircraft operations and projected KC-46A operations.

As discussed in Appendix A.2.3, air quality impacts from the beddown of the KC-46A aircraft at Pittsburgh IAP were reviewed for significance relative to the PSD threshold for new major sources for attainment pollutants, and the General Conformity *de minimis* thresholds for nonattainment pollutants. Because the project region within Allegheny County is a nonattainment area for O_3 (moderate) and $PM_{2.5}$, the *de minimis* threshold of 100 tpy for O_3 precursors NO_x and VOCs, and $PM_{2.5}$ was used as an indicator of the potential significance of the emissions from the KC-46A conversion. For attainment pollutants, the PSD threshold of 250 tpy (100,000 tpy for GHGs) was used as an indicator of the potential significance of the emissions from Alternative #4.

4.4.2.1 Operational Emissions

Sources associated with operation of the proposed KC-46A beddown at Pittsburgh IAP include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) offsite POV commutes; and (4) AGE. It was assumed that other sources, including nonroad mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged. Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the 2012 baseline airfield analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (AFCEC 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were estimated based on the proposed personnel for the existing and proposed scenarios, using emission factors for vehicles from AFCEC 2013.

Table 4.4.2-1 summarizes the annual operational emissions that would result from KC-46A operations at Pittsburgh IAP. Table 4.4.2-1 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at Pittsburgh IAP. As shown in Table 4.4.2-1, the net emissions increases are below the PSD/*de minimis* thresholds for all pollutants.

Table 4.4.2-1. Comparison of Baseline and Proposed Annual Operational Emissions, 171 ARW

	ANNUAL EMISSIONS, TONS/YEAR					
Baseline	***VOC***	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-135 Aircraft Operations	3.42	50.69	67.79	6.14	0.33	0.33
AGE	0.01	0.01	0.10	0.00	0.00	0.00
Engine Tests	0.11	1.67	0.46	0.07	0.01	0.01
POVs	4.27	65.56	3.37	0.05	0.14	0.06
Total	**7.81**	**117.93**	**71.72**	**6.26**	**0.48**	**0.40**
Proposed Action	***VOC***	***CO***	***NOx***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-46A Aircraft Operations	20.22	73.83	158.42	9.37	0.66	0.56
AGE	0.01	0.02	0.13	0.00	0.01	0.01
Engine Tests	0.80	2.75	0.74	0.09	0.01	0.01
POVs	3.44	58.54	2.52	0.05	0.14	0.06
Total	**24.48**	**135.14**	**161.81**	**9.51**	**0.81**	**0.64**
Net Increase	**16.67**	**17.21**	**90.09**	**3.24**	**0.33**	**0.24**
MOB2 Net Emissions Increase Fraction of Existing Emissions	**2.13**	**0.15**	**1.26**	**0.52**	**0.69**	**0.60**
PSD/*de minimis* Threshold	**100**	**250**	**100**	**250**	**250**	**100**

Notes: Numbers may not add precisely due to rounding.

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle; PSD = Prevention of Significant Deterioration

In addition to criteria pollutant emissions, the beddown of the KC-46A aircraft at Pittsburgh IAP would result in emissions of HAPs and GHGs. Operational activities would result in a net increase of HAPs that is below 1 tpy.

Table 4.4.2-2 summarizes the annual operational GHG emissions that would result from KC-46A operations at Pittsburgh IAP, along with the net increase in comparison with the baseline. As shown in Table 4.4.2-2, emissions are below the PSD thresholds for GHGs.

Table 4.4.2-2. Comparison of Baseline and Proposed Annual Operational GHG Emissions, 171 ARW

	ANNUAL GHG EMISSIONS, METRIC TONS/YEAR			
Baseline	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-135 Aircraft Operations	16,909	0.47	0.53	17,082
AGE	2,370	0.07	0.08	2,395
Engine Tests	196	0.01	0.01	198
POVs	2,270	0.00	0.00	2,270
Total	**21,746**	**0.54**	**0.61**	**21,946**
Proposed Action	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-46A Aircraft Operations	25,411	0.66	0.74	25,655
AGE	3,035	0.09	0.10	3,067
Engine Tests	243	0.01	0.01	245
POVs	2,274	0.00	0.00	2,274
Total	**30,963**	**0.75**	**0.85**	**31,242**
Net Increase	**9,218**	**0.21**	**0.24**	**9,296**
PSD Threshold	**100,000**	**100,000**	**100,000**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; AGE = aerospace ground equipment; POV = privately owned vehicle

4.4.2.2 Construction Emissions

The KC-46A beddown at Pittsburgh IAP would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would occur from (1) combustion emissions from heavy equipment and vehicles; and (2) fugitive dust emissions due to operation of equipment on exposed soil. Table 4.4.2-3 presents a summary of the annual construction emissions for the beddown of the KC-46A aircraft at Pittsburgh IAP. As shown in Table 4.4.2-3, emissions would be below the PSD/*de minimis* thresholds for all pollutants.

Table 4.4.2-3. Annual Construction Emissions Under Alternative #4

Construction Project	*CO*	*NOx*	*VOC*	*SOx*	*PM_{10}*	*$PM_{2.5}$*	*Total CO_2, Metric tons/year*
Project #1 - Addition to Hangar 302	1.64	2.61	0.46	0.05	2.70	2.04	871.93
Project #2 - Addition to Hangar 320	1.54	2.44	0.43	0.05	2.48	1.90	817.22
Project #3 - Internal Renovations to Hangar 301	0.30	0.47	0.06	0.01	0.04	0.04	122.59
Project #4 - Modifications to Existing Parking Ramp and Taxiway	3.84	9.13	0.95	0.45	5.14	2.61	2,267.97
Project #5 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	0.02	0.03	0.01	0.00	0.00	0.00	11.06
Total	**7.33**	**14.68**	**1.91**	**0.56**	**10.37**	**6.60**	**4,090.77**
PSD/*de minimis* Threshold	**250**	**100**	**100**	**250**	**250**	**100**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide; PSD = Prevention of Significant Deterioration

4.4.2.3 Summary of Impacts

The Pittsburgh ANGS is located within a non-attainment area for $PM_{2.5}$, a moderate nonattainment area for the 1997 8-hour O_3 standard, and is classified as a marginal nonattainment area for the 2008 8-hour O_3 standard, according to 40 CFR 81.339. The Pittsburgh ANGS is therefore subject to *de minimis* thresholds. Impacts from proposed operational emissions would be less than significant for all criteria pollutants. Impacts from construction emissions and operational HAP emissions are negligible.

4.4.3 Safety

4.4.3.1 Ground Safety

Existing facilities at Pittsburgh ANGS for fire response and crash recovery meet KC-46A beddown requirements (Headquarters AMC and NGB 2013d).

To support the aircraft beddown at Pittsburgh ANGS, some facilities would require renovation/modification. However, no construction activities would involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities.

Proposed renovation and infrastructure improvement projects related to Alternative #4 would not impact aircraft take-off or landings or penetrate any RPZs (Headquarters AMC and NGB 2013d).

New construction and building renovation activity would not result in any greater safety risk or obstructions to navigation. Operations would fall within the same general types as those that have historically occurred at Pittsburgh IAP. For example, the KC-46A would follow established local approach and departure patterns. Therefore, flight activity and subsequent operations would not require changes to RPZs.

Under this alternative, no new facilities are proposed for Pittsburgh ANGS. Planned construction at the base comprises renovation and additions to three hangars; modification to existing parking ramp and taxiway; and demolition and installation of new fuel hydrants and lines. Therefore, none of the construction or demolition would be in conflict with the current QD arcs.

No construction activities would involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures, including AFI 13-213, *Airfield Driving* (2011), would further minimize the relatively low risk associated with these construction activities.

The proposed construction projects meet all criteria specified in the ANG Handbook 32-1084, *Facility Space Standards.* AT/FP requirements have also been addressed to the extent practicable in all projects. Projects would use AT/FP site design standards for siting of facilities, parking, walkways, and other features. Renovations would bring the facilities into compliance with UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, providing additional protection for the personnel based there.

4.4.3.2 Flight Safety

Although the KC-46A is a new aircraft, it is a military derivative of the commercial Boeing 767 aircraft. First flown commercially in 1982, more than 1,000 commercial Boeing 767 aircraft have been produced; and it is a proven commercial airliner, freighter, and tanker already in service (Boeing 2012). Mishap statistics for the commercial Boeing 767 show 14 total aircraft losses (similar to a Class A military mishap definition) during its 31 year lifetime (ASN 2013).

Although no facilities are proposed that would affect navigable airspace, Pittsburgh ANGS would comply with 14 CFR Part 77, *Objects Affecting Navigable Airspace*, as appropriate, should they be selected to host the KC-46A.

To augment airborne training missions, pilots flying the KC-46A would use simulators extensively. Simulator training includes all facets of flight operations and comprehensive

emergency procedures. The sophistication and fidelity of current simulators and related computer programs are commensurate with the advancements made in aircraft technology and are extremely realistic. These factors would minimize risk associated with mishaps due to pilot error.

Under Alternative #4, there would be an increase of approximately 33 percent in 171 ARW operations (2 percent in total Pittsburgh IAP airfield operations) compared to existing conditions. This increase in take-offs, landings, proficiency training, and other flights would result in a commensurate increase in the safety risk to aircrews and personnel.

The proposed increase in airfield flight operations would be expected to increase the opportunity for aircraft mishaps, including BASH incidents; however, the expected rate of mishaps or BASH incidents would not be expected to change from current conditions. Both the KC-135 and the commercial Boeing 767 have very low mishap rates and with a new airframe and technological improvements, the KC-46A would be expected to have a similar safety record. Current airfield safety procedures would continue to be implemented and additional airfield flight operations would adhere to established safety procedures (171 ARW 2010c).

Given the low likelihood of an aircraft accident or BASH mishap to occur in the local airfield area and even lower likelihood for civilians to be impacted, impacts to safety in the vicinity of Pittsburgh IAP as a result of Alternative #4 are expected to be negligible.

The KC-46A will have the capability to jettison fuel for emergency situations. Military policy is to avoid fuel jettisons, unless safety of flight dictates an immediate jettison, and requires senior officer approval before fuel jettison, unless under emergency situations. Records of KC-135 fuel jettison events reveal that such circumstances are rare, occurring in slightly less than two sorties per thousand (Headquarters AMC 2013). Additionally, unlike the KC-135, the KC-46A will have the capability to land fully loaded with fuel so long as adequate runway length and braking capability are available (Headquarters AMC 2013), which could potentially lessen the need to jettison fuel in certain circumstances. Based on information provided by Boeing, landing the KC-46A above maximum landing weight is not prohibited; however, it does drive costly inspection requirements. To land above maximum landing weight routinely could reduce the fatigue life of the airplane (Headquarters AMC 2013).

4.4.3.3 Summary of Impacts

There would be a 33 percent increase in actual 171 ARW airfield operations (2 percent increase in total airfield operations) at Pittsburgh IAP with a commensurate increase in mishap and BASH potential. Construction activities would involve no unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and

strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.

4.4.4 Soils and Water

4.4.4.1 Soils

Under Alternative #4, new construction would consist of five separate projects resulting in 186,395 SF (4.3 acres) of new construction footprint and 88,529 SF (2.0 acres) of new impervious surface (Table 2.3-23). These proposed construction projects for aircraft conversion would meet all criteria specified in ANG Handbook 32-1084, *Facility Space Standards.*

Proposed construction under Alternative #4 would occur on Urban land-Culleoka complex. This soil type is not rated in road or small commercial building development and may require onsite investigation and evaluation for most land use decisions to identify any potential limitations (NRCS 2013). Pursuant to the Farmland Protection Policy Act, the USAF determined that the land is not farmland subject to the Farmland Protection Policy Act; therefore, the Farmland Protection Policy Act does not apply to this alternative.

Under Alternative #4, there would be approximately 186,395 SF (4.3 acres) of temporary soil disturbance as a result of proposed construction. To minimize potential impacts to soil and water resources associated with erosion, runoff, and sedimentation during construction activity, standard construction practices as described in the 171 ARW SWPPP (171 ARW 2010a) would be implemented during and following the construction period. Such practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate. A site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls is an effective way of controlling erosion while soil is exposed and subject to construction activity. An NOI must be filed with the state of Pennsylvania to obtain coverage under the General NPDES Permit for Stormwater Discharges Associated with Construction Activities (General Permit No. PAG-02) prior to implementation of individual projects. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation. Impacts to earth resources would be negligible.

4.4.4.2 Surface Water

As a result of implementation of Alternative #4, there would be approximately 88,529 SF (2.0 acres) of new impervious surface from the proposed construction (Figure 4.4.4-1). This could result in localized increases in stormwater runoff volume and intensity, in addition to increases in total suspended particulates to nearby surface waters. However, in accordance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features. The integration of LID design concepts incorporates site design and stormwater management to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Increased runoff and peak discharge volumes as a result of increases to impervious surface can be managed by appropriately designed conveyance structures (such as roadways, channels, and culverts) in accordance with site-specific engineering standards that take into consideration the influence of surface water drainage within, adjacent to, and downstream of the project. In addition, implementing features that manage surface water runoff into the design of the project would avoid or minimize conflicts with city, county, state, or federal regulations and prevent adversely affecting adjacent properties and/or the project area itself. Such measures could include:

- water harvesting and natural open space,
- installation of retention/detention basins for water recharge or for release of runoff at predetermined times to minimize peak discharges,
- the use of porous materials, such as pavers or gravel, for driveway and walkway construction, and
- directing runoff toward permeable areas, such that discharge exiting each site post-construction would be equal to or less than existing conditions.

Implementation of these measures, as necessary and appropriate, would ensure that impacts to surface water as a result of implementation of Alternative #4 would be minimal.

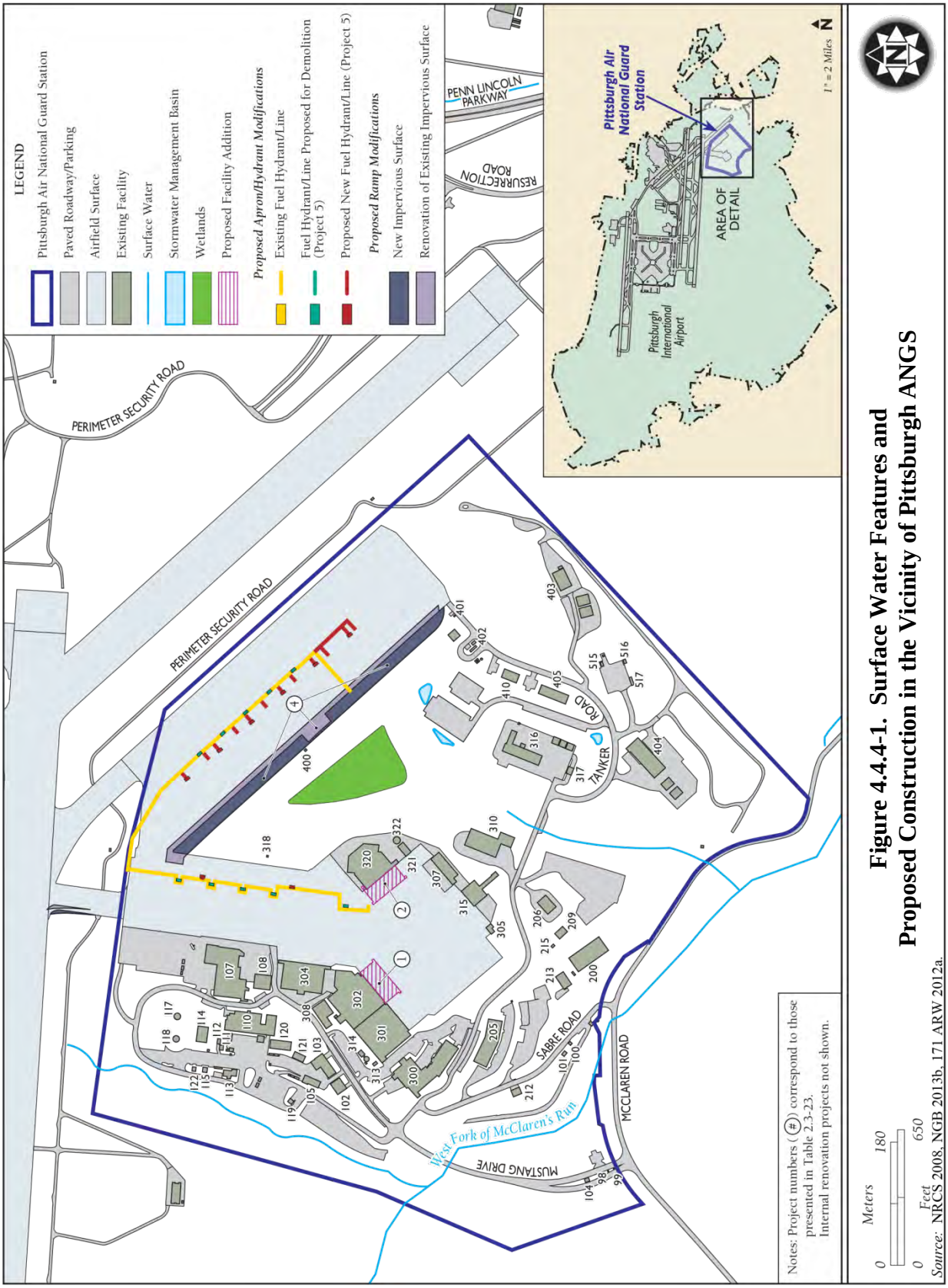


Figure 4.4.4-1. Surface Water Features and Proposed Construction in the Vicinity of Pittsburgh ANGS

4.4.4.3 Groundwater

As a result of Alternative #4, the increase in the amount of impervious surface (2.0 acres) would also result in a decrease in groundwater recharge. However, as noted above, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of permit-related temporary and/or permanent drainage management features such as detention/retention basins and standard construction practices as described above and in the 171 ARW SWPPP (171 ARW 2010a). The integration of water harvesting and natural open space into project design would further minimize potential adverse impacts due to increased impervious surface. The use of these features would also increase groundwater recharge through direct percolation offsetting the loss of pervious surface due to future construction. Additionally, the impervious surface area resulting from the proposed activities would not be one continuous, hardened surface. Rather, the impervious surfaces would occupy several smaller areas, which would further minimize localized impacts to groundwater recharge.

4.4.4.4 Floodplains

Proposed construction activities at the installation would not occur within the 100-year floodplain zone. As such, there would be no impacts to floodplains under this alternative.

4.4.4.5 Summary of Impacts

There would be approximately 4.3 acres of temporary soil disturbance and 2.0 acres of new impervious surface as a result of the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. Proposed construction would not impact prime farmlands; therefore the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.

4.4.5 Biological Resources

4.4.5.1 Vegetation

Construction of new facilities associated with Alternative #4 at the 171 ARW installation would occur on currently paved areas or actively managed (i.e., mowed and landscaped) areas, and would result in an increase of 88,529 SF (2.0 acres) of impervious surfaces. No native vegetation would be impacted. Impacts to the vegetation at the installation would be negligible due to the lack of sensitive vegetation in the project area.

4.4.5.2 Wildlife

Under Alternative #4, impacts to wildlife due to construction would be minor. Noise associated with construction may cause wildlife to temporarily avoid the area, including those that are protected under the MBTA. Noise associated with construction activities, as well as an increase in general industrial activity and human presence, could evoke reactions in birds. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. However, bird and wildlife populations in the vicinity of the airport where project components would occur are accustomed to elevated noise associated with aircraft and general military industrial use. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications.

Under Alternative #4, impacts to wildlife due to proposed operations would be minor. Annual operations for the KC-46A at Pittsburgh IAP would be projected to increase by approximately 33 percent over the KC-135 baseline operations (2 percent increase in total airfield operations) found on Table 2.3-21. An increase in levels of operations (e.g., sorties) may result in an increased opportunity for bird-aircraft strikes to occur, including those with migratory birds. Adherence to the existing, BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.4.3, *Safety*). The 171 ARW has developed procedures designed to minimize the occurrence of bird/wildlife aircraft strikes, and has documented detailed procedures to monitor and react to heightened risk of bird/wildlife aircraft strikes. When risk increases, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed pattern work) in the airport environment. Special briefings are provided to pilots whenever the potential exists for increased bird/wildlife aircraft strikes within the airspace.

4.4.5.3 Special Status Species

No federally threatened and endangered species are currently known to occur on Pittsburgh IAP and there is only a low potential for them to occur within the vicinity due to the lack of habitat. In a letter dated April 2, 2014, the USFWS Pennsylvania Field Office concurred that no federally listed threatened or endangered species are known to occur within the project area. One state listed species (Torrey's Rush) is currently known to occur on Pittsburgh IAP; however, it would not be impacted by the proposed construction or operations. Therefore, Alternative #4 would have no effect on special status species.

4.4.5.4 Wetlands

There are no wetland areas that occur within the proposed project footprints. The wetland that occurs within the vicinity of the project areas, between the east and west aircraft parking aprons,

would not be impacted from the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices as described in the 171 ARW SWPPP (171 ARW 2010a) would be implemented during and following the construction period. Such standard construction practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate. Following construction, disturbed areas not covered with impervious surface would be reestablished with appropriate vegetation and native seed mixtures and managed to minimize future erosion potential. Therefore, no significant impacts to wetlands would occur as a result of Alternative #4.

4.4.5.5 Summary of Impacts

Construction of new facilities associated with this alternative would occur primarily on currently paved or actively managed areas. Therefore impacts to vegetation would be negligible. There would be no impacts to wetlands. Impacts to wildlife from operational noise would be minor due to the 33 percent increase in 171 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird-aircraft strikes to occur, including those with migratory birds. No federally listed species or critical habitat and one state listed species is known to occur on Pittsburgh IAP. However, under Alternative #4 there would be no impacts to special status species.

4.4.6 Cultural Resources

Potential direct impacts to cultural resources examined in this analysis include effects to archaeological sites due to ground disturbing activities during construction or modification to buildings. Indirect impacts from an increase in personnel from 1,306 to 1,365 would be negligible as personnel would primarily be confined to the developed areas on the installation.

4.4.6.1 Archaeological Resources

The only undisturbed portion of the 171 ARW installation in the southwest portion was intensively surveyed for archaeological resources and no NRHP-eligible archaeological resources were located. The Pennsylvania SHPO concurred with the results of this archaeological survey (171 ARW 2012b, McLearen 2011). In the unlikely event that archaeological or human remains are identified during construction, all activities in the area of the discovery would cease and the Environmental Manager would contact a qualified archaeologist to evaluate the discovery. Under these conditions, there would be no adverse impacts to archaeological resources as a result of Alternative #4.

4.4.6.2 Architectural Resources

Three buildings are proposed for interior renovations or additions at the 171 ARW installation (Buildings 301, 302, and 320). None of these buildings are eligible to the NRHP. Both 301 and 302 were inventoried and evaluated for NRHP eligibility in 2011 and the SHPO concurred with the recommendation that they were not eligible for listing in the NRHP (171 ARW 2012b, MacDonald 2011). Building 320 was built in 1997 and is therefore not eligible to the NRHP because it is less than 50 years old, does not fall within the Cold War-era, and has not achieved exceptional significance (meet Criterion Consideration G) for any other reason. SHPO consultation for this EIS has provided concurrence that the proposed project has no potential to adversely affect historic properties (see Appendix B3). There would be no adverse impacts to architectural resources as a result of implementation of Alternative #4.

4.4.6.3 Traditional Resources

The 171 ARW installation contains no known traditional resources. Given the extensive development on the installation, it is unlikely that there are traditional resources located at the 171 ARW. Government-to-government consultation for this action has been conducted with each federally-recognized Tribe associated with the 171 ARW installation in recognition of their status as sovereign nations and in order to provide information regarding tribal concerns per Section 106 of the NRHP as well as information on traditional resources that may be present on or near the installation. Responses have been received from all the Tribes under consultation. On October 3, 2013 an e-mail from the Seneca Nation of Indians was received stating that they had no objection to the Proposed Action (see Toth 2013 in Appendix B2). On January 13, 2014, an e-mail from the Cayuga Nation of New York was received stating that they had no objection to the Proposed Action (see Halftown 2014 in Appendix B2). On January 17, 2014, the Onondaga Nation of New York stated that they had no objection to the Proposed Action via telephone call. On April 4, 2014, the Tonowanda Band of Seneca stated that they had no objection to the Proposed Action via telephone call. In a letter dated April 14, 2014, the Tuscarora Nation stated that they concur that the proposed project will have no effect on predetermined archaeological sites within the Area of Potential Effect. The NGB and the USAF values its relationship with tribes and will continue to seek opportunities to consult on other planning efforts or matters of known/potential interest to tribes.

4.4.6.4 Summary of Impacts

Construction activities associated with this alternative are limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements, where no archaeological resources are known. Additionally, all undisturbed parts of the installation have been surveyed and no resources were present; the SHPO has concurred (McLearen 2011). The area is also considered to have a low potential for buried archaeological materials. None of the

buildings that would be impacted under the Proposed Action are eligible to the NRHP. The SHPO has concurred with this determination for Buildings 301 and 302 (MacDonald 2011). Building 320 is modern and does not meet any of the NRHP criteria for significance. No traditional resources are known to occur at the installation. Therefore, no impacts to cultural resources are anticipated at the 171 ARW installation under Alternative #4.

4.4.7 Land Use

The primary source of impacts to land use resulting from Alternative #4 would be from noise. As shown in Table 4.4.7-1 and Figure 4.4.7-1, areas outside of the airport boundaries currently exposed to DNLs of 65 dB to 70 dB would decrease by approximately 23 acres, overall. By zoning districts, the Commercial area affected by DNL of 65 dB to 70 dB would decrease by approximately 27 acres; Mixed Use areas would increase by approximately 2 acres; Industrial areas would increase by approximately 3 acres; and Residential and Agricultural areas would remain approximately the same. There would be no change in the areas affected by DNL of 70 dB or greater. No additional houses, churches, schools or other sensitive noise receptors are located within the 65 dB DNL off-airport noise contour areas.

Table 4.4.7-1. Change in Acres Affected by Noise Levels Above 65 dB DNL Outside the Pittsburgh IAP Boundary

	65 dB to 70 dB DNL			70 dB DNL +			65 dB to 80 dB DNL
Land Use	*Baseline*	*Proposed*	*Change*	*Baseline*	*Proposed*	*Change*	*Change*
Commercial	67.5	40.4	-27.1	-	-	-	-27.1
Mixed Use	25.1	27.4	2.3	-	-	-	2.3
Industrial	33.1	35.6	2.5	-	-	-	2.5
Residential	2.9	2.5	-0.4	-	-	-	-0.4
Agricultural	-	-	-	-	-	-	-
Total Area	**128.6**	**105.9**	**-22.7**	-	-	-	**-22.7**

A more detailed discussion of aircraft operations and noise can be found in Section 4.4.1, *Noise*.

4.4.7.1 Summary of Impacts

The number of airfield operations would decrease by 3,834 (29 percent decrease) from the currently published FAR Part 150 Noise Compatibility Program, and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 79 acres. There would be a decrease of approximately 23 acres within the 65 dB DNL noise contour that are off airport-controlled property. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to noise levels above 65 dB DNL. Airport Hazard Areas would not be affected.

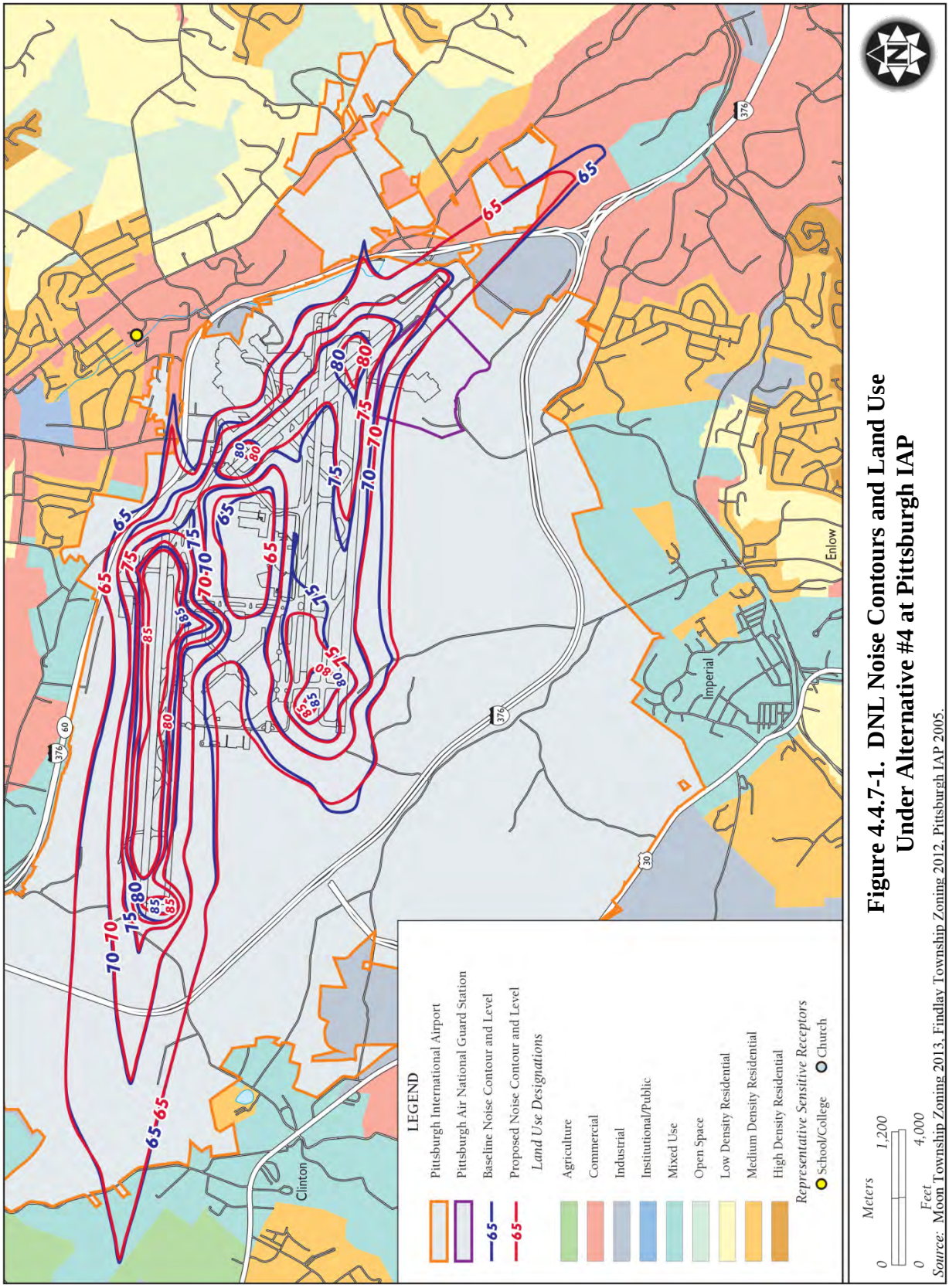


Figure 4.4.7-1. DNL Noise Contours and Land Use Under Alternative #4 at Pittsburgh IAP

Source: Moon Township Zoning 2013, Findlay Township Zoning 2012, Pittsburgh IAP 2005.

4.4.8 Infrastructure and Transportation

4.4.8.1 Potable Water

Water consumption would be expected to increase slightly under Alternative #4 as a result of the increase in personnel; however, an increase in 23 personnel on the installation would not be expected to impact regional water supply. Additionally, the demand for water (e.g., if used to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact the regional water supply.

4.4.8.2 Wastewater

Wastewater generation would be expected to increase slightly as a result of the increase in 23 personnel on the installation. However, there have been no deficiencies identified with the existing system, and it is expected that the existing sanitary sewer system is generally adequate to serve the facilities proposed under this alternative.

4.4.8.3 Stormwater

Under Alternative #4, there would be up to 186,395 SF (4.3 acres) of temporary soil disturbance as a result of proposed construction. The proposed construction activities could temporarily impact the quality of stormwater runoff (see Section 4.4.4, *Soils and Water*); however, through implementation of appropriate standard construction practices, preventative maintenance, and periodic inspections and sampling to detect risk to stormwater, especially during active construction activity, no impacts would be expected to the existing stormwater drainage system as a result of the proposed construction.

In addition, there would be an increase in up to 88,529 SF (2.0 acres) of new impervious surface. The addition of new impervious surfaces would potentially increase stormwater runoff volume and peak discharge rates; however, as discussed in further detail in Section 4.4.4, *Soils and Water*, stormwater runoff increases would be managed such that discharge exiting each site post-construction would be equal to or less than existing conditions in accordance with UFC 3-210-10 and EISA Section 438. Implementation of these measures would ensure that impacts to the stormwater drainage system as a result of implementation of Alternative #4 would be minimal.

4.4.8.4 Electrical and Natural Gas Systems

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel, and the building space and facilities to be constructed would require

additional electricity. However, any new facilities and additions associated with this alternative would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities.

Construction activity associated with Alternative #4 could result in some temporary interruption of utility services during construction. These impacts would be temporary, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

4.4.8.5 Solid Waste Management

The building space and facilities to be constructed would generate construction and demolition debris requiring landfill disposal. Construction activities would result in approximately 186,395 SF of additions and alterations to existing facilities and 88,529 SF of new building construction. Using a multiplier provided by the USEPA to determine solid waste generation, it was estimated that proposed renovations at Pittsburgh ANGS would generate 2,197,597 pounds (1,099 tons) of renovation debris requiring landfill disposal and proposed new construction at Pittsburgh ANGS would generate 384,216 pounds (192 tons) of construction debris (USEPA 2009). Therefore, the total amount of construction and demolition debris generated at Pittsburgh ANGS would be 1,291 tons.

Solid waste generated as a result of the proposed construction could result in impacts to solid waste management facilities in the area. It is unknown what landfill would be used for construction debris since the construction contractor would choose the landfill. However, the Allied Waste Imperial Landfill, which is the closest to the installation, has a permitted throughput of 649,800 tons per year (Allegheny County 2009). The 1,291 tons of proposed construction debris generated at Pittsburgh ANGS would represent 0.2 percent of the yearly capacity of the landfill. Impacts to local landfills would not be expected to exceed the permitted throughput or contribute significantly to the remaining capacity.

Off-installation contractors completing construction and demolition projects at the 171 ARW installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can

be recycled or reused, or otherwise diverted from landfills. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, sets a target diversion rate of 50 percent for recycling and waste diversion for DoD facilities by 2015, including construction and demolition waste; compliance with EO 13514 would further minimize the increase in solid waste generation as a result of the proposed construction. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (2009).

4.4.8.6 Transportation

Construction equipment would be driven to proposed construction areas and would be kept on-site for the duration of the respective activity. Construction workers would drive daily in their personal vehicles to and from the construction site. In general, construction traffic would result in increases in the use of on-installation roadways during construction activities; however, increases would be temporary and intermittent, occurring only during active construction periods.

The number of authorized personnel on the installation would increase by 23 under Alternative #4 (see Table 2.3-24). The increase in personnel would create a potential 23 additional one-way vehicle trips to and from the installation during morning and evening peak periods for these additional personnel. Assuming that each person makes two trips per day, the implementation of Alternative #4 would add an additional 46 trips onto the existing roadway network after the construction phase is complete. However, regional roads used to access the installation as well as those located on the installation have sufficient capacity to manage this minimal increase in traffic without substantial impacts to circulation. Therefore, impacts to transportation infrastructure would not be significant under Alternative #4.

4.4.8.7 Summary of Impacts

Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increase demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.

4.4.9 Hazardous Materials and Waste

4.4.9.1 Hazardous Materials

A HMMP has been developed for the KC-46A program. Training activities and other functions would be expected to remain similar between the KC-46A and existing KC-135 aircraft. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. However, unlike the KC-135, the KC-46A aircraft will be free of ODSs. ODSs were typically used as part of the fire suppression systems on aircraft; ODS use and/or storage would no longer be required under Alternative #4.

The KC-46A aircraft has been designed with a focus on reduction of hazardous materials such that hazardous materials currently required for maintenance, operations, and materials on or associated with the new aircraft would be less than or equal to the existing aircraft (Boeing 2011). In addition, it is anticipated that the amount of hazardous waste generated for one KC-46A aircraft for maintenance activities would be slightly less than that generated for one KC-135 aircraft since the KC-46A has two engines as opposed to the four engines for the KC-135. Furthermore, the KC-46A is a newer aircraft and is expected to need less maintenance than the older KC-135 aircraft.

Under Alternative #4, the total number of flying hours would increase from 6,016 to 8,040 (a 34 percent increase); therefore, the throughput of petroleum substances (e.g., fuels, oils) used during operations would be expected to increase commensurately from what is currently used to maintain the KC-135 fleet (see Appendix A, Section A.9, for more details). Additionally, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities, because various fuels (e.g., diesel, gasoline) would be required to run earth-moving equipment and power tools and to provide electricity and lighting as conditions warrant. Procedures for hazardous material management established for the 171 ARW installation would continue to be followed in future operations associated with Alternative #4 and as required during all construction and renovation activities.

Toxic Substances

Under Alternative #4, additions to Hangars 302 and 320 are proposed, and internal renovations to Hangar 301 are proposed. According to the 1991 asbestos report, Hangars 301 and 302 were found to contain ACM in the insulation, floor tiles, and mastic. A LBP survey has not been conducted at the 171 ARW installation. However, Buildings 301 and 302 were built before 1978 and therefore may contain LBP. Any structures proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any

renovation or demolition activities. All ACM would be properly removed and disposed of prior to or during demolition in accordance with 40 CFR 61.40 through 157. All LBP would be managed and disposed of in accordance with TSCA, OSHA regulations, Pennsylvania requirements (regarding site work practices for buildings with LBP), and established ANG procedures. Removal and disposal of ACM and LBP may also require local permits and inspections (depending on volume or area being removed/renovated) through the Allegheny County Health Department. Materials, especially discarded oil products, would be screened for PCB contamination prior to disposal.

4.4.9.2 Hazardous Waste Management

The type of hazardous waste streams generated by KC-46A operations would be expected to remain similar to those being generated by the existing KC-135 aircraft. Additionally, the two aircraft require the same types of hazardous materials for their maintenance and operations (e.g., fuels, oils). Under Alternative #4, the total number of flying hours for the 171 ARW would increase by approximately 34 percent; therefore, hazardous waste streams would be expected to increase commensurately (see Appendix A, Section A.9, for more details). Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. No changes to the installation's large quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations.

4.4.9.3 Environmental Restoration Program

In accordance with AFI32-7020, The Environmental Restoration Program, construction, modifications and/or additions to existing buildings can occur on or in proximity to existing ERP sites. Accordingly, the appropriate organizations (e.g., installation planners, ERP managers, design engineers) must consider a compatible land use based on current site conditions and the selected or projected remedial action alternatives. Construction should be sited and designed to minimize life-cycle costs to include those associated with impacts from existing contaminated sites. If the potential for uncharacterized ERP sites exist, the installation is responsible for identifying existing contamination at the proposed construction sites to avoid unknowingly locating construction projects in areas with contamination. The installation is responsible for performing necessary environmental baseline surveys, accomplishing environmental impact analysis process requirements, and for otherwise informing itself about existing site conditions and their associated cost impacts in preparation for a construction project. When warranted by the site history, environmental restoration funds may be used to accomplish RCRA facility assessments, or preliminary assessments and site inspections undertaken in accordance with the

CERCLA process, or similar site investigations in accordance with applicable state laws for suspected releases. To the extent that a construction project generates actions to address contamination, or a need to change the timing of ERP-generated actions to address contamination, the costs of such actions are not Environmental Restoration Account-eligible and shall be funded as part of the construction project. This includes the handling, mitigation, and disposal or other disposition of contamination discovered before or during the construction activity.

The removal and disposal of contamination unexpectedly encountered within the construction project footprint during the execution of a construction project will be undertaken as part of the construction project using construction project funds which may include other MILCON funds reprogrammed to a MILCON construction project. Construction contractor costs (such as direct delay costs and unabsorbed or extended overhead) incidental to discovery and removal of the contamination will be construction project funded to the extent that the government is responsible and liable for such costs.

Vapor intrusion should be evaluated when volatile chemicals are present in soil, soil gas, or groundwater that underlies existing structures or has the potential to underlie future buildings and there may be a complete human exposure pathway. Due to their physical properties, volatile chemicals can migrate through unsaturated soil and into the indoor air of buildings located near zones of subsurface contamination.

One ERP site, Site #7 overlaps with the proposed addition to Hangar 320 as well as the proposed apron expansion (Figure 4.4.9-1). This site is closed and was a POL storage area and fuel hydrant system for JP-4 fuel. Soil and groundwater sampling performed at this site did not reveal contaminants of concern above PADEP guidelines; therefore, it is not expected to pose a vapor intrusion concern. However, it is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations.

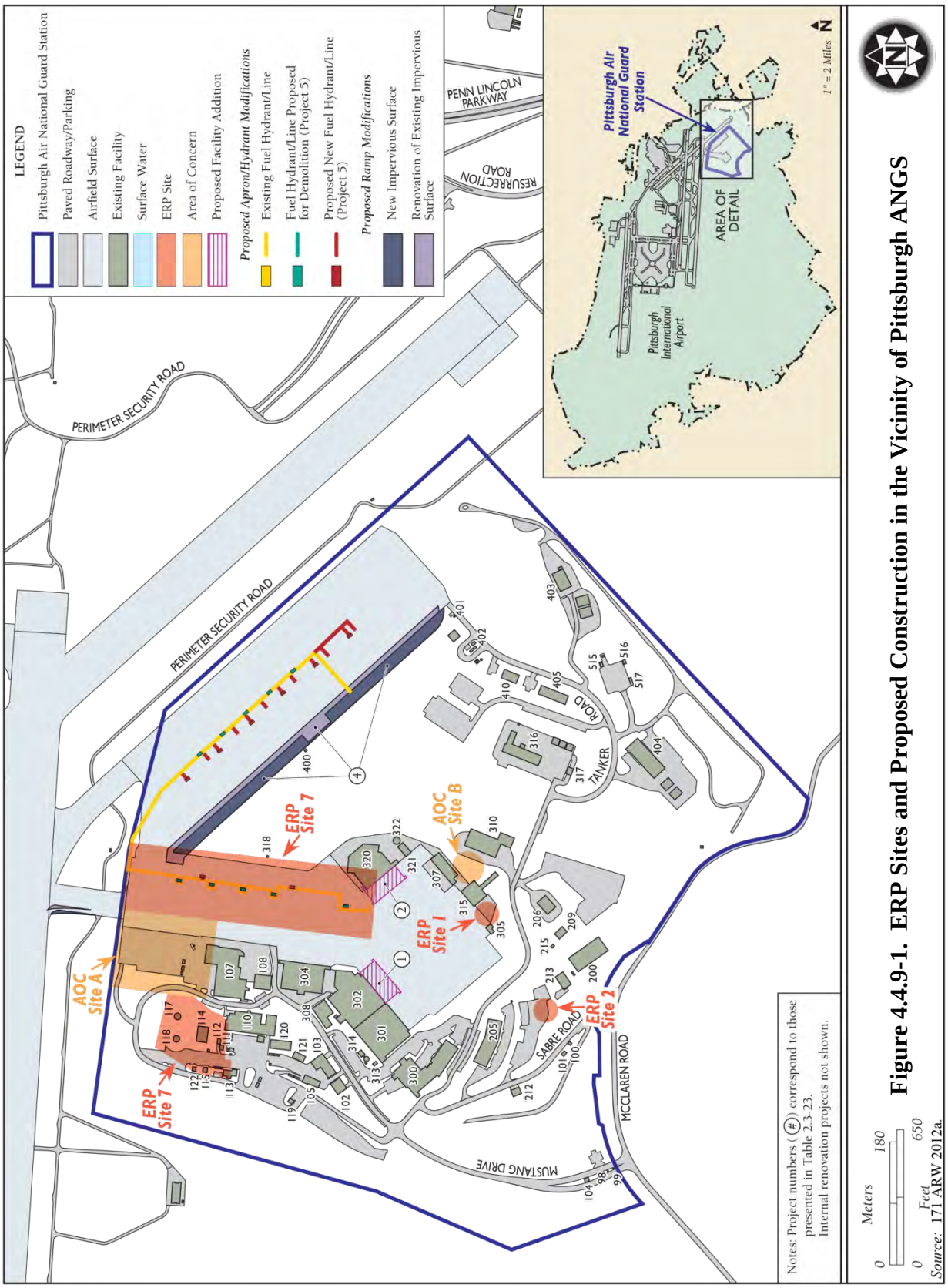


Figure 4.4.9-1. ERP Sites and Proposed Construction in the Vicinity of Pittsburgh ANGS

If contaminated media (e.g., soil, vapor, groundwater) are encountered during the course of site preparation (e.g., clearing, grading) or site development (e.g., excavation for installation of building footers) for proposed construction activities, work would cease until 171 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met, and to arrange for agency consultation as necessary if existing ERP sites are affected. Also, prior to construction activities, the construction contractors would be notified of the nature and extent of known contamination so that they can inform their employees in advance of on-site activities and take appropriate precautions to protect health and safety, and to prevent the spread of contamination. The construction contractors would be responsible for ensuring their workers follow appropriate health and safety requirements.

Alternative #4 would not result in an increased risk of hazardous waste releases or exposure, nor would it affect the criteria listed in Appendix A, Section A.9. Therefore, no significant impacts from hazardous materials and wastes would occur with the implementation of Alternative #4.

4.4.9.4 Summary of Impacts

There would not be an increased risk of hazardous waste releases or exposure from this alternative. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations. There would be no expected impact from ERP sites. Impacts relative to hazardous materials and wastes would be negligible.

4.4.10 Socioeconomics

Under Alternative #4, construction activities would be contained entirely within the boundaries of Pittsburgh IAP. Economic activity associated with proposed construction activities at the 171 ARW installation, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased would be negligible on a regional scale.

The proposed aircraft beddown and related activities would result in a minor change in staffing requirements for the 171 ARW. Currently, the 171 ARW is authorized 1,306 personnel. Under Alternative #4, the KC-46A mission would add an additional 59 military positions (increase in 235 full-time positions and reduction of 176 traditional Guard positions) (see Table 2.3-24). Combined with their approximately 80 family members, this would represent less than 0.01 percent of Allegheny County population. Of the 80 family members, approximately 28 would be anticipated to be of school age. The students entering the local schools would be expected to be enrolled in various grades and live in different areas within Allegheny County. It is anticipated

that there is enough capacity within the schools in this county to absorb this minimal increase in school age children.

A net increase in 59 military personnel positions would amount to an increase of approximately 4.5 percent to the existing 171 ARW personnel. Total payroll associated with the 235 additional full-time personnel would amount to an estimated total annual salary increase of approximately $12 million for full-time employees. However, a portion of this (approximately $4 million) would be offset by the loss of 176 part-time guardsmen.

All 171 ARW personnel live off-installation as there is no on-installation housing. A conservative scenario would result in 80 homes purchased at the same time as personnel relocate to the area. This would represent less than 0.01 percent of the total housing units in the Allegheny County. However, not all the military personnel who would relocate would own homes, and some personnel may choose to live in other neighboring counties or states.

4.4.10.1 Summary of Impacts

Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.

4.4.11 Environmental Justice and the Protection of Children

4.4.11.1 Minority and Low-Income Populations

As presented in Table 4.4.11-1, of the roughly 12 persons (same as baseline) that would be affected by proposed DNL between 65 dB and 70 dB, none are considered to be minorities, or low-income populations. No additional minorities or low-income populations would be impacted by aircraft DNL greater 65 dB under Alternative #4. Therefore, there would be no impacts to minority or low-income populations in the vicinity of Pittsburgh IAP and there would be no disproportionate impacts to minority or low-income populations.

Table 4.4.11-1. Population within Alternative #4 Noise Contours, Pittsburgh IAP[1]

Noise Contour	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income[2]*
65-70	12	0	0	0	0
70-75	0	0	0	0	0
75-80	0	0	0	0	0
80-85	0	0	0	0	0
85+	0	0	0	0	0
Total	**12**	**0**	**0**	**0**	**0**

Note: 1. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low income population numbers are from the 2007-2011 ACS 5-Year Estimates.
2. The percentage of low-income persons is calculated as a percentage of all persons for whom the USCB determines poverty status, which is generally a lower number than the total population because it excludes institutionalized persons, persons in military group quarters and college dormitories, and unrelated individuals under 15 years old.

Sources: USCB 2010f and 2011f.

4.4.11.2 Protection of Children

There are no facilities on the installation where children may be encountered on a regular basis. Currently there are no Kindergarten through Grade 12 off-installation schools that are exposed to aircraft DNL between 65 dB and 70 dB. Under Alternative #4 there would be no new Kindergarten through Grade 12 schools exposed to aircraft DNL of 65 dB or above. Therefore, under Alternative #4 there would be no special health or safety risks to children.

4.4.11.3 Summary of Impacts

Given that the acreage within the 65 dB DNL noise contour would be reduced under Alternative #4, there would be no additional residential populations, including no minority or low-income populations, and no additional schools located within the vicinity Pittsburgh IAP exposed to DNL of 65 dB or above; thus, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Pittsburgh IAP. In addition, there would be no special health or safety risks to children.

4.5 ALTERNATIVE #5 -- RICKENBACKER AIR NATIONAL GUARD STATION

4.5.1 Noise

In this section, noise associated with flying operations and construction activities related to Alternative #5 are considered and compared with current conditions associated with the most current approved and published baseline noise study to assess potential impacts. Details of the noise modeling methodologies used for this section can be found Appendix A, Section A.1.2.

Actual 2012 KC-135 airfield operations were identified in Table 2.3-25. This data was used in determining the proposed KC-46A airfield operations based on most current home-station sorties and airfield operations to provide a more accurate determination of the number of airfield operations for Alternative #5. Under this analysis, the proposed airfield operations are compared to the most current approved and published 2007 FAR Part 150 Noise Compatibility Program for Rickenbacker IAP.

The DNL noise contours for the KC-46A under Alternative #5 were generated using INM. Based KC-135 operations were removed and replaced with KC-46A operations using the B-767-300 and the standard flight profile data provided with INM as substitute data and applying the data to the current based KC-135 flight tracks and operational procedures (INM does not have a standard profile or noise curve data for the KC-46A). Using the standard flight profile data provided for this substitute aircraft in INM provides an accurate analysis of noise contour comparisons that would be expected with the new KC-46A. Flight profiles, flight tracks, and operational procedures currently being used by the KC-135 were used in this INM program.

4.5.1.1 Aircraft Noise

Under Alternative #5, 12 KC-46As would be based at Rickenbacker ANGS replacing the current 18 KC-135 aircraft. There would be no change in the number or type of other aircraft using the airfield. KC-46A aircrews would use the same flying procedures (e.g., ground tracks, altitude profiles) currently used by KC-135 aircrews. Aircrews associated with the KC-46A would continue to practice closed patterns, including tactical procedures in which the aircraft climbs or descends in the immediate vicinity of the airfield. Tactical training prepares aircrews for operations in forward operating locations in which flying at low-altitudes over land not controlled by friendly forces exposes the aircraft to ground-based threats. This procedure is currently being flown with the KC-135; however, most tactical procedures would be accomplished in the simulator and at the other locations away from Rickenbacker IAP.

Using the current published and approved baseline noise contours from the Rickenbacker IAP FAR Part 150 Noise Compatibility Program Update and INM data, there would be a decrease in the overall number of airfield operations with the proposed KC-46A for comparison (Table 4.5.1-1).

Under Alternative #5, the 121 ARW KC-46A aircraft would fly a total of 8,040 hours, resulting in 2,010 annual sorties of which it is expected that up to 1,286 sorties would be flown at Rickenbacker ANGS. Baseline conditions for the KC-135 are represented here as the same number of 121 ARW airfield operations published in the August 2007 Rickenbacker IAP FAR Part 150 study (CRAA 2007). Based on 1,286 annual home-station sorties with an average of 5.33 operations per sortie, there would be 6,857 annual home-station operations, or a reduction of 6,283 airfield operations annually at Rickenbacker IAP. This would decrease the average daily airfield operations from approximately 36 to 25 as shown in Table 4.5.1-1. The 121 ARW KC-46A operations would be approximately 11 percent of all aircraft operations at the airfield under the current approved FAR Part 150 Noise Compatibility Update.

Table 4.5.1-1. Changes to Rickenbacker IAP Airfield Operations with Proposed KC-46A Based on FAR Part 150 Baseline

Unit	*Total Based KC-135 (Average Daily Airfield Operations)*	*Total Based KC-46A (Average Daily Airfield Operations)*	*Change in Airfield Operations Annually for Proposed KC-46A Operations (% Change)*
121 ARW	13,140[1] (35.8)	6,857 (25.3)	-6,283 (-47.8%)

Note: 1. Operations based on currently approved FAR Part 150.

Table 4.5.1-2 provides details on the total airfield operations for Rickenbacker IAP under Alternative #5 using the current FAR Part 150 as the baseline operations. There would be a 9.4 percent decrease in the overall airfield operations from the current baseline operations. There would be approximately 4 percent of KC-46A airfield operations flown during environmental night. The total number of operations flown by all other aircraft at Rickenbacker IAP would not change from previously identified airfield activities. There would be no change to any other aircraft types or aircraft flight tracks and profiles from the baseline condition.

Table 4.5.1-2. Rickenbacker ANGS Aircraft Operations with Proposed KC-46A

	DEPARTURES		ARRIVALS		TOTAL[1]		*Grand Total[1]*
Aircraft	*Day*	*Night[2]*	*Day*	Night[2]	*Day*	*Night[2]*	
KC-46A	3,428	0	3,153	276	6,581	276	6,857
Other Aircraft[3,4]	13,870	13,140	13,505	13,505	27,375	26,645	54,020
Total	**17,298**	**13,140**	**16,658**	**13,781**	**33,956**	**26,921**	**60,877**

Notes: 1. Includes Closed Patterns (which count as two airfield operations).
2. Night –Between 10 p.m. and 7 a.m. for environmental night.
3. Other Based aircraft and Transient Aircraft (multiple type aircraft) including: Boeing 737, 747, and Airbus 300.
4. Operations based on currently approved FAR Part 150.

Figure 4.5.1-1 depicts Alternative #5 noise exposure area from aircraft operations after the conversion from the current 18 KC-135 aircraft to 12 KC-46A aircraft, and Figure 4.5.1-2 compares baseline noise contours with Alternative #5 contours. The aircraft operations modeled include all current based and transient aircraft as depicted in the 2007 FAR Part 150 Noise Compatibility Noise Update. Table 4.5.1-3 shows changes to the acreage of land within each noise contour under Alternative #5.

Table 4.5.1-3. Land Areas within DNL Contours at Rickenbacker IAP Affected by DNL Greater than 65 dB under Baseline and Alternative #5

Noise Contour (dB DNL)	BASELINE (KC-135) TOTAL (ACRES)			ALTERNATIVE #5 (KC-46A) TOTAL (ACRES)			*Change Total (Acres)*
	On Airport	*Off Airport*	*Total*	*On Airport*	*Off Airport*	*Total*	
65-70	811	417	1,228	799	345	1,144	-84
70-75	478	0	478	495	0	495	17
75-80	156	0	156	276	0	276	120
80-85	265	0	265	288	0	288	23
>85	232	0	232	57	0	57	-175
Total	**1,942**	**417**	**2,359**	**1,915**	**345**	**2,260**	**-99**

Notes: DNL = Day Night Average Sound Level; dB = decibel

Under Alternative #5, the DNL noise contours would decrease slightly from the DNL baseline contours. The reduction is the result of fewer KC-46A airfield operations and because the KC-46A is generally a quieter aircraft (5 dB quieter on landing and 1 dB louder on take-off) than the KC-135.

Overall, the number of acres contained within the 65 dB DNL and greater exposure area would decrease by approximately 99 acres, or 4 percent, and would remain primarily on airport property with approximately 345 of the acres off the airport property under Alternative #5. Information regarding the number of people residing in this area can be found in Section 4.5.11, *Environmental Justice and the Protection of Children*; and information regarding the area of residential use is located in Section 4.5.7, *Land Use*.

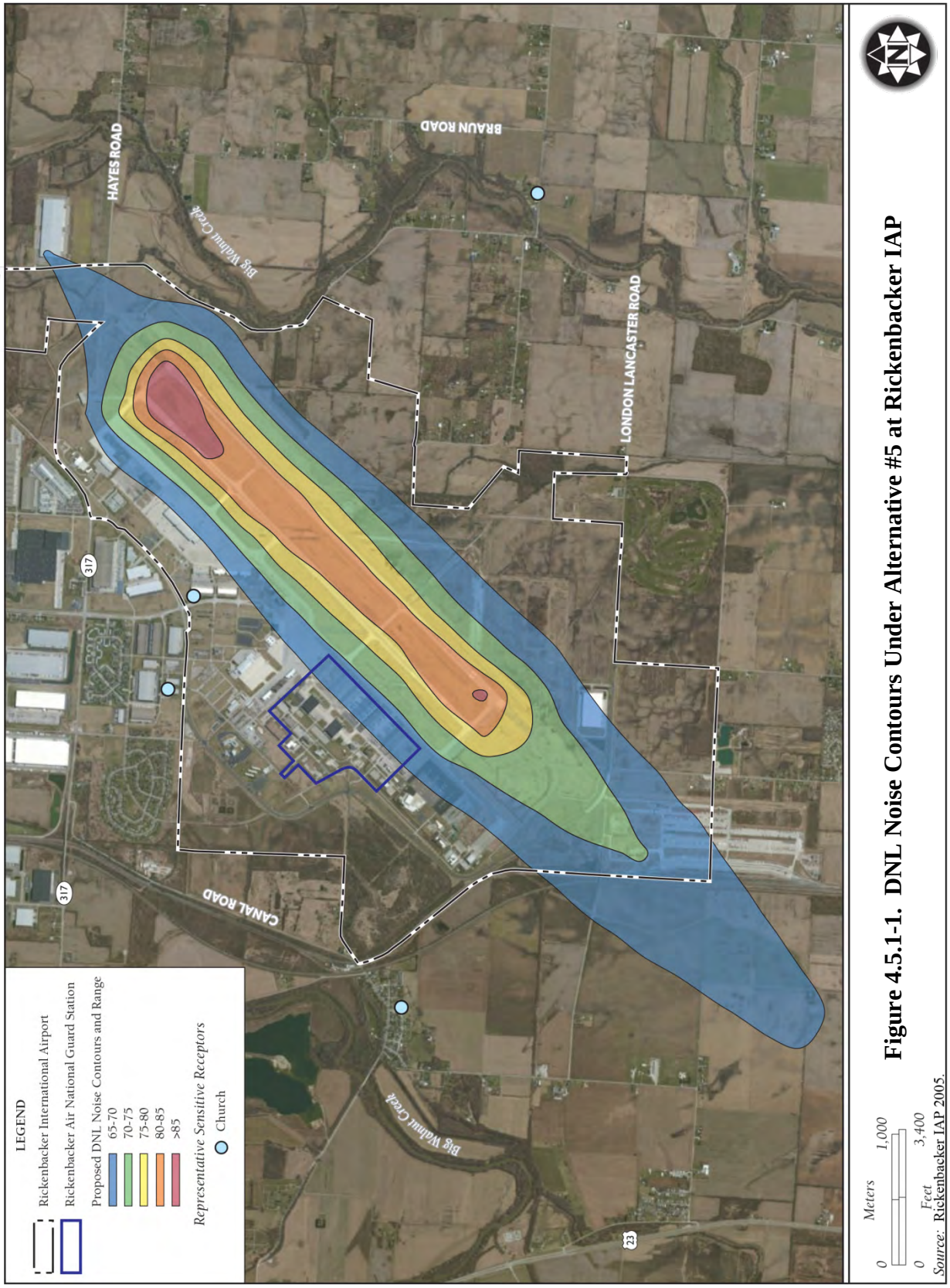


Figure 4.5.1-1. DNL Noise Contours Under Alternative #5 at Rickenbacker IAP

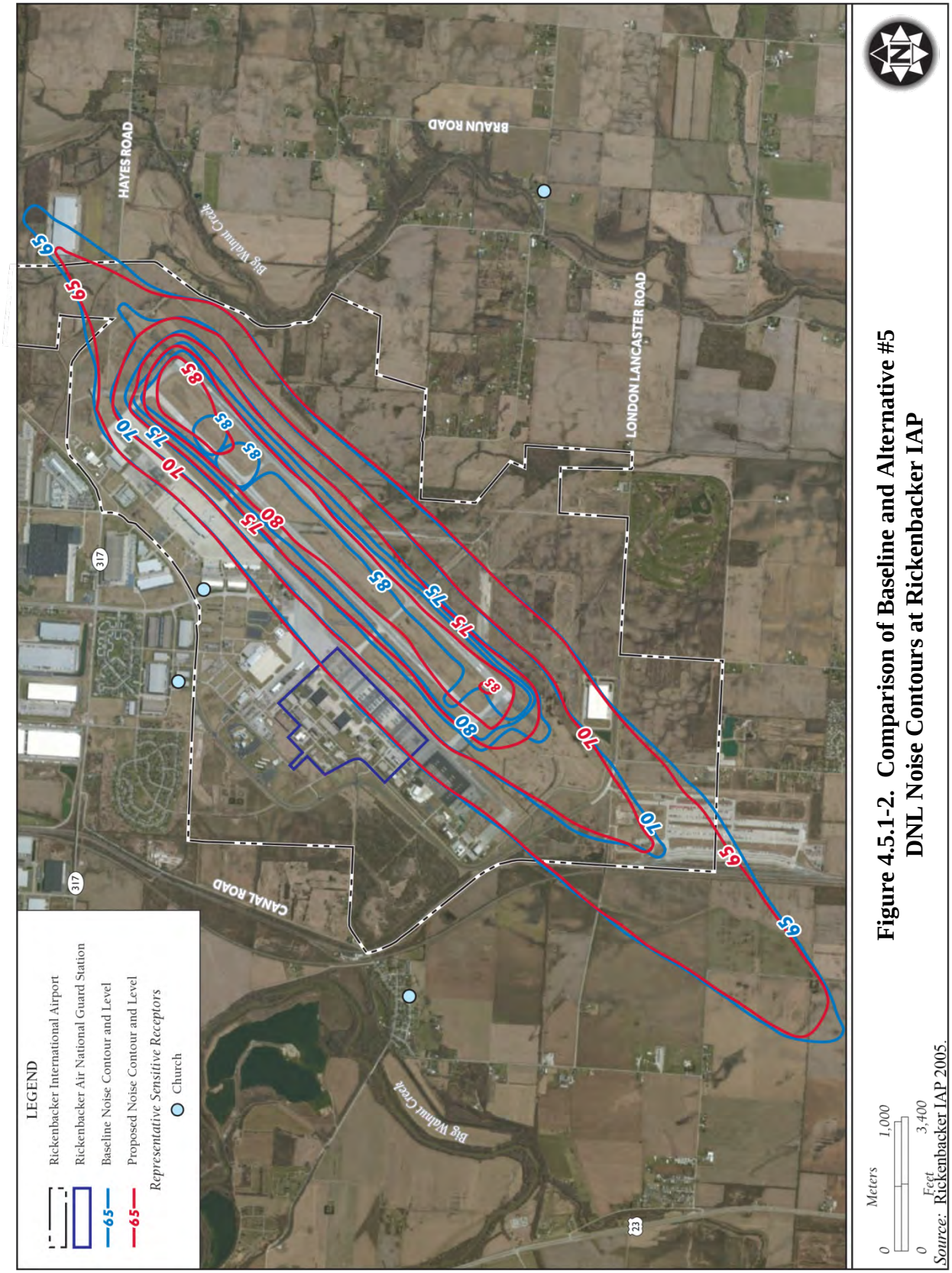


Figure 4.5.1-2. Comparison of Baseline and Alternative #5 DNL Noise Contours at Rickenbacker IAP

Source: Rickenbacker IAP 2005.

Percent of the Population Expected to be Highly Annoyed

The percentage of the population expected to be highly annoyed under Alternative #5 would not be expected to change from baseline conditions because there are no additional residences exposed to levels above 65 dB DNL.

Single Event Sound Analysis

Under Alternative #5, the flying profiles would not change, and the scheduled flying program would not change. As shown in Appendix A, Table A.1.2-2 provides representative SELs, indicating that the SEL for individual landings by the KC-46A would be 5 dB less while take-offs would be 1 dB more than the KC-135. Under Alternative #5, only the number of aircraft operations would change; there would be no change in where or when individual aircraft operate. Flights would be scheduled for similar time periods as currently flown during the morning and afternoons, with approximately 4 percent of flights occurring during environmental night (after 10 p.m. and before 7 a.m.).

Potential Hearing Loss

As shown in Table 4.5.1-3, there is no property off the Rickenbacker IAP that falls within the 80+ dB DNL noise contour; therefore, there would be no potential hearing loss risk associated with these areas.

4.5.1.2 Construction Noise

There would be some minor noise from construction equipment associated with construction activities that would occur intermittently during the construction period (beginning FY 2015). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (FHWA 2006). Aviation-related activities at Rickenbacker IAP dominate the local noise environment for brief times on some days. Equipment used during the facility construction would contribute little to the general background noise levels around the airfield. Therefore, impacts from construction under Alternative #5 would be negligible.

4.5.1.3 Summary of Impacts

The number of 121 ARW airfield operations would decrease by 6,283 (48 percent decrease from the currently published FAR Part 150 Noise Compatibility Program; and a 1 percent increase in actual 2012 airfield operations), and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. There would be a decrease of 72 acres within the 65 dB DNL noise contour that are off airport-controlled property, resulting in 345 acres off airport-

controlled property that lie within the 65 dB DNL contour. There would be no potential for hearing loss off the airport and no increase in the percent of the population highly annoyed. Construction noise would be localized and temporary and would not add to the overall noise environment. Impacts from noise would be negligible.

4.5.2 Air Quality

The air quality analysis estimated the magnitude of emissions that would result from implementation of the proposed KC-46A construction and operational activities at the 121 ARW. The estimation of proposed operational emissions is based on the net change in emissions between existing aircraft operations and projected KC-46A operations.

As discussed in Appendix A.2.3, air quality impacts from the beddown of the KC-46A aircraft at Rickenbacker IAP were reviewed for significance relative to the PSD threshold for new major sources for attainment pollutants, and the General Conformity *de minimis* thresholds for nonattainment pollutants. Because the project region within Franklin County is a nonattainment area for O_3 (marginal) and $PM_{2.5}$, the *de minimis* threshold of 100 tpy for O_3 precursors NO_x and VOCs, and $PM_{2.5}$, was used as an indicator of the potential significance of the emissions from the KC-46A conversion. For attainment pollutants, the PSD threshold of 250 tpy (100,000 tpy for GHGs) was used as an indicator of the potential significance of the emissions from Alternative #5.

4.5.2.1 Operational Emissions

Sources associated with operation of the proposed KC-46A beddown at Rickenbacker IAP include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) offsite POV commutes; and (4) AGE. It was assumed that other sources, including nonroad mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged. Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the project noise analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (AFCEC 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were

estimated based on the proposed personnel for the existing and proposed scenarios, using emission factors for vehicles from AFCEC 2013.

Table 4.5.2-1 summarizes the annual operational emissions that would result from KC-46A operations at Rickenbacker IAP. Table 4.5.2-1 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at Rickenbacker IAP. As shown in Table 4.5.2-1, the net emissions increases are below the PSD/*de minimis* thresholds for all pollutants.

Table 4.5.2-1. Comparison of Baseline and Proposed Annual Operational Emissions, 121 ARW

	ANNUAL EMISSIONS, TONS/YEAR					
Baseline	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-135 Aircraft Operations	4.63	68.57	64.35	6.38	0.34	0.34
AGE	0.01	0.02	0.15	0.00	0.01	0.01
Engine Tests	0.11	1.55	0.43	0.07	0.01	0.01
POVs	4.55	67.35	3.55	0.05	0.15	0.07
Total	**9.29**	**137.50**	**68.48**	**6.50**	**0.51**	**0.42**
Proposed Action	***VOC***	***CO***	***NO_x***	***SO_2***	***PM_{10}***	***$PM_{2.5}$***
KC-46A Aircraft Operations	21.73	77.82	123.58	7.78	0.57	0.49
AGE	0.01	0.02	0.15	0.00	0.01	0.01
Engine Tests	0.59	2.03	0.54	0.07	0.01	0.01
POVs	4.09	60.59	2.68	0.05	0.15	0.07
Total	**26.43**	**140.46**	**126.95**	**7.90**	**0.73**	**0.55**
Net Increase	**17.13**	**2.96**	**58.47**	**1.40**	**0.23**	**0.15**
MOB2 Net Emissions Increase Fraction of Existing Emissions	**1.84**	**0.02**	**0.85**	**0.22**	**0.45**	**0.36**
PSD/*de minimis* Threshold	**100**	**250**	**100**	**250**	**250**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately owned vehicle; PSD = Prevention of Significant Deterioration

In addition to criteria pollutant emissions, the beddown of the KC-46A aircraft at Rickenbacker IAP would result in emissions of HAPs and GHGs. Operational activities would result in a net increase of HAPs that is below 1 ton per year.

Table 4.5.2-2 summarizes the annual operational GHG emissions that would result from KC-46A operations at Rickenbacker IAP, along with the net increase in comparison with the baseline. As shown in Table 4.5.2-2, emissions are below the PSD thresholds for GHGs.

Table 4.5.2-2. Comparison of Baseline and Proposed Annual Operational GHG Emissions, 121 ARW

	ANNUAL GHG EMISSIONS, METRIC TONS/YEAR			
Baseline	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-135 Aircraft Operations	17,562	0.49	0.55	17,742
AGE	3,298	0.09	0.11	3,333
Engine Tests	183	0.01	0.01	185
POVs	2,407	0.00	0.00	2,407
Total	**23,451**	**0.58**	**0.66**	**23,667**
Proposed Action	***CO_2***	***CH_4***	***N_2O***	***CO_2e***
KC-46A Aircraft Operations	21,009	0.53	0.60	21,206
AGE	3,291	0.09	0.11	3,326
Engine Tests	180	0.00	0.01	182
POVs	2,430	0.00	0.00	2,430
Total	**26,909**	**0.63**	**0.71**	**27,143**
Net Increase	**3,458**	**0.05**	**0.05**	**3,476**
PSD Threshold	**100,000**	**100,000**	**100,000**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; AGE = aerospace ground equipment; POV = privately owned vehicle

4.5.2.2 Construction Emissions

The KC-46A beddown at Rickenbacker IAP would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would occur from (1) combustion emissions from heavy equipment and vehicles; and (2) fugitive dust emissions due to operation of equipment on exposed soil. Table 4.5.2-3 presents a summary of the annual construction emissions for the beddown of the KC-46A aircraft at Rickenbacker IAP. As shown in Table 4.5.2-3, emissions would be below the PSD/*de minimis* thresholds for all pollutants.

Table 4.5.2-3. Annual Construction Emissions Under Alternative #5

Construction Project	*CO*	*NOx*	*VOC*	*SOx*	*PM_{10}*	*$PM_{2.5}$*	*Total CO_2, Metric tons/year*
Project #1 - Addition and Modifications to Hangar 885	0.32	0.51	0.09	0.01	0.40	0.37	170.43
Project #2 - Addition to Hangar 883	1.39	2.20	0.39	0.04	2.17	1.70	736.69
Project #3 - Internal Renovations to Hangar 888	0.30	0.47	0.06	0.01	0.04	0.04	122.59
Project #4 - Modifications to Existing Parking Ramp and Taxiway	9.07	21.55	2.25	1.07	22.37	8.31	5,355.66
Project #5 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	0.05	0.08	0.01	0.00	0.02	0.01	27.82
Total	**11.12**	**24.82**	**2.80**	**1.13**	**25.00**	**10.43**	**6,413.19**
PSD/*de minimis* Threshold	**250**	**100**	**100**	**250**	**250**	**250**	**100,000**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide; PSD = Prevention of Significant Deterioration

4.5.2.3 Summary of Impacts

The Rickenbacker ANGS is located in an area of nonattainment for the O_3 and $PM_{2.5}$ NAAQS. While there are increases in operational criteria pollutant emissions, they are below the PSD/*de minimis* thresholds for all pollutants and are not significant. Operational GHG emissions are within thresholds in the PSD tailoring rule. Impacts from construction emissions and operational HAP emissions are negligible.

4.5.3 Safety

4.5.3.1 Ground Safety

Existing facilities at Rickenbacker IAP for fire response and crash recovery meet KC-46A beddown requirements (Headquarters AMC and NGB 2013b).

Providing new and renovated facilities for the 121 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 121 ARW.

Proposed renovation and infrastructure improvement projects related to Alternative #5 would not impact aircraft take-off or landings or penetrate any RPZs. New construction is not proposed, only existing building renovation; therefore, construction activity would not result in any greater safety risk or obstructions to navigation. Operations would fall within the same general types as

those that have historically occurred at Rickenbacker IAP. For example, the KC-46A would follow established local approach and departure patterns used. Therefore, flight activity and subsequent operations would not require changes to RPZs.

To support the aircraft beddown at Rickenbacker ANGS, some facilities would require renovation/modification. However, no construction activities would involve any unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures, including AFI 13-213, *Airfield Driving* (2011), would further minimize the relatively low risk associated with these construction activities.

At present, Rickenbacker ANGS has no QD arcs and no plans to store munitions at the installation are proposed.

The proposed construction projects meet all criteria specified in the ANG Handbook 32-1084, *Facility Space Standards.* AT/FP requirements have also been addressed to the extent practicable in all projects. Projects would use AT/FP site design standards for siting of facilities, parking, walkways, and other features. Renovations would bring the facilities into compliance with UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* and UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, providing additional protection for the personnel based there.

4.5.3.2 Flight Safety

Although the KC-46A is a new aircraft, it is a military derivative of the commercial Boeing 767 aircraft. First flown commercially in 1982, more than 1,000 commercial Boeing 767 aircraft have been produced and it is a proven commercial airliner, freighter, and tanker already in service (Boeing 2012). Mishap statistics for the commercial Boeing 767 show 14 total aircraft losses (similar to a Class A military mishap definition) during its 31 year lifetime (ASN 2013).

Although no facilities are proposed that would affect navigable airspace, Rickenbacker ANGS would comply with 14 CFR Part 77, *Objects Affecting Navigable Airspace*, as appropriate, should they be selected to host the KC-46A.

To augment airborne training missions, pilots flying the KC-46A would use simulators extensively. Simulator training includes all facets of flight operations and comprehensive emergency procedures. The sophistication and fidelity of current simulators and related computer programs are commensurate with the advancements made in aircraft technology and are extremely realistic. These factors should minimize risk associated with mishaps due to pilot error.

Under Alternative #5, there would be an increase of approximately 6 percent in 121 ARW annual operations (1 percent in total Rickenbacker IAP airfield operations) compared to existing conditions. This negligible increase in take-offs, landings, proficiency training, and other flights would not result in a measurable change in the safety risk to aircrews and personnel.

The proposed change in airfield flight operations would be expected to increase the opportunity for aircraft mishaps, including BASH incidents; however, the expected rate of mishaps or BASH incidents would not be expected to change from current conditions. In addition, current airfield safety procedures discussed previously would continue to be implemented and additional airfield flight operations would adhere to established safety procedures.

Given the low likelihood for an aircraft accident or BASH mishap to occur in the local airfield area and even lower likelihood for civilians to be impacted, impacts to safety in the vicinity of Rickenbacker IAP as a result of the Proposed Action are expected to be negligible.

The KC-46A will have the capability to jettison fuel for emergency situations. Military policy is to avoid fuel jettisons, unless safety of flight dictates an immediate jettison, and requires senior officer approval before fuel jettison, unless under emergency situations. Records of KC-135 fuel jettison events reveal that such circumstances are rare, occurring in slightly less than two sorties per thousand (Headquarters AMC 2013). Additionally, unlike the KC-135, the KC-46A will have the capability to land fully loaded with fuel so long as adequate runway length and braking capability are available (Headquarters AMC 2013), which could potentially lessen the need to jettison fuel in certain circumstances. Based on information provided by Boeing, landing the KC-46A above maximum landing weight is not prohibited; however, it does drive costly inspection requirements. To land above maximum landing weight routinely could reduce the fatigue life of the airplane (Headquarters AMC 2013).

4.5.3.3 Summary of Impacts

There would be a 6 percent increase in actual 121 ARW airfield operations (1 percent increase in total airfield operations) at Rickenbacker IAP with a commensurate increase in mishap and BASH potential. Construction activities would involve no unusual or extraordinary techniques. During construction and modifications, standard construction safety procedures would be employed, and strict adherence to all applicable standard industrial safety requirements and procedures would further minimize the relatively low risk associated with these construction activities. Impacts to safety would be expected to be negligible.

4.5.4 Soils and Water

4.5.4.1 Soils

Under Alternative #5, new construction would consist of five separate projects resulting in 368,330 SF (8.5 acres) of new construction footprint and 14,660 SF (0.3 acre) of new impervious surface (Table 2.3-29). These proposed construction projects for aircraft conversion would meet all criteria specified in ANG Handbook 32-1084, *Facility Space Standards.*

Proposed construction under Alternative #5 would occur primarily on Crosby-Urban land complex (0 to 2 percent slopes), with a small amount of the new construction footprint on Kokomo-Urban land complex. Crosby-Urban land complex is not rated in road or small commercial building development and may require onsite investigation and evaluation for most land use decisions to identify any potential limitations (NRCS 2013). There is no proposed construction on any farmland; therefore, the Farmland Protection Policy Act does not apply to Alternative #5.

Under Alternative #5, there would be approximately 368,330 SF (8.5 acres) of temporary soil disturbance as a result of the proposed construction. To minimize potential impacts to soil and water resources associated with erosion, runoff, sedimentation during construction activity, and standard construction practices as described in the 121 ARW SWPPP (121 ARW 2009) would be implemented during and following the construction period. Such practices could include the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate.

A site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls is an effective way of controlling erosion while soil is exposed and subject to construction activity. An NOI must be filed with the state of Ohio to obtain coverage under the Storm Water Discharge from Small and Large Construction Activities (General Permit No. OH000004) prior to implementation of individual projects. Construction activities subject to this permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation. Implementation of these measures, as necessary and appropriate, would ensure that impacts to earth resources as a result of implementation of Alternative #5 would be minimal.

4.5.4.2 Surface Water

As a result of implementation of Alternative #5, there would be approximately 14,660 SF (0.3 acre) of new impervious surface from the proposed construction (Figure 4.5.4-1). This could

result in localized increases in stormwater runoff volume and intensity, in addition to increases in total suspended particulates to nearby surface waters. However, in accordance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features. The integration of LID design concepts incorporates site design and stormwater management to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Increased runoff and peak discharge volumes as a result of increases to impervious surface can be managed by appropriately designed conveyance structures (such as roadways, channels, and culverts) in accordance with site-specific engineering standards that take into consideration the influence of surface water drainage within, adjacent to, and downstream of the project. In addition, implementing features that manage surface water runoff into the design of the project would avoid or minimize conflicts with city, county, state, or federal regulations and prevent adversely affecting adjacent properties and/or the project area itself. Such measures could include:

- water harvesting and natural open space,
- installation of retention/detention basins for water recharge or for release of runoff at predetermined times to minimize peak discharges,
- the use of porous materials, such as pavers or gravel, for driveway and walkway construction, and
- directing runoff toward permeable areas, such that discharge exiting each site post-construction would be equal to or less than existing conditions.

Implementation of these measures, as necessary and appropriate, would ensure that impacts to surface water as a result of implementation of Alternative #5 would be minimal.

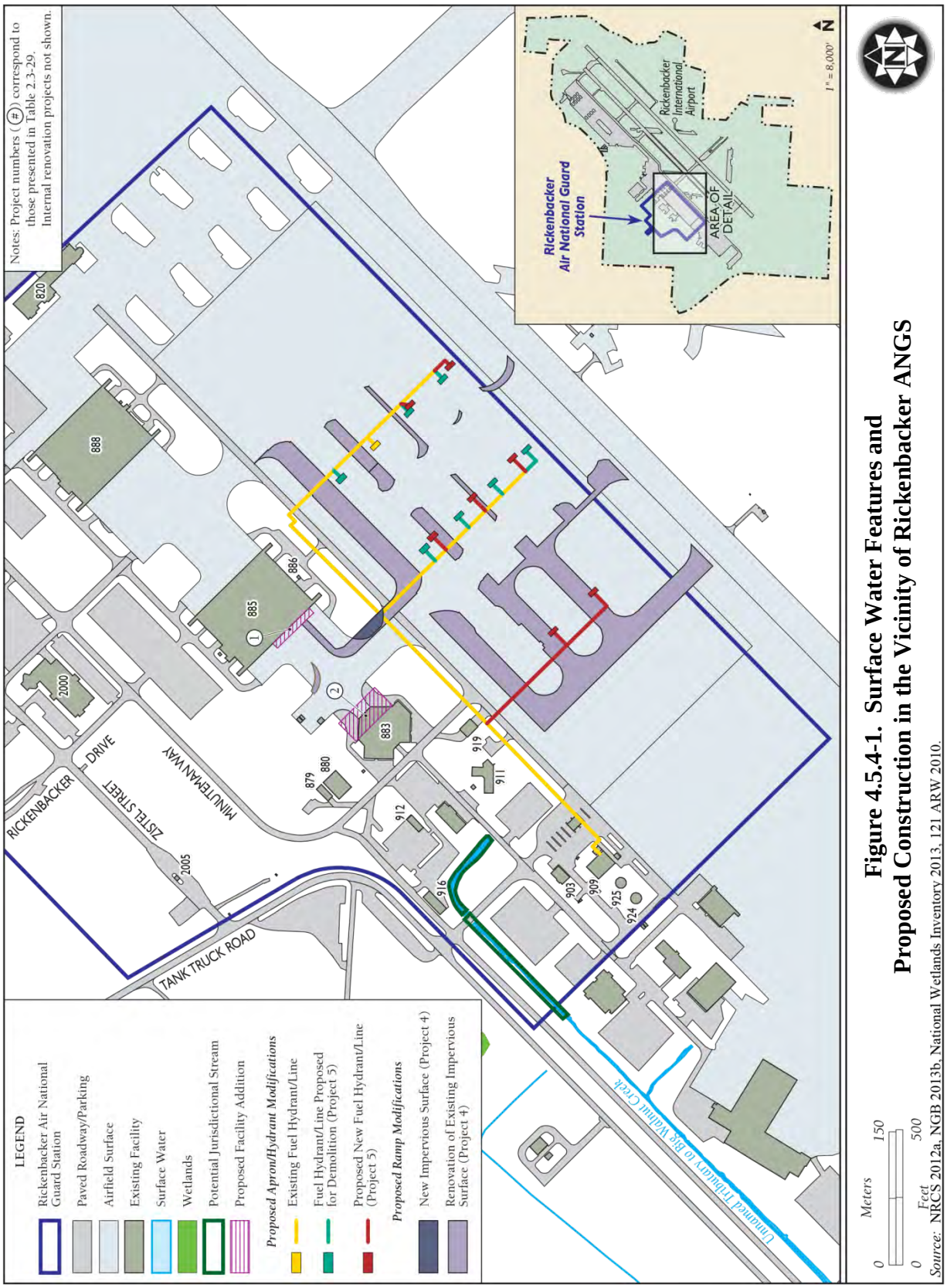


Figure 4.5.4-1. Surface Water Features and Proposed Construction in the Vicinity of Rickenbacker ANGS

Source: NRCS 2012a, NGB 2013b, National Wetlands Inventory 2013, 121 ARW 2010.

4.5.4.3 Groundwater

As a result of Alternative #5, the increase in the amount of impervious surface (0.3 acre) would also result in a decrease in groundwater recharge. However, as noted above, any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of permit-related temporary and/or permanent drainage management features such as detention/retention basins and standard construction practices as described in the 121 ARW SWPPP (121 ARW 2009). The integration of water harvesting and natural open space into project design would further minimize potential adverse impacts due to increased impervious surface. The use of these features would also increase groundwater recharge through direct percolation offsetting the loss of pervious surface due to future construction. Additionally, the impervious surface area resulting from the proposed activities would not be one continuous, hardened surface. Rather, the impervious surfaces would occupy several smaller areas, which would further minimize localized impacts to groundwater recharge.

4.5.4.4 Floodplains

Proposed construction activities at the installation would not occur within the 100-year floodplain zone. As such, there would be no impacts to floodplains under this alternative.

4.5.4.5 Summary of Impacts

There would be approximately 8.5 acres of temporary soil disturbance and 0.3 acre of new impervious surface as a result of the proposed construction. To minimize potential impacts associated with erosion, runoff, and sedimentation, standard construction practices would be implemented. Proposed construction would not impact prime farmlands; therefore the Farmland Protection Policy Act does not apply to this alternative. Therefore, impacts to soil and water resources would be negligible.

4.5.5 Biological Resources

4.5.5.1 Vegetation

Construction of new facilities associated with Alternative #5 at the 121 ARW installation would occur on currently paved areas or actively managed (i.e., mowed and landscaped) areas, and would result in an increase of 14,660 SF (0.3 acre) of impervious surfaces. No native vegetation would be impacted. Impacts to the vegetation at the installation would be negligible due to the lack of sensitive vegetation in the project area.

4.5.5.2 Wildlife

Under Alternative #5, impacts to wildlife due to construction would be minor. Noise associated with construction may also cause wildlife to temporarily avoid the area, including those that are protected under the MBTA and may cause them to temporarily leave the area. Noise associated with excavating, as well as an increase in general industrial activity and human presence, could evoke reactions in birds. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. However, bird and wildlife populations in the vicinity of the airport where project components would occur are accustomed to elevated noise associated with aircraft and general military industrial use. As a result, indirect impacts from construction such as dust and noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications.

Under Alternative #5, impacts to wildlife due to noise from proposed operations would be minor. Bird/wildlife aircraft strikes are also an inevitable hazard associated with military aircraft training. Under Alternative #5, the KC-46A would operate in the same airfield environment as the current aircraft. Annual operations for the KC-46A at Rickenbacker IAP would be projected to increase slightly by approximately 6 percent from the 2012 baseline operations (1 percent increase in total airfield operations) found in Table 2.3-27. This negligible increase in levels of operations (e.g., sorties) may result in a negligible increase in opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. Adherence to the existing, BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.5.3, *Safety*). The 121 ARW has developed procedures designed to minimize the occurrence of bird/wildlife aircraft strikes, and has documented detailed procedures to monitor and react to heightened risk of bird/wildlife aircraft strikes. When risk increases, limits are placed on low-altitude flight and some types of training (e.g., multiple approaches, closed pattern work) in the airport environment. Special briefings are provided to pilots whenever the potential exists for increased bird/wildlife aircraft strikes within the airspace.

4.5.5.3 Special Status Species

No federally threatened and endangered species are known to occur on Rickenbacker IAP, and there is only a low potential for them to occur due to lack of habitat. Therefore, there would be no effect on federally listed species. In an email dated April 7, 2014, the USFWS has concurred with this determination (see Appendix B, Section B6). Only one state listed species, the Northern Harrier, is currently known to occur on Rickenbacker IAP, and there is only low potential for others to occur due to lack of habitat. Impacts to the Northern Harrier would be similar to those

impacts described under wildlife. Indirect impacts to the Northern Harrier from construction such as dust and noise are expected to be minimal because the ambient noise levels within the vicinity are relatively high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed construction and modifications. In addition, noise from proposed operations would be minor as total airfield operations are projected to increase slightly by approximately 1 percent from baseline. This negligible increase in levels of operations (e.g., sorties) may result in a negligible increase in opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. However, adherence to the existing BASH program would minimize the risk of bird/wildlife aircraft strikes (see Section 4.5.3, *Safety*). Impacts due to construction noise and from proposed operations would be minor.

4.5.5.4 Wetlands

There are no wetland areas that occur within the vicinity of the proposed project footprints. Therefore, no impacts to wetlands would occur as a result of Alternative #5.

4.5.5.5 Summary of Impacts

Construction of new facilities associated with this alternative would occur primarily on currently paved or actively managed areas. Therefore impacts to vegetation would be negligible. There would be no impacts to wetlands. Impacts to wildlife and sensitive species from operational noise would be minor due to the 6 percent increase in 121 ARW airfield operations. This small increase in the airfield operations may also result in a slight increased opportunity for bird-aircraft strikes to occur, including those with migratory birds. Impacts to state listed species would be minor. No federally listed species or critical habitat is known to occur on Rickenbacker IAP, therefore there would be no impacts to federally listed species.

4.5.6 Cultural Resources

Potential direct impacts to cultural resources examined in this analysis include effects to archaeological sites due to ground disturbing activities during construction or modification to buildings. Indirect impacts from an increase in personnel from 1,497 to 1,694 would be negligible as personnel would primarily be confined to the developed areas on the installation, which lack cultural resources.

4.5.6.1 Archaeological Resources

There is one significant archaeological resource located at the 121 ARW at Rickenbacker IAP. This is a multi-component site that is considered eligible to the NRHP. The ground disturbing

activities associated with this alternative would not occur near the archaeological resource and therefore, there would be no impacts to the site. In the unlikely event that archaeological or human remains are identified during construction, all activities in the area of the discovery would cease and the Environmental Manager would contact a qualified archaeologist to evaluate the discovery. Under these conditions, there would be no impact to archaeological resources under Alternative #5.

4.5.6.2 Architectural Resources

Two of the hangars (885 and 888) proposed for additions, modifications, and renovations are eligible to the NRHP. The Ohio SHPO concurred with this eligibility determination (121 ARW 2011d). Hangar 885 would have an addition and renovations inside to house the new aircraft and support facilities. Because these renovations would alter the exterior appearance of a structure that is considered eligible because of its design, the construction would have an adverse effect on a historic property. Modification to Hangar 888 would all be interior; however, they could have an adverse effect to this NRHP-eligible resource. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, further consultation would be conducted to minimize and mitigate adverse effects to these buildings (see Appendix B, Section B3). The third hangar with proposed changes (additions) under this alternative is Hangar 883. This structure has not been inventoried; however, it was constructed in 2000 and is therefore less than 50 years old, is not a Cold War-era resource, and is not exceptionally significant (eligible to the NRHP under Criterion Consideration G). For these reasons, it is not eligible for listing in the NRHP. The SHPO has concurred with this determination and agrees that no adverse effects to this structure would result from the proposed action.

4.5.6.3 Traditional Resources

No traditional resources have been identified at the 121 ARW installation and the highly developed nature of the installation makes it unlikely to contain any such resources. Government-to-government consultation for this action has been conducted with each federally-recognized Tribe associated with the 121 ARW installation in recognition of their status as sovereign nations, to provide information regarding tribal concerns per Section 106 of the NRHP as well as information on traditional resources that may be present on or near the installation. Five responses have been received. The Peoria Tribe of Indians of Oklahoma has sent a response stating that according to their reviews no traditional resources exist on the 121 ARW installation (see Appendix B2 and Stacy 2013). On January 17, 2014, the Shawnee Tribe stated that they had no objection to the Proposed Action via telephone call. On January 22, 2014 the Turtle Mountain Band of Chippewa Indians of North Dakota stated that they had no objection to the Proposed Action via telephone call. On February 4, 2014, the Pokagon Band of Potawatomi

Indians stated that they had no objection to the Proposed Action via telephone call. The Delaware Nation stated via telephone on April 3, 2014 that they had no objection to the Proposed Action. Letters and written correspondence to Tribes were followed up with telephone calls and emails in an effort to increase accessibility and encourage communication in the event a Tribe would have any concerns regarding the Proposed Action or land below the affected or proposed airspace areas. Correspondence sent to the tribes and follow-up efforts are located in Appendix B2. Additional efforts were made to contact non-responsive tribes without success (see Appendix B2). While the NGB and the USAF values its relationship with all tribes and will continue to consult on other planning efforts or matters of known or potential interest to tribes, Section 106 consultation on the KC-46A MOB 2 proposed alternative at Rickenbacker ANGS is now complete.

4.5.6.4 Summary of Impacts

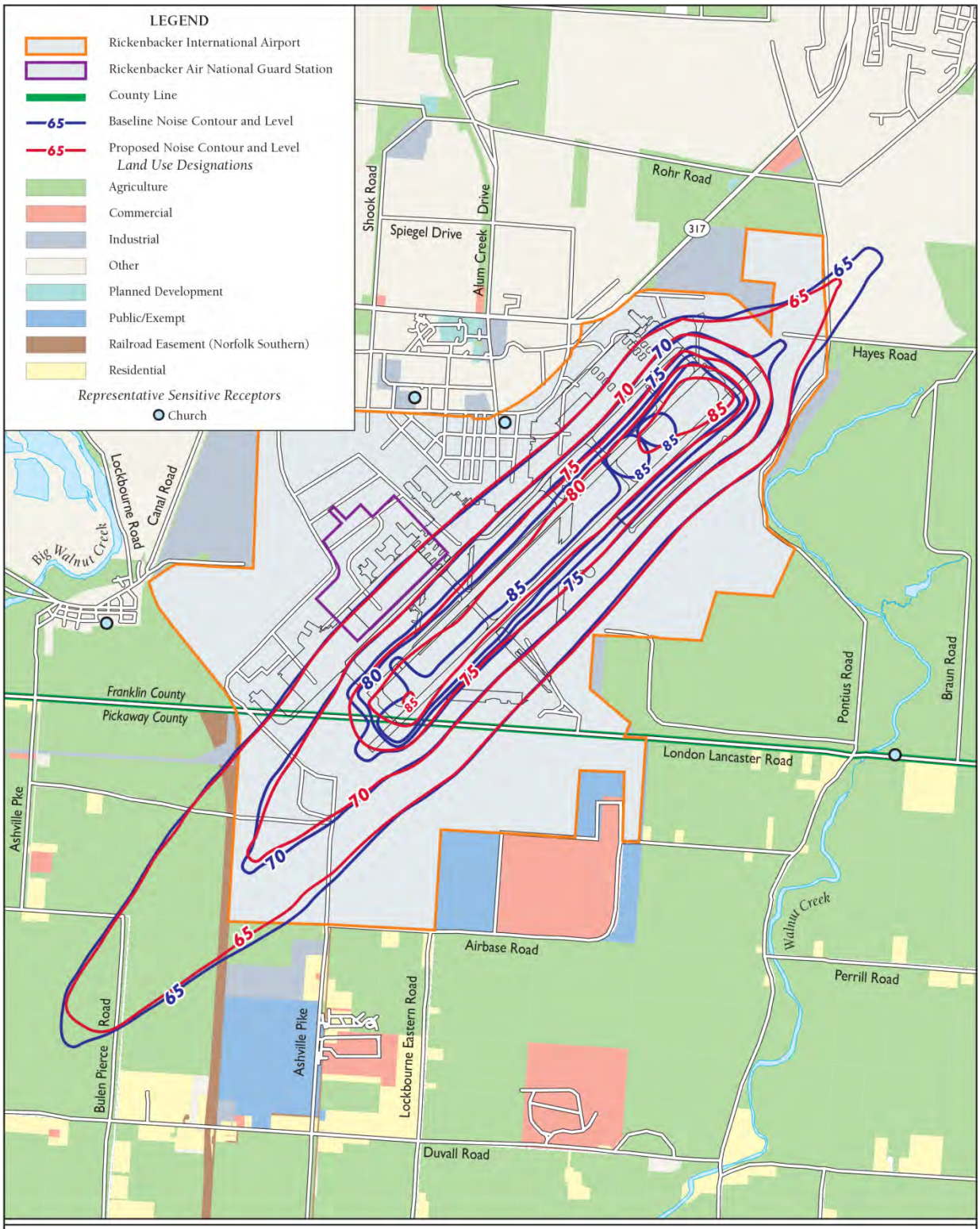
Construction activities at Rickenbacker ANGS would be limited to the developed areas of the installation, primarily in the areas of the aircraft hangars and airfield pavements, where no archaeological resources are known. Additionally, the installation has been surveyed for archaeological resources and no NRHP-eligible resources were discovered. The Ohio SHPO has concurred with the findings of the archaeological survey (Snyder 2007). One significant archaeological resource was recorded prior to the 2007 installation-wide survey. This site is not within the proposed construction areas and would not be impacted by the Proposed Action. Two NRHP-eligible hangars (883 and 885) could be adversely impacted by construction under this alternative. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46A beddown, further consultation would be conducted to minimize and mitigate adverse effects to these buildings. Therefore, with completion of Section 106 consultation, no adverse impacts are anticipated to cultural resources at the 121 ARW installation under Alternative #5.

4.5.7 Land Use

The primary source of impacts to land use resulting from Alternative #5 would be from noise. As shown in Table 4.5.7-1 and Figure 4.5.7-1, areas outside of the airport boundaries currently exposed to DNLs of 65 dB to 70 dB would decrease by 72 acres, overall. By zoning districts, Industrial areas affected by DNL of 65 dB to 70 dB would decrease by approximately 2 acres, Public and Utility areas would decrease slightly (less than 1 acre each), Agricultural areas would decrease by approximately 36 acres, and non-designated lands would decrease by approximately 33 acres. No houses, churches, schools or other sensitive noise receptors are located within the 65 dB DNL off-airport noise contour areas. A more detailed discussion of aircraft operations and noise can be found in Section 4.5.1, *Noise*. Therefore, Alternative #5 is compatible with current land use and zoning designations and would result in minor beneficial impacts.

Table 4.5.7-1. Change in Acres Affected by Noise Levels Above 65 dB DNL Outside the Rickenbacker IAP Boundary

	65 dB TO 70 dB DNL		
Land Use	*Baseline*	*Proposed*	*Change*
Industrial	5.3	3.1	-2.2
Public Exempt	0.3	0.1	-0.2
Utilities	0.8	0.3	-0.5
Agricultural	342.1	306.1	-36.0
Non-designated	68.5	35.4	-33.1
Total Area	**417**	**345**	**-72.0**



Meters 0 1,000
Feet 0 3,500

Figure 4.5.7-1. DNL Noise Contours and Land Use Under Alternative #5 at Rickenbacker IAP

Source: Pickaway County 2013, Franklin County Zoning 2013, Rickenbacker IAP 2005.

4.5.7.1 Summary of Impacts

The number of airfield operations would decrease by 6,283 (48 percent decrease) from the currently published FAR Part 150 Noise Compatibility Program, and the acreage within the 65 dB DNL (and greater) noise contour would decrease by 99 acres. There would be a decrease of 72 acres within the 65 dB DNL noise contour that are off airport-controlled property, resulting in 345 acres off airport-controlled property that lie within the 65 dB contour. Current land use and zoning designations would not change due to the basing of the KC-46A. This alternative would result in negligible impacts in off-airport areas exposed to noise levels above 65 dB DNL. Airport Hazard Areas would not be affected.

4.5.8 Infrastructure and Transportation

4.5.8.1 Potable Water

Water consumption would be expected to increase slightly under Alternative #5 as a result of the increase in personnel; however, an increase in 184 personnel on the installation would not be expected to impact regional water supply. Additionally, the demand for water (e.g., if used to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact regional water supply.

4.5.8.2 Wastewater

Wastewater generation would be expected to increase slightly as a result of the increase in 184 personnel on the installation. However, there have been no deficiencies identified with the existing system, and it is expected that the existing sanitary sewer system is generally adequate to serve the facilities proposed under this alternative.

4.5.8.3 Stormwater

Under Alternative #5, there would be an up to 368,330 SF (8.5 acres) of temporary soil disturbance as a result of proposed construction. The proposed construction activities could temporarily impact the quality of stormwater runoff (see Section 4.5.4, *Soils and Water*); however, through implementation of appropriate standard construction practices (as described previously), preventative maintenance, and periodic inspections and sampling to detect risk to stormwater, especially during active construction activity, no impacts would be expected to the existing stormwater drainage system as a result of the proposed construction.

In addition, there would be an increase in up to 14,660 SF (0.3 acre) of new impervious surface. The addition of new impervious surfaces would potentially increase stormwater runoff volume and peak discharge rates; however, as discussed in further detail in Section 4.5.4, *Soils and Water*, stormwater runoff increases would be managed such that discharge exiting each site post-construction would be equal to or less than existing conditions in accordance with UFC 3-210-10 and EISA Section 438. Implementation of these measures would ensure that impacts to the stormwater drainage system as a result of implementation of Alternative #5 would be minimal.

4.5.8.4 Electrical and Natural Gas Systems

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel, and the building space and facilities to be constructed would require additional electricity. However, any new facilities and additions associated with Alternative #5 would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities.

Construction activity associated with Alternative #5 could result in some temporary interruption of utility services during construction. These impacts would be temporary, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

4.5.8.5 Solid Waste Management

The building space and facilities to be constructed would generate construction and demolition debris requiring landfill disposal. Construction activities would result in approximately 368,330 SF of additions and alterations to existing facilities and 14,660 SF of new building construction. Using a multiplier provided by the USEPA to determine solid waste generation, it was estimated that proposed renovations at Rickenbacker IAP would generate 4,342,611 pounds (2,171 tons) of renovation debris requiring landfill disposal and proposed new construction at Rickenbacker IAP would generate 63,624 pounds (32 tons) of construction debris (USEPA 2009). Therefore, the total amount of construction and demolition debris generated at Rickenbacker IAP would be 2,203 tons.

Solid waste generated at Rickenbacker IAP as a result of the proposed construction could result in impacts to solid waste management facilities in the area. The Franklin County Landfill has a remaining life expectancy of 24 years and a permitted throughput of 1,020,659 tons per year (Solid Waste Authority of Central Ohio 2011). The 2,203 tons of proposed construction debris generated at Rickenbacker IAP would represent 0.2 percent of the yearly capacity of the landfill. Impacts to local landfills would not be expected to exceed the permitted throughput or contribute significantly to the remaining capacity.

Off-installation contractors completing construction and demolition projects at the 121 ARW installation would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled or reused, or otherwise diverted from landfills. EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, sets a target diversion rate of 50 percent for recycling and waste diversion for DoD facilities by 2015, including construction and demolition waste; compliance with EO 13514 would further minimize the increase in solid waste generation as a result of the proposed construction. All non-recyclable construction and demolition waste would be collected in a dumpster until removal. Construction and demolition waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFI 32-7042, *Waste Management* (2009).

4.5.8.6 Transportation

Construction equipment would be driven to proposed construction areas and would be kept on-site for the duration of the respective activity. Construction workers would drive daily in their personal vehicles to and from the construction site. In general, construction traffic would result in increases in the use of on-installation roadways during construction activities; however, increases would be temporary and intermittent, occurring only during active construction periods.

The number of authorized personnel on the installation would increase by 184 under Alternative #5 (see Table 2.3-30). The increase in personnel would create a potential 184 additional one-way vehicle trips to and from the installation during morning and evening peak periods for these additional personnel. Assuming that each person makes two trips per day, the implementation of Alternative #5 would add an additional 368 trips onto the existing roadway network after the construction phase is complete. However, regional roads used to access the installation as well as those located on the installation have sufficient capacity to manage this increase in traffic without substantial impacts to circulation. Therefore, impacts to transportation infrastructure would not be significant under Alternative #5.

4.5.8.7 Summary of Impacts

Impacts from this alternative would not be expected since there have been no deficiencies identified with the existing systems, and it is expected that the existing infrastructure is generally adequate to serve the facilities and increased personnel proposed under this alternative. Impacts to infrastructure resulting from construction would be negligible since any interruption of utility services or increase demand on infrastructure would be temporary and infrequent. Impacts to infrastructure would be negligible.

4.5.9 Hazardous Materials and Waste

4.5.9.1 Hazardous Materials

A HMMP has been developed for the KC-46A program. Training activities and other functions would be expected to remain similar between the KC-46A and existing KC-135 aircraft. The types of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet. However, unlike the KC-135, the KC-46A aircraft will be free of ODSs. ODSs were typically used as part of the fire suppression systems on aircraft; ODS use and/or storage would no longer be required under the Proposed Actions.

The KC-46A aircraft has been designed with a focus on reduction of hazardous materials such that hazardous materials currently required for maintenance, operations, and materials on or associated with the new aircraft would be less than or equal to the existing aircraft (Boeing 2011). In addition, it is anticipated that the amount of hazardous waste generated for one KC-46A aircraft for maintenance activities would be slightly less than that generated for one KC-135 aircraft since the KC-46A has two engines as opposed to the four engines for the KC-135. Furthermore, the KC-46A is a newer aircraft and is expected to need less maintenance than the older KC-135 aircrafts.

Under Alternative #5, the total number of flying hours for the 121 ARW would increase from 7,215 to 8,040 (an 11 percent increase); therefore, the throughput of petroleum substances (e.g., fuels, oils) used during operations would be expected to increase commensurately from what is currently used to maintain the KC-135 fleet (see Appendix A, Section A.9, for more details). Additionally, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities, because various fuels (e.g., diesel, gasoline) would be required to run earth moving equipment and power tools and to provide electricity and lighting as conditions warrant. Procedures for hazardous material management established for the 121

ARW installation would continue to be followed in future operations associated with Alternative #5 and as required during all construction and renovation activities.

Toxic Substances

Under Alternative #5, additions to Hangars 885 and 883 are proposed, and internal renovations to Hangar 888 are proposed. Lead abatement was conducted in 2004 at Buildings 885 and 888. According to the 1995 asbestos report, Hangars 885 and 883 were found to contain no ACM. Building 883 was built in the year 2000 and therefore it is assumed that it does not contain any LBP or ACM. Any structures proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. All ACM would be properly removed and disposed of prior to or during demolition in accordance with 40 CFR 61.40 through 157. All LBP would be managed and disposed of in accordance with TSCA, OSHA regulations, Ohio requirements (regarding site work practices for buildings with LBP), and established ANG procedures. Materials, especially discarded oil products, would be screened for PCB contamination prior to disposal.

4.5.9.2 Hazardous Waste Management

The type of hazardous waste streams generated by KC-46A operations would be expected to remain similar to those being generated by the existing KC-135 aircraft with the exception of ODSs, which would not be required with the KC-46A. Additionally, the two aircraft require the same types of hazardous materials for their maintenance and operations (e.g., fuels, oils). Under Alternative #5, the total number of flying hours would increase approximately 11 percent; therefore, hazardous waste streams would be expected to increase commensurately (see Appendix A, Section A.9, for more details). Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations.

4.5.9.3 Environmental Restoration Program

In accordance with AFI 32-7020, *The Environmental Restoration Program*, construction, modifications and/or additions to existing buildings can occur on or in proximity to existing ERP sites. Accordingly, the appropriate organizations (e.g., installation planners, ERP managers, design engineers) must consider a compatible land use based on current site conditions and the selected or projected remedial action alternatives. Construction should be sited and designed to minimize life-cycle costs to include those associated with impacts from existing contaminated sites. If the potential for uncharacterized ERP sites exist, the installation is responsible for

identifying existing contamination at the proposed construction sites to avoid unknowingly locating construction projects in areas with contamination. The installation is responsible for performing necessary environmental baseline surveys, accomplishing environmental impact analysis process requirements, and for otherwise informing itself about existing site conditions and their associated cost impacts in preparation for a construction project. When warranted by the site history, environmental restoration funds may be used to accomplish RCRA facility assessments, or preliminary assessments and site inspections undertaken in accordance with the CERCLA process, or similar site investigations in accordance with applicable state laws for suspected releases. To the extent that a construction project generates actions to address contamination, or a need to change the timing of ERP-generated actions to address contamination, the costs of such actions are not Environmental Restoration Account-eligible and shall be funded as part of the construction project. This includes the handling, mitigation, and disposal or other disposition of contamination discovered before or during the construction activity.

The removal and disposal of contamination unexpectedly encountered within the construction project footprint during the execution of a construction project will be undertaken as part of the construction project using construction project funds which may include other MILCON funds reprogrammed to a MILCON construction project. Construction contractor costs (such as direct delay costs and unabsorbed or extended overhead) incidental to discovery and removal of the contamination will be construction project funded to the extent that the government is responsible and liable for such costs.

Vapor intrusion should be evaluated when volatile chemicals are present in soil, soil gas, or groundwater that underlies existing structures or has the potential to underlie future buildings and there may be a complete human exposure pathway. Due to their physical properties, volatile chemicals can migrate through unsaturated soil and into the indoor air of buildings located near zones of subsurface contamination.

One ERP site, Site #46, overlaps with the proposed fuel line under Alternative #5 (Figure 4.5.9-1). This site, which is closed, was investigated as part of a jet fuel pipeline investigation. Petroleum contamination levels for this site were found to be below Bureau of Underground Storage Tank Regulation limits; therefore, it is not expected to pose a vapor intrusion concern. However, it is recommended that a vapor intrusion analysis/testing is completed prior to construction to investigate any potential concern. If testing indicates a vapor intrusion concern, the installation would implement practices in accordance with site-specific vapor mitigation design considerations.

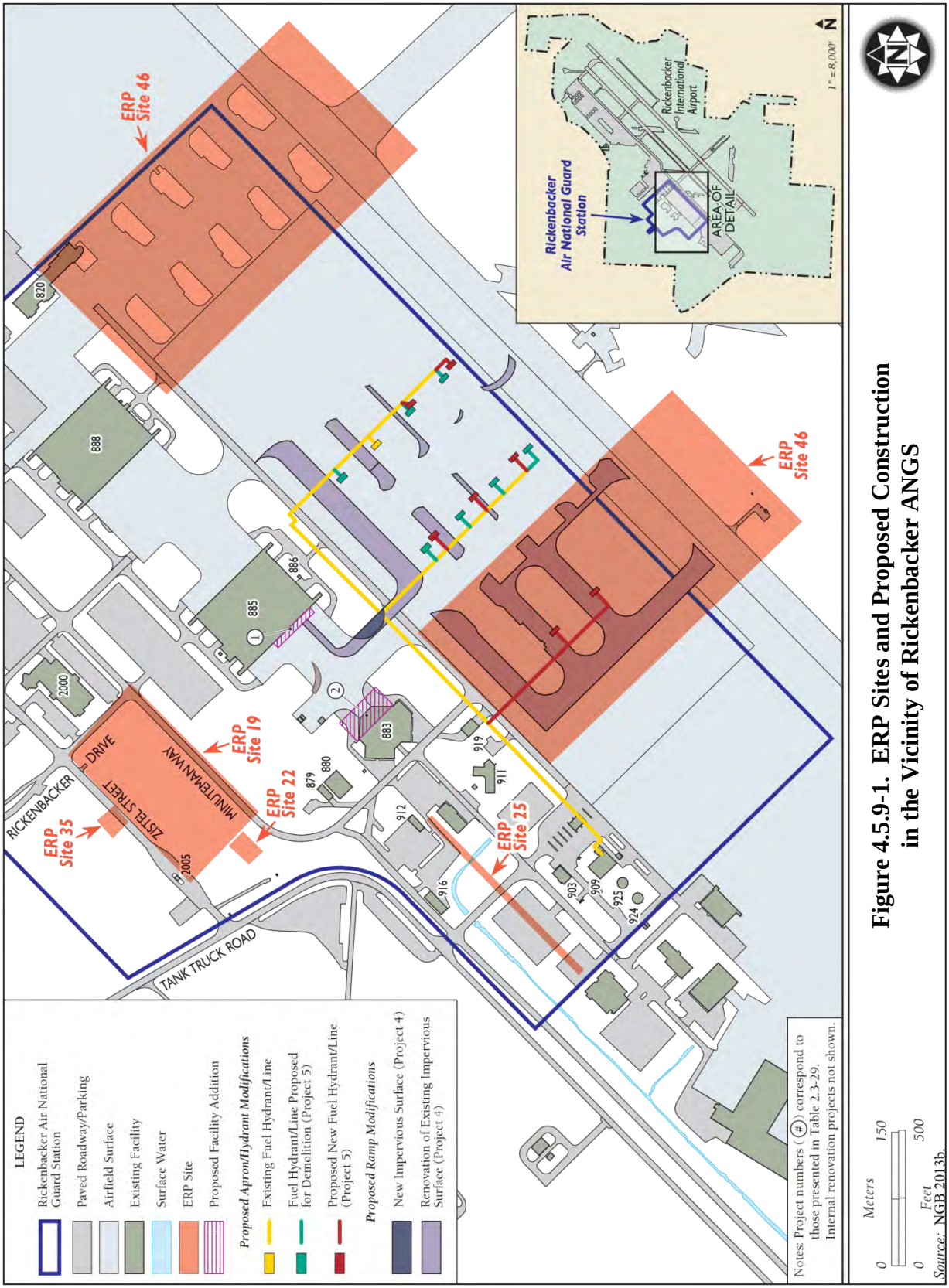


Figure 4.5.9-1. ERP Sites and Proposed Construction in the Vicinity of Rickenbacker ANGS

If contaminated media (e.g., soil, vapor, groundwater) are encountered during the course of site preparation (e.g., clearing, grading) or site development (e.g., excavation for installation of building footers) for proposed construction activities, work would cease until 121 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met, and to arrange for agency consultation as necessary if existing ERP sites are affected. Also, prior to construction activities, the construction contractors would be notified of the nature and extent of known contamination so that they can inform their employees in advance of on-site activities and take appropriate precautions to protect health and safety, and to prevent the spread of contamination. The construction contractors would be responsible for ensuring their workers follow appropriate health and safety requirements.

4.5.9.4 Summary of Impacts

There would not be an increased risk of hazardous waste releases or exposure under this alternative. Any LBP or ACM that may be found in buildings that are scheduled for construction activities would be managed per applicable USAF regulations. There would be no expected impact from ERP sites. However, if contaminated media are encountered during the course of site preparation or site development, work would cease until 121 ARW Program Managers establish an appropriate course of action for the construction project to ensure that federal and state agency notification requirements are met. Impacts relative to hazardous materials and wastes would be negligible.

4.5.10 Socioeconomics

Under Alternative #5, construction activities would be contained entirely within the boundaries of Rickenbacker IAP. Economic activity associated with proposed construction activities at the 121 ARW installation, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased would be negligible on a regional scale.

The proposed aircraft beddown and related activities would result in a change in staffing requirements for the 121 ARW. Currently, the 121 ARW is authorized 1,497 personnel. Under Alternative #5, the KC-46A mission would add an additional 197 military positions (increase in 212 full-time positions and reduction of 15 traditional Guard positions) (see Table 2.3-30). Combined with their approximately 268 family members, this would represent less than 0.04 percent of Franklin County population and 0.8 percent of Pickaway County population. Of the 268 family members, approximately 112 would be anticipated to be of school age. The students entering the local schools would be expected to be enrolled in various grades and live in different

areas within Pickaway and Franklin counties. It is anticipated that there is enough capacity within the schools in these counties to absorb this minimal increase in school age children.

A net increase in 197 military personnel positions would amount to an increase of approximately 13.2 percent to the existing 121 ARW personnel. Total payroll associated with the 212 proposed full-time personnel would amount to an estimated total annual salary increase of approximately $16.5 million.

All 121 ARW personnel live off-installation as there is no on-installation housing. A conservative scenario would result in 197 homes purchased at the same time as personnel relocate to the area. This would represent less than 0.04 percent of the total housing units in the Franklin County and less than 0.9 percent of Pickaway County. However, not all the military personnel who would relocate would own homes and personnel would most likely be distributed between the two counties.

4.5.10.1 Summary of Impacts

Impacts to socioeconomics resulting from construction would be beneficial and negligible resulting from construction payrolls and materials purchased. In addition, impacts from proposed operations would be beneficial and minor due to the proposed increase in personnel.

4.5.11 Environmental Justice and the Protection of Children

4.5.11.1 Minority and Low-Income Populations

Under Alternative #5, there would be no residential populations, including no minority or low-income populations, located within the vicinity of Rickenbacker IAP exposed to aircraft DNL of 65 dB or above. Therefore, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Rickenbacker IAP.

4.5.11.2 Protection of Children

There are no facilities on the installation where children may be encountered on a regular basis. Currently there no schools that are exposed to DNL of 65 dB or above. Under Alternative #5 there would be no schools exposed to DNL of 65 dB or above. Therefore, under Alternative #5 there would be no special health or safety risks to children.

4.5.11.3 Summary of Impacts

Given that the acreage within the 65 dB DNL noise contour would be reduced, there would be no residential populations, including no minority or low-income populations, and no additional

schools located within the vicinity Rickenbacker IAP exposed to DNL of 65 dB or above; thus, there would be no disproportionate impacts to minority or low-income populations in the vicinity of Rickenbacker IAP. In addition, there would be no special health or safety risks to children.

4.6 NO ACTION ALTERNATIVE

The CEQ regulation 40 CFR § 1502.14(d) specifically requires analysis of the "No Action" alternative in all NEPA documents. Under the No Action Alternative, the proposed aircraft beddown would not occur, and the NGB would not implement the components described under any of the five Action Alternatives analyzed in the previous sections. There would be no change in based aircraft, use of the airfield or Special Use Airspace (SUA), or personnel assigned to the KC-135 aircraft squadrons and the proposed construction would not be required. Under the No Action Alternative, the NGB would continue to conduct their current mission using the existing KC-135 aircraft with multiple configurations and crews that are not trained to accomplish every mission. This lack of standardized equipment and training throughout the fleet would continue to negatively impact the ability for aircrews to support, on a large scale, multi-role missions or exploit new tactics and procedures. The continued use of the KC-135 aircraft would not meet the identified needs of the NGB or the USAF; however, this alternative is carried forward for analysis in this EIS per CEQ regulations. Impacts at each of the alternative installations as a result of the No Action Alternative are described below.

Under the No Action Alternative there would be no change in based aircraft authorized at any of the alternative installations; use of the respective airfield; construction, or assigned personnel.

- The 190 ARW would continue to fly the air refueling mission with a PAA of 12 KC-135 aircraft and 1,242 personnel.
- The 108 WG would continue to fly the air refueling mission with a PAA of 8 KC-135 aircraft and 1 BAI and 1,329 personnel.
- The 157 ARW would continue to fly the air refueling mission with a PAA of 8 KC-135 aircraft and 1 BAI and 1,382 personnel.
- The 171 ARW would continue to fly the air refueling mission with a PAA of 16 KC-135 aircraft and 1,306 personnel.
- The 121 ARW would continue to fly the air refueling mission with a PAA of 18 KC-135 aircraft and 1,497 personnel, until the 2013 NDAA is fully implemented. At that time, the 121 ARW will have a reduction of 6 KC-135 aircraft, resulting in a PAA of 12 KC-135. There would be a commensurate reduction in personnel assigned to the 121 ARW as a result of implementation of the NDAA (see Section 5.5).

4.6.1 Noise

Noise at each alternative airfield would remain as described in the baseline Noise section for each alternative location (Sections 3.1.1, 3.2.1, 3.3.1, 3.4.1, and 3.5.1). Each of the five

installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as described in Chapter 3. The noise environment at each of the five alternative airfields would continue to be managed through their existing AICUZ or FAR Part 150 airfield compatibility programs. Under each alternative described in the Noise sections in Chapter 4, there were varying changes in the extent of the 65 dB DNL noise contours; some of the alternatives had imperceptible positive changes (Forbes ANGS, Pittsburgh ANGS, Rickenbacker ANGS), and some had larger adverse changes (JB MDL, Pease ANGS). There would be no additional Noise impacts at any of the alternative installations under the No Action Alternative.

4.6.2 Air Quality

Air Quality at each alternative airfield would remain as described in the baseline Air Quality section for each alternative location (Sections 3.1.2, 3.2.2, 3.3.3, 3.4.2, and 3.5.2) under the No Action Alternative. Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as described in Chapter 3. Emissions at each of the alternative installations would continue to be in compliance with their respective SIPs. There would be no additional impacts to Air Quality at each alternative installation under the No Action Alternative.

4.6.3 Safety

Both ground and flight safety at each alternative airfield would remain as described in the baseline Safety section for each alternative location (Sections 3.1.3, 3.2.3, 3.3.3, 3.4.3, and 3.5.3). Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as described in Chapter 3. Under each alternative described in Chapter 4, there was a range in the increase of annual airfield operations, with Rickenbacker ANGS increasing by 412 annual operations up to JB MDL, which would increase by 9,268 annual operations. Under the No Action Alternative, this increase in annual airfield operations would not occur at any of the alternative installations. All aspects of both ground and flight safety would be expected to remain as described in Chapter 3. There would be no additional impacts to Safety under the No Action Alternative.

4.6.4 Soils and Water

Both Soils and Water Resources at each alternative airfield would remain as described in the baseline Soils and Water section for each alternative location (Sections 3.1.4, 3.2.4, 3.3.4, 3.4.4, and 3.5.4). Under the alternatives, surface disturbance at the alternative installations ranged

from 3.0 to 8.5 acres (Pease ANGS and Rickenbacker ANGS, respectively); and new impervious surface ranged from 0 to 2.4 acres (Pease ANGS and JB MDL, respectively). Under the No Action Alternative, none of this proposed construction would occur at any of the alternative installations, although other non-related construction activities would occur to provide the necessary facilities for the on-going mission. There would be no additional impacts to Soils and Water Resources as a result of the No Action Alternative.

4.6.5 Biological Resources

Biological Resources would remain as described in the baseline Biological Resources section for each alternative location (Sections 3.1.5, 3.2.5, 3.3.5, 3.4.5, and 3.5.5). Under the alternatives, new impervious surface ranged from 0 to 2.4 acres (Pease ANGS and JB MDL, respectively); and there was a proposed increase in annual airfield operations, with Rickenbacker ANGS increasing by 412 annual operations up to JB MDL, which would increase by 9,268 annual operations. Under the No Action Alternative, there would be no increase in annual airfield operations at any of the installations, and none of this proposed construction would occur at any of the alternative installations, although other non-related construction activities would occur to provide the necessary facilities for the on-going mission. There would be no additional impacts to Biological Resources as a result of the No Action Alternative.

4.6.6 Cultural Resources

Under the No Action Alternative, Cultural Resources at each alternative installation would remain as described in the baseline Cultural Resources section for each alternative location (Sections 3.1.6, 3.2.6, 3.3.6, 3.4.6, and 3.5.6). None of the proposed facility construction/renovations would occur at any of the installations, and thus, there would be no potential impacts to facilities that are eligible for listing on the NRHP. There would be no surface disturbance from construction activities, and thus no potential to impact unknown archaeological resources. There would be no additional impacts to Cultural Resources as a result of the No Action Alternative.

4.6.7 Land Use

Land Use at each alternative airfield would remain as described in the baseline Land Use section for each alternative location (Sections 3.1.7, 3.2.7, 3.3.7, 3.4.7, and 3.5.7). Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as described in Chapter 3. Under each alternative described in the Land Use sections in Chapter 4, there were varying changes in the areal extent of the 65 dB DNL noise contours; some of the alternatives had imperceptible positive changes (Forbes ANGS, Pittsburgh ANGS, Rickenbacker ANGS), and

some had larger adverse changes (JB MDL, Pease ANGS), but land use within the 65 dB DNL and greater noise contours was generally considered to be compatible at all locations. There would be no additional impacts to Land Use under the No Action Alternative at any of the alternative locations.

4.6.8 Infrastructure and Transportation

Under the No Action Alternative, Infrastructure and Transportation at each alternative installation would remain as described in the baseline section for each alternative location (Sections 3.1.8, 3.2.8, 3.3.8, 3.4.8, and 3.5.8). Under the various action alternatives, there would be a range of increases in additional based personnel between 23 and 255 (Pittsburgh ANGS and JB MDL, respectively). Under the No Action Alternative, there would be no change to the based personnel at any of the alternative locations. There would be no increase in use of various utilities or roadway systems under this alternative. There would be no additional impacts to Infrastructure and Transportation under the No Action Alternative.

4.6.9 Hazardous Materials and Wastes

Under the No Action Alternative, Hazardous Materials and Wastes at each alternative installation would remain as described in the baseline section for each alternative location (Sections 3.1.9, 3.2.9, 3.3.9, 3.4.9 and 3.5.9). Each of the five installations would retain the KC-135 aircraft and would continue to fly the aircraft in the same manner and with approximately the same number of airfield operations as described in Chapter 3. Under the No Action Alternative, the throughput and management of hazardous materials and wastes would not change from baseline conditions. The benefit of eliminating ODS with the KC-46A would not be realized. There would be no additional impacts to Hazardous Materials and Wastes under the No Action Alternative.

4.6.10 Socioeconomics

Under the No Action alternative, Socioeconomics at each alternative installation would remain as described in the baseline section for each alternative location (Sections 3.1.10, 3.2.10, 3.3.10, 3.4.10, and 3.5.10). Under the various action alternatives, there would be a range of increases in additional stationed personnel between 23 and 255 (Pittsburgh ANGS and JB MDL, respectively). Under the No Action Alternative, there would be no change to the based personnel at any of the alternatives. Further, under the No Action Alternative, none of the proposed construction activities would occur, and thus the minor economic benefit of additional based personnel and construction activity would not occur at any of the alternative installations. There would be no additional impacts to Socioeconomics under the No Action Alternative.

4.6.11 Environmental Justice and the Protection of Children

Under the No Action Alternative, Environmental Justice and the Protection of Children at each alternative installation would remain as described in the baseline section for each alternative location (Sections 3.1.11, 3.2.11, 3.3.11, 3.4.11, and 3.5.11). There were no disproportionate impacts to low-income, minority, or children identified under any of the action alternatives. There would be no additional impacts as a result of the No Action Alternative.

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CHAPTER 5 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the ROI. Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

5.1 ALTERNATIVE #1 -- FORBES AIR NATIONAL GUARD STATION CUMULATIVE EFFECTS

5.1.1 Past, Present, and Reasonably Foreseeable Actions

Forbes Field Airport is an active, dynamic airfield where operational changes and facility upgrades occur on a frequent basis. Projects that have been identified in the ROI that have the potential to act in a cumulative manner with Alternative #1 are discussed in this section. The ROI for cumulative impacts is generally limited to Forbes Field Airport, and the immediately adjacent property because physical impacts related to the proposal are largely confined to these properties. Planning efforts in the ROI include the actions described within this EIS, as well as those other projects that are ongoing, or planned over the short term. Additional projects within the ROI are discussed below in Table 5.1.1-1.

Table 5.1.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Forbes ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
190 ARW Projects		
KC-46A MOB 1 Basing would add 977 airfield operations per year to Forbes Field Airport	N/A	FY 2015
Forbes Field Airport Runway 03-21: Mill and overlay existing concrete with 4 inches of asphalt. Add medium intensive lighting.	N/A	FY 2013 – FY 2014
Building 770: Consolidate vehicle maintenance/AGE	2,000	FY 2014
Building 665: Repair roof	N/A	FY 2014
Secondary Entry Control: Add new control point at main entry	80,000	FY 2015
Parking ramp: replace parking ramp at the full depth	850,000	FY 2016
Building 550 Repair roof, add 78 photovoltaic panels	N/A	FY 2017
Building 200: Repair roof, add photovoltaic panels	80,000	FY 2018
Repair Building 668	N/A	FY 2018

Notes: SF = square feet; 190 ARW = 190th Air Refueling Wing; MOB 1 = Main Operating Base 1; FY = Fiscal Year; AGE = aerospace ground equipment

5.1.2 Cumulative Impacts

5.1.2.1 Noise

Under Alternative #1, the number of acres contained within the 65 dB DNL and greater exposure area would decrease by approximately 41 acres. There are no residential areas that underlie the noise contours under this alternative. While there are other projects listed in Table 5.1.1-1 that have the ability to add noise to the environment at Forbes Field Airport, most of these, with the exception of the potential MOB 1 KC-46A use of the airfield, are short-term construction projects that would occur in what is otherwise an industrial setting. Noise associated with the additional 977 MOB 1 annual operations would not be expected to change the noise contours to the extent that additional sensitive receptors would be impacted, or that would result in land use incompatibilities. Noise from implementation of these actions would be short term and localized to the airport environs, and would not be expected to increase the overall DNL noise contours. Cumulative impacts to the noise environment at Forbes Field Airport would be minimal.

5.1.2.2 Air Quality

The net annual emissions increases from the proposed KC-46A beddown as well as the other projects described in Table 5.1.1-1 at Forbes Field Airport (including both construction and airfield operations) would be below the CAA PSD major source thresholds as set forth in the CAA for all pollutants. Implementation of the proposed KC-46A beddown at Forbes Field Airport would contribute to less than adverse (or less than significant) cumulative impacts to air quality.

The potential effects of GHG emissions from the Proposed Action are by nature global. Substantial temperature increases attributable to global climate change could result in a variety of impacts to the people, economy, and environment. These impacts include potential impacts to ecosystems, wildlife and agriculture, increases in the incidence of wildfires, changes in precipitation levels, and rising sea levels. The impacts of global climate change would not be expected to have a substantial impact on Forbes ANGS beyond regional impacts to the area in general.

Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

5.1.2.3 Safety

Providing new and renovated facilities for the 190 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 190 ARW. AT/FP requirements have also been addressed to the extent practicable in all facility construction projects. The fire and crash response capability currently provided by the 190 ARW at Forbes Field Airport is sufficient to meet all requirements. Risk of a catastrophic event occurring during construction activities described under Alternative #1 or those activities described in Table 5.1.1-1 is considered to be low, and strict adherence to all applicable occupational safety requirements would further minimize the relatively low risk associated with described construction activities. Cumulative impacts to ground or flight safety would be negligible at the airfield. Construction and repair projects identified in Table 5.1.1-1 would be beneficial to safety with pavement repairs and AT/FP enhancements.

5.1.2.4 Soils and Water

Soils

In addition to the 258,149 SF (5.9 acres) of surface disturbance that would result from the implementation of Alternative #1, additional surface area would also be disturbed in the vicinity as a result of the projects described in Table 5.1.1-1 over the next 5 years.

The Clean Water Act (CWA) considers stormwater from a construction site as a point source of pollution regulated by the NPDES permit. Therefore, those projects described in Table 5.1.1-1 larger than 1 acre would be required to have a site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls in an effort to reduce the impacts to the local watershed; this is an effective way of controlling erosion while soil is exposed and subject to construction activity. Implementation of standard construction practices would be used to limit or eliminate soil movement, stabilize erosion, and control sedimentation. These standard construction practices would include the use of: velocity dissipation devices; well-maintained silt fences; minimizing surficial area disturbed; stabilization of cut/fill slopes; minimization of earth-moving activities during wet weather; and use of temporary detention ponds. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to minimize future erosion potential. Given the use of engineering practices that would minimize potential erosion, cumulative impacts to earth resources would be expected to be minor.

The Farmland Protection Policy Act is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Provided that the projects in Table 5.1.1-1 are all within federal lands, each project would be subject to Farmland Protection Policy Act compliance. Should any of these projects have the potential to convert farmland to non-farm use, a land evaluation and site assessment would be conducted and alternative sites considered should potential adverse impacts to farmland exceed the recommended allowable level.

Water

There would be no increase in impervious surfaces as a result of implementation of Alternative #1. It is expected that any construction activities would adhere to NPDES requirements including implementation of standard construction practices described above. As such, cumulative impacts to surface water and groundwater would be expected to be minor.

5.1.2.5 Biological Resources

DNL noise contours from operations would be expected to decrease by 41 acres from baseline with the conversion to the KC-46A aircraft. Noise levels from construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with current aircraft and military operations. Annual operations for the KC-46A at Forbes Field Airport would be projected to increase by approximately 39 percent from baseline operations (17 percent increase in total airfield operations). An increase in levels of operations (e.g., sorties) may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No special status species are currently known to reside on Forbes Field Airport and there is only a low potential for them to occur within the vicinity due to the lack of habitat. There would be no construction-related impacts to the vegetation at the installation and in the vicinity of projects identified in Table 5.1.1-1. There are no wetland areas that occur within the vicinity of the project footprints. In general, construction activities at the 190 ARW installation and at Forbes Field Airport would primarily occur on sites that are already highly altered by man. These impacts would include the removal of some vegetation and associated wildlife habitat. However, wildlife that uses these areas is typical of urban and suburban areas. Therefore, cumulative impacts to biological resources would be minor.

5.1.2.6 Cultural Resources

The installation is considered to have no to low probability of containing archaeological resources. In the unlikely event that archaeological or human remains were identified during

proposed construction activities associated with Alternative #1 or any of the projects listed in Table 5.1.1-1, activities would immediately cease in the area of the discovery and appropriate personnel would contact a qualified archaeologist to evaluate the discovery. Under Alternative #1, only one of the buildings proposed for modification (Building 679) is eligible for listing in the NRHP. However, extensive renovations have occurred to this building that were mitigated through a Memorandum of Agreement signed in 2009. The current interior modifications would not affect this previous agreement. Additionally, the Kansas SHPO has concurred that there would be no historic properties affected with implementation of Alternative #1 (Zollner 2013). Therefore, there would be no adverse effect to a historic property. No traditional cultural resources have been identified on the installation. None of the facilities listed for renovation and/or modification listed in Table 5.1.1-1 are eligible for listing in the NRHP. Therefore, no cumulative impacts to cultural resources are anticipated.

5.1.2.7 Land Use

Under Alternative #1, acreage off airport property contained within the 65 dB DNL and greater noise contours would decrease by approximately 41 acres resulting in beneficial impacts. In general, land uses surrounding Forbes Field Airport would not be adversely affected by the activities described under Alternative #1 in concert with those described in Table 5.1.1-1. The location and function of proposed structures within the Forbes ANGS are compatible with the surrounding area. Although future development at Forbes Field Airport and adjacent areas is anticipated, development would be subject to planning and land use requirements, including those associated with the airport, counties, cities and other municipalities. Project-specific studies would be performed to determine and address any projects that would result in land use conflicts, such as encroachment airfield safety zones. If the rehabilitation of the runway in 2014 is approved, all based aircraft would need to be relocated to a different airfield during construction. Additionally, if the USAF MOB 1 bases the KC 46 at McConnell AFB, Forbes Field Airport would be used as an auxiliary field, adding an additional 977 operations per year. Cumulative impacts to land use as a result of the described activities, including impacts from noise and air quality, would be expected to be negligible.

5.1.2.8 Infrastructure and Transportation

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel under Alternative #1. Further, building space and facilities to be constructed as a component of this action as well as those identified in Table 5.1.1-1 may require additional electricity. In addition, wastewater, solid waste, demand for potable water, and traffic would temporarily increase during construction, and would increase slightly in the long-term due to increase in personnel. The proposed construction and demolition activities could temporarily

affect the quality of stormwater runoff through potential increases in soil erosion. Standard construction practices would be implemented during construction and demolition to minimize runoff. Any new facilities and additions associated with these projects would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. In general, cumulative impacts to installation infrastructure as a result of described activities would be expected to be positive over the long-term.

5.1.2.9 Hazardous Materials and Waste

The type of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet, with the exception of ODSs. Under Alternative #1, the total number of flying hours for the 190 ARW would increase approximately 65 percent; therefore, throughput of petroleum substances and hazardous waste streams would be expected to increase commensurately. Furthermore, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities for this action as well as those listed in Table 5.1.1-1. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations. In addition, any structures listed in Table 5.1.1-1 proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. Cumulative impacts as a result of the described activities are expected to be minor.

5.1.2.10 Socioeconomics

Economic activity associated with proposed construction activities described as a component of this alternative and those shown in Table 5.1.1-1, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. Additionally, there would be a permanent increase in 194 military positions. However, short-term cumulative beneficial impacts resulting from construction payrolls and materials purchased as a result of implementation of Alternative #1 and those projects listed in Table 5.1.1-1 would be negligible on a regional scale.

5.1.2.11 Environmental Justice and the Protection of Children

Under Alternative #1, in concert with those projects listed in Table 5.1.1-1, there would be no residential populations, including no minority or low-income populations, located within the projected 65 dB DNL noise contour in the vicinity of Forbes Field Airport. There are no other projects listed in Table 5.1.1-1 that would be expected to impact environmental justice communities. Therefore, there would be no cumulative impacts to the health or safety of children.

5.2 ALTERNATIVE #2 -- JOINT BASE MCGUIRE-DIX-LAKEHURST CUMULATIVE EFFECTS

Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the ROI. Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

5.2.1 Past, Present, and Reasonably Foreseeable Actions

McGuire Field is an active, dynamic airfield where operational changes and facility upgrades occur on a frequent basis. Projects that have been identified in the ROI that have the potential to act in a cumulative manner with Alternative #2 are discussed in this section. The ROI for cumulative impacts is generally limited to McGuire Field, and the immediately adjacent property because physical impacts related to the proposal are largely confined to these properties. Planning efforts in the ROI include the actions described within this EIS, as well as those other projects that are ongoing, or planned over the short term. Additional projects within the ROI are discussed below in Table 5.2.1-1.

Table 5.2.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for JB MDL

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
108 WG Projects		
Demolition of Building 3326	940	FY 2015 – FY 2017
Addition to Building 3325	3,000	FY 2015 – FY 2017
JB MDL Projects		
Various airfield repairs - Repair airfield shoulders, Assault Landing Zone Runway shoulders, main ramp taxiway, repair concrete apron and Alpha ramp, replace Taxiway A, B, C, D, and L edge lights, repair Runway 15/33, Repair Transportation Working Capital Fund apron.	Currently unknown	FY 2013
Construct Munitions Storage Area	Currently unknown	FY 2014 – FY 2018
Construct Physical Fitness Facility	Currently unknown	FY 2014 – FY 2018
Construct Fire Station	Currently unknown	FY 2014 – FY 2018
Construct Global Reach Development Complex	Currently unknown	FY 2014 – FY 2018
Construct Education and Professional Development Center	Currently unknown	FY 2014 – FY 2018

Table 5.2.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for JB MDL

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
Construct Unified Security Forces Operations Facility	Currently unknown	FY 2014 – FY 2018
Addition to Combat Communications Admin Facility, Building 3514	Currently unknown	FY 2014 – FY 2018
Construct Army Aviation Support Facility	Currently unknown	FY 2014 – FY 2018
Construct Aviation Readiness Center	Currently unknown	FY 2014 – FY 2018
Construct Communications-Electronics Research, Development, and Engineering Center	Currently unknown	FY 2014 – FY 2018
Other Projects		
Hurricane Sandy U.S. Army Corps of Engineers disaster relief projects to repair, restore, and fortify the coastline. Four projects exceed NO_x trigger level of 100 TPY.	N/A	FY 2014 – FY 2016

Notes: SF = square foot; 108 WG = 108th Wing; FY = Fiscal Year; JB MDL = Joint Base McGuire-Dix-Lakehurst; N/A = Not Applicable; TPY = tons per year

5.2.2 Cumulative Impacts

5.2.2.1 Noise

Under Alternative #2, the number of acres contained within the 65 dB DNL and greater exposure area would increase by approximately 1,831 acres. Of the acreage exposed to 65 dB DNL or greater, approximately 751 would be off-airport property. While there are other projects listed in Table 5.2.1-1 that have the ability to add noise to the environment at JB MDL, most of these are short-term construction projects that would occur in what is otherwise an industrial setting. Noise from implementation of these actions would be short-term and localized to the airport environs, and would not be expected to increase the overall DNL noise contours. Cumulative impacts to the noise environment at JB MDL would be minimal.

5.2.2.2 Air Quality

The net annual emissions increases from the proposed KC-46A beddown as well as those other projects described in Table 5.2.1-1 at JB MDL (including both construction and airfield operations) would be below the CAA PSD major source thresholds and/or the General Conformity Rule *de minimis* thresholds as set forth in the CAA for all pollutants except NO_x. JB MDL and the USACE have entered into a Memorandum of Agreement that would allow temporary use of a portion of the NO_x SIP emissions budget for calendar years 2014 through 2016 to allow the USACE to proceed with construction projects to repair, restore, and fortify the coastline in the state of New Jersey in response to damage during Hurricane Sandy (JB MDL and USACE 2013). The USACE projects will be completed prior to implementation of Alternative

#2 at JB MDL, should that alternative be selected for the KC-46A MOB 2 beddown; therefore, the temporary use of NO_x emissions within the SIP would be complete by the time the emissions associated with Alternative #2 would occur, which would be scheduled to commence in 2018.

A Conformity Determination as required under the General Conformity Rule would ensure that the selected action would conform to the requirements of the applicable SIP and would not cause or contribute to a delay in attainment consistent with 42 USC § 7506(c). The purpose of the General Conformity Rule is to demonstrate that project emissions, combined with all of the other air basin emissions, would not result in a cumulative impact and thereby delay attainment of the air quality standards. The ANG has prepared a Draft Conformity Determination that demonstrates that emissions associated with Alternative #2 are within the SIP NO_x emissions budget for JB MDL. It is anticipated that the ANG will obtain an affirmative Conformity Determination prior to signing of the ROD. Thus, given that Alternative #2 will have demonstrated conformity with the SIP, cumulative impacts to air quality would not be significant.

The potential effects of GHG emissions from the Proposed Action are by nature global. Substantial temperature increases attributable to global climate change could result in a variety of impacts to the people, economy, and environment. These impacts include potential impacts to ecosystems, wildlife and agriculture, increases in the incidence of wildfires, changes in precipitation levels, and rising sea levels. The impacts of global climate change would not be expected to have a substantial impact on JB MDL beyond regional impacts to the area in general.

Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

5.2.2.3 Safety

Providing new and renovated facilities for the 108 WG that support operational requirements and are properly sited with adequate space and a modernized supporting infrastructure would generally improve ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 108 WG. AT/FP requirements have also been addressed to the extent practicable in all facility construction projects. A new fire station would enhance fire and crash response capability at JB MDL. Risk of a catastrophic event occurring during construction activities described under Alternative #2 or those activities described in Table 5.2.1-1 is considered to be low, and strict adherence to

all applicable occupational safety requirements would further minimize the relatively low risk associated with described construction activities. Additionally, the new munitions storage area facility at JB MDL would be sited in accordance with AFMAN 91-201and improve munitions safety. Cumulative impacts to ground or flight safety would be negligible at the airfield. Construction and repair projects identified in Table 5.2.1-1 would be beneficial to safety with pavement repairs and AT/FP enhancements.

5.2.2.4 Soils and Water

Soils

In addition to the 204,009 SF (4.7 acres) of surface disturbance that would result from the implementation of Alternative #2, additional surface area would be disturbed in the vicinity as a result of the projects described in Table 5.2.1-1 over the next 5 years.

The CWA considers stormwater from a construction site as a point source of pollution regulated by the NPDES permit. Therefore, those projects described in Table 5.2.1-1 larger than 1 acre would be required to have a site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls in an effort to reduce the impacts to the local watershed; this is an effective way of controlling erosion while soil is exposed and subject to construction activity. Implementation of standard construction practices would be used to limit or eliminate soil movement, stabilize erosion, and control sedimentation. These standard construction practices would include the use of: velocity dissipation devices; well-maintained silt fences; minimizing surficial area disturbed; stabilization of cut/fill slopes; minimization of earth-moving activities during wet weather; and use of temporary detention ponds. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to minimize future erosion potential. Given the use of engineering practices that would minimize potential erosion, cumulative impacts to earth resources would be expected to be minor.

The Farmland Protection Policy Act is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Provided that the projects in Table 5.2.1-1 are all within federal lands, each project would be subject to Farmland Protection Policy Act compliance. Should any of these projects have the potential to convert farmland to non-farm use, a land evaluation and site assessment would be conducted and alternative sites considered should potential adverse impacts to farmland exceed the recommended allowable level.

Water

In addition to the 104,884 SF (2.4 acres) of new impervious surface that would result from Alternative #2, other increases in impervious surfaces would also occur in the vicinity as a result of the projects described in Table 5.2.1-1 over the next 5 years.

Cumulative impacts to the hydrologic cycle as a result of increasing impervious surface would be dependent on the unique conditions present at the site and its watershed. LID is a stormwater management approach that mimics nature‘s ability to clean and store stormwater runoff accomplished through use of standard construction practices that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source.

Provided that the projects listed in Table 5.2.1-1 are located within federal lands, compliance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438 would ensure any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features such that post-development runoff rates would be equal to or less than pre-development rates. Additionally, it is expected that any construction activities would adhere to NPDES requirements including implementation of standard construction practices described above. As such, cumulative impacts to water resources would be expected to be minor.

5.2.2.5 Biological Resources

DNL noise contours would be expected to increase over 1,831 acres. However, the noise levels from operations and construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with aircraft and military operations. Noise levels from construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with current aircraft and military operations. Annual operations for the 108 WG are projected to increase by approximately 111 percent from baseline operations (15 percent increase in total airfield operations). An increase in levels of operations (e.g., sorties) may result in a slight increased opportunity for bird-aircraft strikes to occur, including those with migratory birds. Construction-related impacts to the vegetation at the installation and in the vicinity of projects identified in Table 5.2.1-1 would be negligible due to the lack of sensitive vegetation in the project areas. There are no wetland areas that occur within the vicinity of the project footprints. In general, construction activities at the 108 WG installation and at JB MDL would primarily occur on sites that are already highly altered by man. These impacts would include the removal of some vegetation and associated wildlife habitat. However, wildlife that uses these areas is typical of urban and suburban areas. No federally listed species are currently known to occur on the 108 WG installation and there is only

a low potential for them to occur within the vicinity due to the lack of habitat. Six state listed species have been observed on McGuire Field. Grassland habitat located within the potential ramp expansion area could provide habitat for these species. However, to the extent possible, construction would not occur during the breeding season for grassland birds (March 15 to July 31). Cumulative impacts to biological resources would be minor.

5.2.2.6 Cultural Resources

The area of proposed construction is considered to have no to low probability of containing archaeological resources. Additionally, the Proposed Action would disturb a relatively small amount of acreage, all of which has previously been disturbed. The proposed use is consistent with the installations historical land use for over 70 years. In the unlikely event that archaeological or human remains were identified during proposed construction activities associated with Alternative #2 or any of the projects listed in Table 5.2.1-1, activities would immediately cease in the area of the discovery and the JB MDL Cultural Resource Manager would immediately be contacted for further instruction. None of the facilities listed for renovation and/or modification under Alternative #2 or those listed in Table 5.2.1-1 are eligible for listing in the NRHP. Two of the buildings (3333 and 3336) listed for renovation and/or modification under Alternative #2 are less than 20 years old. Hangar 3322 (built in 1957) was evaluated for NRHP eligibility in 2013 and the results of the inventory indicated that Hangar 3322 is not eligible (JB MDL 2013d). SHPO consultation for this EIS has provided concurrence that no historic properties would be affected under the proposed action (see Saunders 2013 in Appendix B3). No traditional cultural resources have been identified on the installation. Therefore, contingent upon evaluation of Building 3322, no cumulative impacts to cultural resources are anticipated.

5.2.2.7 Land Use

Under Alternative #2, acreage off airport property contained within the 65 dB DNL and greater noise contours would increase by approximately 751 acres. In general, land uses surrounding JB MDL would not be adversely affected by the activities described under Alternative #2 in concert with those described in Table 5.2.1-1. The location and function of proposed structures within the JB MDL are compatible with the surrounding area. Although future development at JB MDL and adjacent areas is anticipated, development would be subject to planning and land use requirements, including those associated with the counties, cities and other municipalities. Project specific studies would be performed to determine and address any projects that would result in land use conflicts, such as encroachment in and near airfield safety zones. Cumulative impacts to land use as a result of the described activities, including impacts from noise and air quality, would be expected to be negligible.

5.2.2.8 Infrastructure and Transportation

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel under Alternative #2. Further, building space and facilities to be constructed as a component of this action as well as those identified in Table 5.2.1-1 may require additional electricity. In addition, wastewater, solid waste, demand for potable water, and traffic would temporarily increase during construction, and would increase slightly in the long-term due to increase in personnel. The proposed construction and demolition activities could temporarily affect the quality of stormwater runoff through potential increases in soil erosion. Standard construction practices would be implemented during construction and demolition to minimize runoff. Any new facilities and additions associated with these projects would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. In general, cumulative impacts to installation infrastructure as a result of described activities would be expected to be positive over the long-term.

5.2.2.9 Hazardous Materials and Waste

The type of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet, with the exception of ODSs. Under Alternative #2, the total number of flying hours for the 108 WG would increase approximately 118 percent; therefore, throughput of petroleum substances and hazardous waste streams would be expected to increase commensurately. Furthermore, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities for this action as well as those listed in Table 5.2.1-1. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's large quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations. In addition, any structures listed in Table 5.2.1-1 proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. Cumulative impacts as a result of the described activities are expected to be minor.

5.2.2.10 Socioeconomics

Economic activity associated with proposed construction activities described as a component of this alternative and those shown in Table 5.2.1-1, such as employment and materials purchasing,

would provide short-term economic benefits to the local economy. Additionally, there would be a permanent increase of 287 military positions. However, short-term beneficial impacts resulting from construction payrolls and materials purchased as a result of implementation of Alternative #2 and those projects listed in Table 5.2.1-1 would be negligible on a regional scale.

5.2.2.11 Environmental Justice and the Protection of Children

Under Alternative #2, in concert with those projects listed in Table 5.2.1-1, roughly 128 persons (48 more than baseline) that would be affected by DNL between 65 dB and 75 dB, approximately 23 would be minority (18 percent). This is an increase of 11 people, or 3 percent, of minorities affected. The number of low-income persons affected by DNL greater than 65 dB would be approximately 6 (an increase of 2 people and less than 1 percent). Overall, the number of persons affected by DNL of 65 dB and greater would increase slightly under this alternative, and the increase in the percentage of minority and low-income persons affected would be minor. Under Alternative #2, there would be no new Kindergarten through Grade 12 schools exposed to a DNL of 65 dB or above; however, the child development center that is currently under the 65 dB contour would be located under the 70 dB contour. There would not be disproportionate cumulative impacts to minority or low-income populations in the vicinity of JB MDL as a result of this action in concert with the current noise impacts from the airport. There are no other projects listed in Table 5.2.1-1 that would be expected to impact environmental justice communities or the health or safety of children.

5.3 ALTERNATIVE #3 -- PEASE AIR NATIONAL GUARD STATION CUMULATIVE EFFECTS

Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the ROI. Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

5.3.1 Past, Present, and Reasonably Foreseeable Actions

Portsmouth IAP is an active, dynamic airfield where operational changes and facility upgrades occur on a frequent basis. Projects that have been identified in the ROI that have the potential to act in a cumulative manner with Alternative #3 are discussed in this section. The ROI for cumulative impacts is generally limited to Portsmouth IAP and the immediately adjacent property because physical impacts related to the proposal are largely confined to these properties. Planning efforts in the ROI include the actions described within this EIS, as well as those other projects that are ongoing, or planned over the short term. Additional projects within the ROI are discussed below in Table 5.3.1-1.

Table 5.3.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Pease ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
157 ARW Projects		
Airfield Pavements: Repair and upgrade pavement areas	61,281	FY 2014 – FY 2015
Building 252: Repair roof	26,200	FY 2014 – FY 2015
Parking Lots: Repair Installation-Wide (Crack Seal/ Seal Coat)	270,000	FY 2014 – FY 2015
Bulk Fuel Roads: Repair and upgrade asphalt	57,654	FY 2014 – FY 2015
Building 257: Renovate for Security Forces	14,000	FY 2014 – FY 2015
Building 251: Renovate for Fuel Cell Operations	27,471	FY 2014 – FY 2015
Building 151: Build addition to support medical facilities	12,126	FY 2016 – FY 2018
Building 244: Demolish for Security Forces Facility	24,047	FY 2016 – FY 2018
Non-Organizational Parking: Replace to conform to AT/FP standards	150,021	FY 2016 – FY 2018
Building 152: Demolish for proposed expansion of facilities	14,486	FY 2016 – FY 2018
Building 244: Demolish for Security Forces Facility	24,047	FY 2016 – FY 2018
Parking Apron: Upgrade and add Hydrant, including interstitial monitoring and containment	198,000	FY 2016 – FY 2018
Aircraft Parking Apron: Repair as Phase V for Multi-Hangar construction	296,766	FY 2016 – FY 2018

Notes: SF = square foot; 157 ARW = 157th Air Refueling Wing; FY = Fiscal Year

5.3.2 Cumulative Impacts

5.3.2.1 Noise

Under Alternative #3, the number of acres contained within the 65 dB DNL and greater exposure area would increase by approximately 135 acres. Of the acreage exposed to 65 dB DNL or greater, approximately 4 would be off the airport property. There are no residential areas that underlie the noise contours under this alternative. While there are other projects listed in Table 5.3.1-1 that have the ability to add noise to the environment at Portsmouth IAP, most of these are short-term construction projects that would occur in what is otherwise an industrial setting. Noise from implementation of these actions would be short term and localized to the airport environs, and would not be expected to increase the overall DNL noise contours. Cumulative impacts to the noise environment at Portsmouth IAP would be minimal.

5.3.2.2 Air Quality

The net annual emissions increases from the proposed KC-46A beddown as well as those other projects described in Table 5.3.1-1 at Pease ANGS (including both construction and airfield operations) would be below the CAA PSD major source thresholds and/or the General Conformity Rule *de minimis* thresholds as set forth in the CAA for all pollutants. Therefore, cumulative impacts to air quality would not be significant.

The potential effects of GHG emissions from the Proposed Action are by nature global. Substantial temperature increases attributable to global climate change could result in a variety of impacts to the people, economy, and environment. These impacts include potential impacts to ecosystems, wildlife and agriculture, increases in the incidence of wildfires, changes in precipitation levels, and rising sea levels. The impacts of global climate change would not be expected to have a substantial impact on Pease ANGS beyond regional impacts to the area in general.

Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

5.3.2.3 Safety

Providing new and renovated facilities for the 157 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting

infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 157 ARW. AT/FP requirements have also been addressed to the extent practicable in all facility construction projects. The fire and crash response capability currently provided by the 157 ARW at Portsmouth IAP is sufficient to meet all requirements. Risk of a catastrophic event occurring during construction activities described under Alternative #3 or those activities described in Table 5.3.1-1 is considered to be low, and strict adherence to all applicable occupational safety requirements would further minimize the relatively low risk associated with described construction activities. Cumulative impacts to ground or flight safety would be negligible at the airfield. Construction and repair projects identified in Table 5.3.1-1 would be beneficial to safety with pavement repairs and AT/FP enhancements.

5.3.2.4 Soils and Water

Soils

In addition to the 130,966 SF (3.0 acres) of surface disturbance that would result from implementation of Alternative #3, additional surface area would be disturbed in the vicinity as a result of the projects described in Table 5.3.1-1 over the next 5 years.

The CWA considers stormwater from a construction site as a point source of pollution regulated by the NPDES permit. Therefore, those projects described in Table 5.3.1-1 larger than 1 acre would be required to have a site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls in an effort to reduce the impacts to the local watershed; this is an effective way of controlling erosion while soil is exposed and subject to construction activity. Implementation of standard construction practices would be used to limit or eliminate soil movement, stabilize erosion, and control sedimentation. These standard construction practices would include the use of: velocity dissipation devices; well-maintained silt fences; minimizing surficial area disturbed; stabilization of cut/fill slopes; minimization of earth-moving activities during wet weather; and use of temporary detention ponds. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to minimize future erosion potential. Given the use of engineering practices that would minimize potential erosion, cumulative impacts to earth resources would be expected to be minor.

Water

In addition to the 23,617 SF (0.5 acre) of new impervious surface that would result from Alternative #3, other increases in impervious surfaces would also occur in the vicinity as a result of the projects described in Table 5.3.1-1 over the next 5 years.

Cumulative impacts to the hydrologic cycle as a result of increasing impervious surface would be dependent on the unique conditions present at the site and its watershed. LID is a stormwater management approach that mimics nature‘s ability to clean and store stormwater runoff accomplished through use of standard construction practices that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source.

Provided that the projects listed in Table 5.3.1-1 are located within Federal lands, compliance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438 would ensure any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features such that post-development runoff rates would be equal to or less than pre-development rates. Additionally, it is expected that any construction activities would adhere to NPDES requirements including implementation of standard construction practices described above. As such, cumulative impacts to water resources would be expected to be minor.

5.3.2.5 Biological Resources

Noise contours would be expected to increase by 135 acres from baseline with the conversion to the KC-46A aircraft. However, these noise levels from operations and construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with current aircraft and military operations. Annual operations for the 157 ARW at Portsmouth IAP are projected to increase by approximately 44 percent from baseline operations (7 percent increase in total airfield operations). An increase in levels of operations (e.g., sorties) may result in a slight increased opportunity for bird-aircraft strikes to occur, including those with migratory birds. No federally threatened and endangered species are currently known to occur on Portsmouth IAP; however, eight state listed species are currently known to occur on Portsmouth IAP. Construction-related impacts to the vegetation at the installation and in the vicinity of projects identified in Table 5.3.1-1 would be negligible due to the lack of sensitive vegetation in the project areas. There are no wetland areas that occur within the vicinity of the project footprints. In general, construction activities at the 157 ARW installation and at Portsmouth IAP would primarily occur on sites that are already highly altered by man. These impacts would include the removal of some vegetation and associated wildlife habitat. However,

wildlife that uses these areas is typical of urban and suburban areas. Cumulative impacts to biological resources would be minor.

5.3.2.6 Cultural Resources

The installation is considered to have no to low probability of containing archaeological resources. In the unlikely event that archaeological or human remains were identified during proposed construction activities associated with Alternative #3 or any of the projects listed in Table 5.3.1-1, activities would immediately cease in the area of the discovery and appropriate personnel would contact a qualified archaeologist to evaluate the discovery. None of the facilities listed for renovation and/or modification under Alternative #3 or those listed in Table 5.3.1-1 are eligible for listing in the NRHP. The SHPO has concurred with a "no historic properties affected" determination (Muzzey 2013). No traditional cultural resources have been identified on the installation. Therefore, no cumulative impacts to cultural resources are anticipated.

5.3.2.7 Land Use

Under Alternative #3, acreage off airport property contained within the 65 dB DNL and greater noise contours would increase by approximately 135 acres. In general, land uses surrounding Portsmouth IAP would not be adversely affected by the activities described under Alternative #3 in concert with those described in Table 5.3.1-1. The location and function of proposed structures within the Pease ANGS are compatible with the surrounding area. No future development at Portsmouth IAP and adjacent areas has been identified; however, any future development would be subject to planning and land use requirements, including those associated with the airport, counties, cities and other municipalities. Project-specific studies would be performed to determine and address any projects that would result in land use conflicts, such as encroachment in and near airfield safety zones. Cumulative impacts to land use as a result of the described activities, including impacts from noise and air quality, would be expected to be negligible.

5.3.2.8 Infrastructure and Transportation

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel under Alternative #3. Further, building space and facilities to be constructed as a component of this action as well as those identified in Table 5.3.1-1 may require additional electricity. In addition, wastewater, solid waste, demand for potable water, and traffic would temporarily increase during construction, and would increase slightly in the long-term due to increase in personnel. The proposed construction and demolition activities could temporarily

affect the quality of stormwater runoff through potential increases in soil erosion. Standard construction practices would be implemented during construction and demolition to minimize runoff. Any new facilities and additions associated with these projects would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. In general, cumulative impacts to installation infrastructure as a result of described activities would be expected to be positive over the long-term.

5.3.2.9 Hazardous Materials and Waste

The type of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet with the exception of ODSs. Under Alternative #3, the total number of flying hours for the 157 ARW would increase approximately 29 percent; therefore, throughput of petroleum substances and hazardous waste streams would be expected to increase commensurately. Furthermore, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities for this action as well as those listed in Table 5.3.1-1. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations. In addition, any structures listed in Table 5.3.1-1 proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. Cumulative impacts as a result of the described activities are expected to be minor.

5.3.2.10 Socioeconomics

Economic activity associated with proposed construction activities described as a component of this alternative and those shown in Table 5.3.1-1, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. Additionally, there would be a permanent increase of 171 military positions. However, short-term beneficial impacts resulting from construction payrolls and materials purchased as a result of implementation of Alternative #3 and those projects listed in Table 5.3.1-1 would be negligible on a regional scale.

5.3.2.11 Environmental Justice and the Protection of Children

Under Alternative #3 in concert with those projects listed in Table 5.3.1-1, there would be no residential populations, including no minority or low-income populations, located within the

projected 65 dB DNL noise contour in the vicinity of Portsmouth IAP. There are no other projects listed in Table 5.3.1-1 that would be expected to impact environmental justice communities. Therefore, there would be no cumulative impacts to the health or safety of children.

5.4 ALTERNATIVE #4 -- PITTSBURGH AIR NATIONAL GUARD STATION CUMULATIVE EFFECTS

Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the ROI. Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

5.4.1 Past, Present, and Reasonably Foreseeable Actions

Pittsburgh IAP is an active, dynamic airfield where operational changes and facility upgrades occur on a frequent basis. Projects that have been identified in the ROI that have the potential to act in a cumulative manner with Alternative #4 are discussed in this section. The ROI for cumulative impacts is generally limited to Pittsburgh IAP, and the immediately adjacent property because physical impacts related to the proposal are largely confined to these properties. Planning efforts in the ROI include the actions described within this EIS, as well as those other projects that are ongoing, or planned over the short term. Additional projects within the ROI are discussed below in Table 5.4.1-1.

Table 5.4.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Pittsburgh ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
171 ARW Projects		
Interior renovations of Buildings 310 (Jet Engine Shop and AGE), 316 (non-powered AGE Corrosion Control and Nondestructive Inspection), and 307 (Small Air Terminal Facility)	NA	FY 2013
Construct new security forces and physical fitness facility.	8,000	Within the next 5 years.
Interior renovations of Building 300 (Medical, dining hall, and operations and training), Hangars 301 and 302 (for various uses), and 110 and 120 (supply consolidation).	Currently unknown	Within the next 5 years.
Expand Building 206: Special Operations Weather Team	5,655	Within the next 5 years.
Expand Building 107 for small air terminal.	12,800	Within the next 5 years.
Construct new AT/FP commercial vehicle inspection facility.	N A	Within the next 5 years.
Phase 1: Demolition of current parking areas (108 parking spaces) and construction of new parking (107 parking spaces) for AT/FP compliance. Phase 2: Demolition of current parking areas (206 parking spaces) and construction of new parking (230 parking spaces) for AT/FP compliance.	Currently unknown	Completed within the last few years.

Table 5.4.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Pittsburgh ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
Demolition of Buildings 102 (Reserve Forces Training, Physical Fitness), 103 (Security Forces, Nondestructive Inspection Shop), and 105 (Base Exchange).	18,292	Within the next 5 years.
Plan identified renovate Building 304 and move the Fire Station to this building.	N/A	Within the next 5 years.
Construct Deployment Processing Center and Relocate Munitions Storage Area.	8,000	Within the next 5 years.
Construct New Simulator Facility	6,600	Within the next 5 years.
911th Airlift Wing Pittsburgh IAP Air Reserve Station		
Acquisition by lease of a 26-acre parcel at the Pittsburgh IAP known as the "T-Ramp" owned by ACAA. The 911th Airlift Wing has been using the T-Ramp property since 1993 under a Memorandum of Agreement to provide space for the 911th Airlift Wing to relocate C-130 aircraft for parking during construction activity.	NA	Within the past year.
Pittsburgh IAP		
U.S. Airways pulled its hub out of Pittsburgh IAP in 2004, dropping passenger traffic by over 8 million, significantly reducing airfield operations and eliminating approximately 7,000 jobs.	NA	FY 2004
Drilling of Marcellus Shale oil and natural gas well sites on Pittsburgh IAP property	NA	Within the next 5 years.
Two non-aviation buildings being constructed west of highway off airport property.	NA	In progress

Notes: SF = square foot; 171 ARW = 171st Air Refueling Wing; AGE = aerospace ground equipment; FY = Fiscal Year; AT/FP = anti-terrorism/force protection; IAP = International Airport; ACAA = Allegheny County Airport Authority

5.4.2 Cumulative Impacts

5.4.2.1 Noise

Under Alternative #4, the number of acres contained within the 65 dB DNL and greater exposure area would decrease by approximately 79 acres. Of the acreage exposed to 65 dB DNL or greater, approximately 23 would be off-airport property. Residential use areas that underlie the noise contours would be slightly reduced under Alternative #4. While there are other projects listed in Table 5.4.1-1 that have the ability to add noise to the environment at Pittsburgh IAP, most of these are short-term construction projects that would occur in what is otherwise an industrial setting. Noise from implementation of these actions would be short-term and localized to the airport environs, and would not be expected to increase the overall DNL noise contours. Cumulative impacts to the noise environment at Pittsburgh IAP would be minimal.

5.4.2.2 Air Quality

The net annual emissions increases from the proposed KC-46A beddown as well as those other projects described in Table 5.4.1-1 at Pittsburgh ANGS (including both construction and airfield operations) would be below the CAA PSD major source thresholds and/or the General Conformity Rule *de minimis* thresholds as set forth in the CAA for all pollutants. Therefore, cumulative impacts to air quality would not be significant.

The potential effects of GHG emissions from the Proposed Action are by nature global. Substantial temperature increases attributable to global climate change could result in a variety of impacts to the people, economy, and environment. These impacts include potential impacts to ecosystems, wildlife and agriculture, increases in the incidence of wildfires, changes in precipitation levels, and rising sea levels. The impacts of global climate change would not be expected to have a substantial impact on Pittsburgh ANGS beyond regional impacts to the area in general.

Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

5.4.2.3 Safety

Providing new and renovated facilities for the 171 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 171 ARW. AT/FP requirements have also been addressed to the extent practicable in all facility construction projects. Additional beneficial impacts would occur from a new AT/FP commercial vehicle inspection facility and parking. The fire and crash response capability currently provided by the 171 ARW at Pittsburgh IAP is sufficient to meet all requirements. Risk of a catastrophic event occurring during construction activities described under Alternative #4 or those activities described in Table 5.4.1-1 is considered to be low, and strict adherence to all applicable occupational safety requirements would further minimize the relatively low risk associated with described construction activities. Cumulative impacts to ground or flight safety would be negligible at the airfield. Construction and repair projects identified in Table 5.4.1-1 would be beneficial to safety with pavement repairs and AT/FP enhancements. No adverse impacts to ground safety are anticipated at the airfield. There would be a large decrease in

airfield operations at Pittsburgh IAP from those previously analyzed as a result of the U.S. Airways ceasing operations at Pittsburgh IAP. No increase in the safety risk is expected due to the accident and mishap potential associated with aircraft operations. Cumulative impacts to safety would be negligible.

5.4.2.4 Soils and Water

Soils

In addition to the 186,395 SF (4.3 acres) of surface disturbance that would result from implementation of Alternative #4, additional surface area would be disturbed in the vicinity as a result of the projects described in Table 5.4.1-1 over the next 5 years.

The CWA considers stormwater from a construction site as a point source of pollution regulated by the NPDES permit. Therefore, those projects described in Table 5.4.1-1 larger than 1 acre would be required to have a site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls in an effort to reduce the impacts to the local watershed; this is an effective way of controlling erosion while soil is exposed and subject to construction activity. Implementation of construction standard construction practices would be used to limit or eliminate soil movement, stabilize erosion, and control sedimentation. These standard construction practices would include the use of: velocity dissipation devices; well-maintained silt fences; minimizing surficial area disturbed; stabilization of cut/fill slopes; minimization of earth-moving activities during wet weather; and use of temporary detention ponds. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to minimize future erosion potential. Given the use of engineering practices that would minimize potential erosion, cumulative impacts to earth resources would be expected to be minor.

Water

In addition to the 88,529 SF (2.0 acres) of new impervious surface that would result from Alternative #4, other increases in impervious surfaces would also occur in the vicinity as a result of the projects described in Table 5.4.1-1 over the next 5 years.

Cumulative impacts to the hydrologic cycle as a result of increasing impervious surface would be dependent on the unique conditions present at the site and its watershed. LID is a stormwater management approach that mimics nature‘s ability to clean and store stormwater runoff accomplished through use of standard construction practices that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source.

Provided that the projects listed in Table 5.4.1-1 are located within federal lands, compliance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438 would ensure any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features such that post-development runoff rates would be equal to or less than pre-development rates. Additionally, it is expected that any construction activities would adhere to NPDES requirements including implementation of standard construction practices described above. As such, cumulative impacts to water resources would be expected to be minor.

5.4.2.5 Biological Resources

Noise levels from construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with current aircraft and military operations. Annual operations for the 171 ARW at Pittsburgh IAP would be projected to increase by approximately 33 percent from baseline operations. An increase in levels of operations (e.g., sorties) may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally threatened and endangered species are currently known to occur on Pittsburgh IAP. One state listed species is currently known to occur on Pittsburgh IAP. Construction-related impacts to the vegetation at the installation and in the vicinity of projects identified in Table 5.4.1-1 would be negligible due to the lack of sensitive vegetation in the project areas. There are no wetland areas that occur within the vicinity of the project footprints. In general, construction activities at the 171 ARW installation and at Pittsburgh IAP would primarily occur on sites that are already highly altered by man. These impacts would include the removal of some vegetation and associated wildlife habitat. However, wildlife that uses these areas is typical of urban and suburban areas. Cumulative impacts to biological resources would be minor.

5.4.2.6 Cultural Resources

The installation is considered to have no to low probability of containing archaeological resources. In the unlikely event that archaeological or human remains were identified during proposed construction activities associated with Alternative #4 or any of the projects listed in Table 5.4.1-1, activities would immediately cease in the area of the discovery and appropriate personnel would contact a qualified archaeologist to evaluate the discovery. None of the facilities listed for renovation and/or modification under Alternative #4 or those listed in Table 5.4.1-1 are eligible for listing in the NRHP. The SHPO has concurred that two of the buildings listed for renovation and/or modification under Alternative #4 are not eligible to the NRHP (see MacDonald 2011 in Appendix B4). The third building is less than 15 years old and not a resource of exceptional significance (eligible under Criterion Consideration G); therefore, it is

not eligible to the NRHP. No traditional cultural resources have been identified on the installation. Therefore, no cumulative impacts to cultural resources are anticipated.

5.4.2.7 Land Use

Under Alternative #4, acreage off airport property contained within the 65 dB DNL and greater noise contours would decrease by approximately 23 acres resulting in beneficial impacts. In general, land uses surrounding Pittsburgh IAP would not be adversely affected by the activities described under Alternative #4 in concert with those described in Table 5.4.1-1. The location and function of proposed structures within the Pittsburgh ANGS are compatible with the surrounding area. Although future development at Pittsburgh IAP and adjacent areas is anticipated, development would be subject to planning and land use requirements, including those associated with the airport, counties, cities and other municipalities. Project specific studies would be performed to determine and address any projects that would result in land use conflicts, such as encroachment to airfield safety zones. Cumulative impacts to land use as a result of the described activities, including impacts from noise and air quality, would be expected to be negligible.

5.4.2.8 Infrastructure and Transportation

Demand for electricity and natural gas would be expected to increase slightly as a result of the increase in personnel under Alternative #4. Further, building space and facilities to be constructed as a component of this action as well as those identified in Table 5.4.1-1 may require additional electricity. In addition, wastewater, solid waste, demand for potable water, and traffic would temporarily increase during construction, and would increase slightly in the long-term due to increase in personnel. The proposed construction and demolition activities could temporarily affect the quality of stormwater runoff through potential increases in soil erosion. Standard construction practices would be implemented during construction and demolition to minimize runoff. Any new facilities and additions associated with these projects would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. In general, cumulative impacts to installation infrastructure as a result of described activities would be expected to be positive over the long-term.

5.4.2.9 Hazardous Materials and Waste

The type of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135

fleet with the exception of ODSs. Under Alternative #4, the total number of flying hours for the 171 ARW would increase approximately 34 percent; therefore, throughput of petroleum substances and hazardous waste streams would be expected to increase commensurately. Furthermore, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities for this action as well as those listed in Table 5.4.1-1. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. No changes to the installation's large quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations. In addition, any structures listed in Table 5.4.1-1 proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. None of the ERP sites overlap the proposed construction projects under Alternative #4. Cumulative impacts as a result of the described activities are expected to be minor.

5.4.2.10 Socioeconomics

Economic activity associated with proposed construction activities described as a component of this alternative and those shown in Table 5.4.1-1, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. However, short-term beneficial impacts resulting from construction payrolls and materials purchased as a result of implementation of Alternative #4 and those projects listed in Table 5.4.1-1 would be negligible on a regional scale.

5.4.2.11 Environmental Justice and the Protection of Children

Under Alternative #4, of the roughly 12 persons that would continue to be affected by DNL above 65 dB DNL, none are considered to be minorities or low-income populations. No additional minorities or low-income populations would be impacted by aircraft DNL greater than 65 dB under Alternative #4. There would not be disproportionate cumulative impacts to minority or low-income populations in the vicinity of Pittsburgh IAP as a result of this action in concert with the projects listed in Table 5.4.1-1. Therefore, there would be no cumulative impacts to the health or safety of children.

5.5 ALTERNATIVE #5 -- RICKENBACKER AIR NATIONAL GUARD STATION CUMULATIVE EFFECTS

Cumulative impacts to environmental resources result from incremental effects of proposed actions when combined with other past, present, and reasonably foreseeable future projects in the ROI. Cumulative impacts can result from individually minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, and local) or individuals. In accordance with NEPA, a discussion of cumulative impacts resulting from projects that are proposed (or anticipated over the foreseeable future) is required.

5.5.1 Past, Present, and Reasonably Foreseeable Actions

Rickenbacker IAP is an active, dynamic airfield where operational changes and facility upgrades occur on a frequent basis. Projects that have been identified in the ROI that have the potential to act in a cumulative manner with Alternative #5 are discussed in this section. The ROI for cumulative impacts is generally limited to Rickenbacker IAP, and the immediately adjacent property because physical impacts related to the proposal are largely confined to these properties. Planning efforts in the ROI include the actions described within this EIS, as well as those other projects that are ongoing, or planned over the short term. Additional projects within the ROI are discussed below in Table 5.5.1-1.

Table 5.5.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Rickenbacker ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
121 ARW Projects		
Under the NDAA Implementation Plan, Rickenbacker ANGS will lose 6 KC-135s in FY 2013.	NA	In progress – FY 2013
New main entrance and guard house: Construction of a new Main Entrance to include 100 percent inspection area, vehicle turn-around, truck inspection canopy, and guardhouse. This includes 32,000 SF of new impervious surface.	47,030	Completed within the last few years
Repair Aircraft Ramp: Seal existing concrete joints, repair storm drain, mill asphalt; remove concrete pavement, pour new asphalt pavement with base, pour new concrete pavement for aircraft parking.	1,336,630	In progress – FY 2014
New Small Arms Indoor Range System: New Small Arms Range, range supplies and equipment storage. This includes 14,400 SF of new impervious surface.	18,400	Within the next 5 years
New Composite Reserve Forces Operations and Training and Medical Training/Administration Facility: Mission Support Group/Mission Support Flight, Medical Administration, Medical Training. This includes 68,220 SF of new impervious surface.	176,220	Within the next 5 years

Table 5.5.1-1. Past, Present, and Reasonably Foreseeable Actions in the ROI for Rickenbacker ANGS

Project Name/Descriptions	*Approximate Square Footage (SF)*	*Timeframe*
New Civil Engineering Pavements and Grounds and Central Hazardous Waste Facility: Pavements and Grounds Facility, Central Hazardous Waste Accumulation Point. This includes 8,000 SF of new impervious surface.	22,850	Within the next 5 years
Repair Base Asphalt Pavements	234,000	Completed within the last few years
Renovate/Repair Building 872: Renovate Building 872 office areas, install Exterior Insulation and Finish System, new windows, and repair lintels and sills in warehouse.	0	Completed within the last few years
Replace Existing Water Lines: Replace water pipes and valves, install new smart water meters.	280,830	Within the next 5 years
Rickenbacker IAP		
Rickenbacker Parkway Phase 1 and 2A: Construction of a median-divided four-lane curb and gutter asphalt roadway. Total length was approximately 3.3 miles along the west side of the airport. Phase 1 was completed in 2006 (Phase 1A) and 2007 (Phase 1B). Phase 2A was completed 2012.	NA	Completed within the last seven years
Rickenbacker Parkway Phase 2B: Extension of the median-divided four-lane curb and gutter asphalt roadway to the north side of the airport up to and including improvements (primarily lane widening) to SR 317 and Alum Creek Drive. Project is out to bid now and will be constructed 2013 through 2014.	NA	Within next few years.
Groveport Road Reconfiguration Phase 1 and Phase 2: Phase 1 included the primarily lane widening at the intersection of Groveport Road and Alum Creek Drive just south of Interstate 270 intersection. Completed in 2012. Phase 2 includes a new bridge and roundabouts to reconfigure vehicular traffic flow at the intersection of Groveport Road and Alum Creek Drive. Project is under construction and will be complete in 2013.	NA	Completed in 2012/To be completed in 2013
East-West Connector (Pickaway County south of airport) Phase 1A and 1B: Phase 1A includes the reconstruction and widening (to 3 lanes) of Duvall Road from SR 23 over to Ashville Pike, including a bridge over the existing railroad tracks. Phase 1B includes the reconstruction and widening (to 3 lanes) of Ashville Pike from Duvall Road up to Rickenbacker Parkway. Project is being bid and construction will start summer 2013 and be complete in 2014.	NA	To be completed in 2014

Notes: SF = square foot; 121 ARW = 121st Air Refueling Wing; NDAA = National Defense Authorization Act; ANG = Air National Guard Station; FY = Fiscal Year; IAP = International Airport; SR = State Route

5.5.2 Cumulative Impacts

5.5.2.1 Noise

Under Alternative #5, the number of acres contained within the 65 dB DNL and greater exposure area would decrease slightly by approximately 99 acres, including a reduction of approximately 72 acres of off-airport property. There are no residential areas that underlie the noise contours under this alternative. While there are other projects listed in Table 5.5.1-1 that have the ability to add noise to the environment at Rickenbacker IAP, most of these are short-term construction

projects that would occur in what is otherwise an industrial setting other than the reduction of aircraft assigned to the 121 ARW which would cause further reduction in noise contours. Noise from implementation of these actions would be localized to the airport environs, and would not be expected to increase the overall noise contours. Cumulative impacts to the noise environment at Rickenbacker IAP would not be significant.

5.5.2.2 Air Quality

The net annual emissions increases from the proposed KC-46A beddown as well as those other projects described in Table 5.5.1-1 at Rickenbacker ANGS (including both construction and airfield operations) would be below the CAA PSD major source thresholds and/or the General Conformity Rule *de minimis* thresholds as set forth in the CAA for all pollutants. Due to the projected loss of aircraft in FY 2013, this would further reduce emissions. It is not anticipated that any of the projects identified in Table 5.5.1-1 would impact air quality.

The potential effects of GHG emissions from the Proposed Action are by nature global. Substantial temperature increases attributable to global climate change could result in a variety of impacts to the people, economy, and environment. These impacts include potential impacts to ecosystems, wildlife and agriculture, increases in the incidence of wildfires, changes in precipitation levels, and rising sea levels. The impacts of global climate change would not be expected to have a substantial impact on Rickenbacker ANGS beyond regional impacts to the area in general.

Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

5.5.2.3 Safety

Providing new and renovated facilities for the 121 ARW that support operational requirements of the KC-46A, and are properly sited with adequate space and a modernized supporting infrastructure would generally enhance ground and flight safety during required operations, training, maintenance and support procedures, security functions, and other activities conducted by the 121 ARW. AT/FP requirements have also been addressed to the extent practicable in all facility construction projects. The fire and crash response capability currently provided by the 121 ARW at Rickenbacker IAP is sufficient to meet all requirements. Risk of a catastrophic event occurring during construction activities described under Alternative #5 or those activities

described in Table 5.5.1-1 is considered to be low, and strict adherence to all applicable occupational safety requirements would further minimize the relatively low risk associated with described construction activities. PAA reduction under the 2013 NDAA would further reduce safety concerns. Cumulative impacts to ground or flight safety would be negligible at the airfield. Construction and repair projects identified in Table 5.5.1-1 would be beneficial to safety with pavement repairs and AT/FP enhancements.

5.5.2.4 Soils and Water

Soils

In addition to the 368,330 SF (8.5 acres) of surface disturbance that would result from implementation of Alternative #5, additional surface area would be disturbed in the vicinity as a result of the projects described in Table 5.5.1-1 over the next 5 years.

The CWA considers stormwater from a construction site as a point source of pollution regulated by the NPDES permit. Therefore, those projects described in Table 5.5.1-1 larger than 1 acre would be required to have a site-specific and detailed SWPPP that coordinates the timing of soil disturbing activities with the installation of soil erosion and runoff controls in an effort to reduce the impacts to the local watershed; this is an effective way of controlling erosion while soil is exposed and subject to construction activity. Implementation of standard construction practices would be used to limit or eliminate soil movement, stabilize erosion, and control sedimentation. These standard construction practices would include the use of: velocity dissipation devices; well-maintained silt fences; minimizing surficial area disturbed; stabilization of cut/fill slopes; minimization of earth-moving activities during wet weather; and use of temporary detention ponds. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and managed to minimize future erosion potential. Given the use of engineering practices that would minimize potential erosion, cumulative impacts to earth resources would be expected to be minor.

Water

In addition to the 14,660 SF (0.3 acre) of new impervious surface that would result from Alternative #5, other increases in impervious surfaces would also occur in the vicinity as a result of the projects described in Table 5.5.1-1 over the next 5 years.

Cumulative impacts to the hydrologic cycle as a result of increasing impervious surface would be dependent on the unique conditions present at the site and its watershed. LID is a stormwater management approach that mimics nature‘s ability to clean and store stormwater runoff

accomplished through use of standard construction practices that infiltrate, filter, store, reuse, evaporate, and detain runoff close to its source.

Provided that the projects listed in Table 5.5.1-1 are located within federal lands, compliance with UFC 3-210-10, LID (as amended, 2010) and EISA Section 438 would ensure any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features such that post-development runoff rates would be equal to or less than pre-development rates. Additionally, it is expected that any construction activities would adhere to NPDES requirements including implementation of standard construction practices described above. As such, cumulative impacts to water resources would be expected to be minor.

5.5.2.5 Biological Resources

Noise from temporary construction would not be expected to impact wildlife in the area because they are accustomed to elevated noise levels associated with current aircraft and military operations. Annual operations for the KC-46A at Rickenbacker IAP are projected to increase by approximately 6 percent from baseline operations. An increase in levels of operations (e.g., sorties) may result in a slight increased opportunity for bird/wildlife aircraft strikes to occur, including those with migratory birds. No federally threatened and endangered species and one state listed species are currently known to occur on Rickenbacker IAP. Construction-related impacts to the vegetation at the installation and in the vicinity of projects identified in Table 5.5.1-1 would be negligible due to the lack of sensitive vegetation in the project areas. There are no wetland areas that occur within the vicinity of the project footprints. In general, construction activities at the 121 ARW installation and at Rickenbacker IAP would primarily occur on sites that are already highly altered by man. These impacts would include the removal of some vegetation and associated wildlife habitat. However, wildlife that uses these areas is typical of urban and suburban areas. Cumulative impacts to biological resources would be minor.

5.5.2.6 Cultural Resources

The installation is considered to have no to low probability of containing archaeological resources. In the unlikely event that archaeological or human remains were identified during proposed construction activities associated with Alternative #5 or any of the projects listed in Table 5.5.1-1, activities would immediately cease in the area of the discovery and appropriate personnel would contact a qualified archaeologist to evaluate the discovery. Under the Proposed Action, two of the buildings proposed for modification are eligible for listing in the NRHP (Hangar 885 and 888) (Snyder 2007). Hangar 885 would have an addition and renovations inside to house the new aircraft and support facilities. Because these renovations would alter the

exterior appearance of a structure that is considered eligible because of its design, the construction would have an adverse effect on a historic property. Modifications to Hangar 888 would all be interior and are not expected to have an adverse effect on this NRHP-eligible resource. Rickenbacker ANGS and the Ohio SHPO have developed a Programmatic Agreement stating that if Rickenbacker ANGS is selected to host the MOB 2 KC-46 beddown, further consultation would be conducted to minimize and mitigate adverse effects to these buildings (see Appendix B, Section B3). No traditional cultural resources have been identified on the installation. Cumulative impacts to cultural resources are anticipated to be minor.

5.5.2.7 Land Use

Under Alternative #5, acreage off airport property contained within the 65 dB DNL and greater noise contours would decrease by approximately 72 acres resulting in beneficial impacts. In general, land uses surrounding Rickenbacker IAP would not be adversely affected by the activities described under Alternative #5 in concert with those described in Table 5.5.1-1. The location and function of proposed structures within the Rickenbacker ANGS are compatible with the surrounding area. Although future development at Rickenbacker IAP and adjacent areas is anticipated, development would be subject to planning and land use requirements, including those associated with the airport, counties, cities and other municipalities. Project-specific studies would be performed to determine and address any projects that would result in land use conflicts, such encroachment airfield safety zones. Cumulative impacts to land use as a result of the described activities, including impacts from noise and air quality, would be expected to be negligible.

5.5.2.8 Infrastructure and Transportation

Demand for electricity and natural gas would be commensurate with the impacts from the loss of six aircraft and the increase in personnel under Alternative #5. Further, building space and facilities to be constructed as a component of this action, as well as those identified in Table 5.5.1-1, may require additional electricity. In addition, wastewater, solid waste, demand for potable water, and traffic would temporarily increase during construction, and would increase slightly in the long-term due to increase in personnel. The proposed construction and demolition activities could temporarily affect the quality of stormwater runoff through potential increases in soil erosion. Standard construction practices would be implemented during construction and demolition to minimize runoff. Any new facilities and additions associated with these projects would be implemented with more energy efficient design standards and utility systems than are currently in place. In addition, construction projects would incorporate LEED and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy

conservation. In general, cumulative impacts to installation infrastructure as a result of described activities would be expected to be positive over the long-term.

5.5.2.9 Hazardous Materials and Waste

The type of hazardous materials needed for maintenance and operation of the KC-46A would be expected to remain similar to those currently used for maintenance and operation of the KC-135 fleet, with the exception of ODSs. Under Alternative #5, the total number of flying hours for the 121 ARW would increase approximately 11 percent; therefore, throughput of petroleum substances and hazardous waste streams would be expected to increase commensurately. Furthermore, it is expected that short-term increases would be realized in terms of the quantity of fuel used during construction activities for this action as well as those listed in Table 5.5.1-1. Hazardous waste generation (e.g., used oil, used filters, oily rags, etc.) would continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations. Additionally, no changes to the installation's small quantity generator status would be expected to occur due to the increase in hazardous waste generation from aircraft operations. In addition, any structures listed in Table 5.5.1-1 proposed for demolition, addition, or retrofit would be inspected for ACM and LBP according to established ANG procedures prior to any renovation or demolition activities. Cumulative impacts as a result of the described activities are expected to be minor.

5.5.2.10 Socioeconomics

Economic activity associated with proposed construction activities described as a component of this alternative and those shown in Table 5.5.1-1, such as employment and materials purchasing, would provide short-term economic benefits to the local economy. Under the NDAA Implementation Plan, the 121 ARW will lose six KC-135 aircraft, including a reduction in personnel. As a result, cumulative impacts under Alternative #5 would mean a greater increase in personnel than projected, and therefore a greater increase in total annual salary for the full-time employees based on those changes. Short-term beneficial impacts resulting from construction payrolls and materials purchased as a result of implementation of Alternative #5 and those projects listed in Table 5.5.1-1 would be negligible on a regional scale.

5.5.2.11 Environmental Justice and the Protection of Children

Under Alternative #5, in concert with those projects listed in Table 5.5.1-1, there would be no residential populations, including no minority or low-income populations, located within the projected 65 dB DNL noise contour in the vicinity of Rickenbacker IAP. There are no other projects listed in Table 5.5.1-1 that would be expected to impact environmental justice

communities. Under Alternative #5 there would be no schools exposed to aircraft DNL of 65 dB or above. Therefore, there would be no cumulative impacts to the health or safety of children.

5.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES FOR ALL ALTERNATIVES

NEPA CEQ regulations require environmental analyses to identify "...any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented" (40 CFR Section 1502.16). Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Building construction material such as gravel and gasoline usage for construction equipment would constitute the consumption of non-renewable resources. Irretrievable resource commitments also involve the loss in value of an affected resource that cannot be restored as a result of the action.

The primary irretrievable impacts of implementation of the Proposed Action for any of the alternatives would involve the use of energy, labor, materials and funds, and the conversion of some lands from an undeveloped condition through the construction of buildings and facilities on the installation. Irretrievable impacts would occur as a result of construction, facility operation, and maintenance activities. Direct losses of biological productivity and the use of natural resources from these impacts would be inconsequential.

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CHAPTER 6 REFERENCES

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LIST OF REPOSITORIES

Topeka and Shawnee County Public Library
1515 SW 10th St
Topeka, KS 66604

Carbondale City Library
235 Main St
Carbondale, KS 66414

Burlington County Library
5 Pioneer Blvd
Westampton, NJ 08060

Pemberton Community Library
16 Broadway
Browns Mills, NJ 08015
609-893-8262

Mr. Scott Campbell
Langdon Public Library
328 Nimble Hill Rd
Newington, NH 03801

Mr. Michael Huxtable
Portsmouth Public Library
175 Parrott Ave
Portsmouth, NH 03801

Moon Township Public Library
1700 Beaver Grade Rd
Moon Township, PA 15108

Robert Morris University Library
6001 University Blvd
Moon Township, PA 15108

Metropolitan Library
South High Branch
3540 S. High Street
Columbus, OH 43207

Metropolitan Library
Southeast Branch
3980 S Hamilton Rd
Groveport, OH 43125

GLOSSARY

Above Ground Level (AGL): Altitude expressed in feet measured above the ground surface.

***Accident Potential Zone (APZ)*:** An area defined near a runway where accidents are likely to occur if they occur. APZs are normally 3,000 feet wide and extend 15,000 feet from the end of the runway but can curve with the flight tracks.

Air Refueling Tracks: Published linear routes identified on air navigation charts that define the flight path used by aircraft when refueling other aircraft. For fixed wing aircraft, this generally occurs above 10,000 feet above mean sea level.

Air Force Instruction (AFI): AFIs implementing United States laws and regulations, and providing policy for United States Air Force personnel and activities.

***Air Installation Compatible Use Zone (AICUZ)*:** A land-use-planning program, used by the military, to protect the health, safety, and welfare of those living near military airfields while preserving the defense flying mission. AICUZ presents noise zones and Accident Potential Zones for military airfields and recommendations for compatible land use.

Air Mobility Command (AMC): AMC, a major command with headquarters at Scott Air Force Base, Illinois, was created June 1, 1992. AMC provides America's Global Reach. This rapid, flexible, and responsive air mobility promotes stability in regions by keeping America's capability and character highly visible.

Air National Guard (ANG): The ANG is administered by the National Guard Bureau, a joint bureau of the departments of the Army and United States Air Force, located in the Pentagon, Washington, D.C. It is one of the seven Reserve components of the United States armed forces that augments the active components in the performance of their missions.

Air Quality Control Region (AQCR): An administrative unit for monitoring and controlling air quality in a specific region.

Air Traffic Control Assigned Airspace (ATCAA): Airspace of defined vertical and lateral limits, assigned by Air Traffic Control, for the purpose of providing air traffic separation between the specified activities being conducted within the assigned airspace and other Instrument Flight Rule air traffic.

Anchors: Air refueling tracks that go in a race-track shape (i.e., loop).

AP/1B: AP/1B provides textual and graphic descriptions and operating instructions for all military training routes (instrument route, visual route, slow route) and refueling tracks/anchors. Complete and more comprehensive information relative to policy and procedures for instrument routes and visual routes is published in Federal Aviation Administration Handbook 7610.4 (Special Military Operation) which is agreed to by the Department of Defense and therefore directive for all military flight operations. AP/1B is the official source of route data for military users.

Area-Wide Emission Sources: Area-wide sources of pollution are those where the emissions are spread over a wide area, such as consumer products, fireplaces, road dust, and farming operations.

Average Annual Flying Day: Average Annual Flying Day represents the average number of aircraft operations flown on a typical flying day based on airport activity and operational data which indicates, on an annual average-daily basis, the number of aircraft, by type of aircraft. An average annual day is a user-defined best representation of the typical long-term average conditions for an airport (typically based on 365 flying days per year). The average conditions include the number and type of operation s, routing structure, runway configuration, aircraft weight, temperature and wind.

Average Sortie Duration (ASD): A flying wing's total number of flying hours divided by the number of sorties that must be flown.

Backup Aerospace Vehicle Inventory (BAI): BAI includes aircraft used as substitutes for Primary Aerospace Vehicles Authorized undergoing maintenance or otherwise unable to fly.

Beddown: The permanent basing of aircraft at a new installation.

Bird/Wildlife-Aircraft Strike Hazard (BASH): A United States Air Force program to reduce the possibilities of bird or wildlife collisions with aircraft.

Boom/Probe and Drogue Refueling: Probe and drogue refueling employs a flexible hose that trails from the tanker aircraft. The drogue is a fitting resembling a windsock, and is attached with a valve to a flexible hose.

Clean Air Act (CAA): This Act empowered the United States Environmental Protection Agency to establish standards for common pollutants that represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety to protect public health and safety.

Council on Environmental Quality (CEQ): The Council is within the Executive Office of the President and is composed of three members appointed by the President, subject to approval by the Senate. Members are to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs of the nation; and to formulate and recommend national policies to promote the improvement of quality of the environment.

Day-Night Average Sound Level (DNL): Day-Night Average Sound Level is a noise metric combining the levels and durations of noise events and the number of events over an extended time period. It is a cumulative average computed over a 24-hour period to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10 decibel penalty for sounds after 10:00 p.m. and before 7:00 a.m. DNL is the Federal Aviation Administration's primary noise metric. Federal Aviation Administration Order 1050.1E defines DNL as the yearly day/night average sound level.

Decibel (dB): A sound measurement unit.

De Minimis Threshold: The minimum threshold for which a conformity determination must be performed, for various criteria pollutants in various areas.

Endangered Species Act (ESA): The Endangered Species Act of 1973 defined the term "endangered species" to mean any species (including any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature) that is in danger of extinction throughout all or a significant portion of its range.

Environmental Justice: Pursuant to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, review must be made as to whether a federal program, policy, or action presents a disproportionately high and adverse human health or environmental effect on minority and/or low-income populations.

Environmental Night: The period between 10 p.m. and 7 a.m. when 10 decibels is added to aircraft noise levels due to increased sensitivity to noise at night.

Flight Level (FL): A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet. For example, FL 250 represents a barometric altimeter indication of 25,000 feet; FL 255, an indication of 25,500 feet.

Instrument Flight Rule (IFR): A standard set of rules that all pilots, civilian and military, must follow when operating under flight conditions that are more stringent than Visual Flight Rule. These conditions include operating an aircraft in reduced visibility, operating above certain

altitudes prescribed by Federal Aviation Administration regulations, and operating in some locations like major civilian airports. Air traffic control agencies ensure separation of all aircraft operating under IFR.

Integrated Noise Model (INM): The INM is the preferred model typically used for Federal Aviation Regulations Part 150 noise compatibility planning and for Federal Aviation Administration Order 1050 environmental assessments and environmental impact statements. INM is a computer model that evaluates aircraft noise impacts in the vicinity of airports. It is developed based on the algorithm and framework from SAE AIR 1845 standard, which used Noise-Power-Distance data to estimate noise accounting for specific operation mode, thrust setting, and source-receiver geometry, acoustic directivity and other environmental factors. The INM can output either noise contours for an area or noise level at pre-selected locations. The noise output can be either exposure-based, maximum-level-based, or time-based.

Loess: An unstratified, usually buff to yellowish brown, loamy deposit believed to be chiefly deposited by the wind.

Main Operating Base: A permanently manned, well-protected base with robust infrastructure. Main operating bases are characterized by command and control structures, enduring family support facilities, and strengthened force protection measures.

Mean Sea Level (MSL): Altitude or elevation expressed in feet referenced to the average elevation of the sea. For example, a field elevation of 26 feet above mean sea level would be expressed as “26 feet MSL” and an aircraft altitude of 1,200 feet above mean sea level would be expressed as “1,200 feet MSL.”

Military Operations Area (MOA): A MOA is airspace designated outside of Class A airspace (i.e., below 18,000 feet mean sea level) to separate or segregate certain non-hazardous military activities from Instrument Flight Rule (IFR) traffic and to identify for Visual Flight Rule (VFR) traffic where these activities are conducted.

Mobile Sources: Mobile sources include cars and light trucks, heavy trucks and buses, nonroad engines, equipment, and vehicles.

National Ambient Air Quality Standards (NAAQS): NAAQS are established by the United States Environmental Protection Agency for criteria pollutants that represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and safety.

National Environmental Policy Act (NEPA): The National Environmental Policy Act of 1969 directs federal agencies to take environmental factors into consideration in their decisions.

National Guard Bureau (NGB): The NGB, both a staff and operating agency, administers the federal functions of the Army and the Air National Guard. As a staff agency, the National Guard Bureau participates with the Army and Air staffs in developing and coordinating programs that directly affect the National Guard. As an operating agency, the National Guard Bureau formulates and administers the programs for training, development, and maintenance of the Army National Guard and Air National Guard and acts as the channel of communication between the Army, Air Force, and the 54 states and territories where National Guard units are located.

National Historic Preservation Act (NHPA): The NHPA of 1966, as amended, established a program for the preservation of historic properties throughout the United States.

Nautical Mile: A distance unit equal to 1.14 statute miles.

NOISEMAP: *NOISEMAP* is a group of computer programs developed over a number of years by the U.S. Air Force for prediction of noise exposures in the vicinity of a military installation. NOISEMAP is the primary computer model used by Department of Defense for evaluating military fixed-wing aircraft noise. It contains a suite of computer programs for prediction of noise exposure from aircraft flight, maintenance, and ground runup operations. NOISEMAP output includes noise contours, noise levels at preselected locations, and other supplemental metrics to assist users in analyzing impacts resulting from aircraft noise in the airfield environment.

Operation: An operation can apply to both airfield and airspace activities. At an airfield, an operation consists of a single action such as a take-off, or a landing (i.e., two operations). For airspace and ranges, an operation consists of the use of one airspace unit (e.g., Military Operations Area, Air Refueling Track) by one aircraft. Each time a single aircraft flies into a different airspace unit, one operation is counted. During a single sortie, an aircraft could fly in several airspace units, and conduct a number of operations; therefore, the number of operations exceeds the number of sorties.

Prime Farmland: Prime farmlands are designations assigned by the U.S. Department of Agriculture. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The land is also used as cropland, pastureland, rangeland, forest land, or other land, but cannot be used as urban built-up land or water.

Power Setting: The power or thrust output of an engine in terms of kilonewtons thrust for turbojet and turbofan engines or shaft power in terms of kilowatts for turboprop engines.

Primary Aerospace Vehicles Authorized (PAA): PAA consists of the aircraft authorized and assigned to perform an Air National Guard wing's missions.

Scoping: A process of identifying the main issues of concern at an early stage in planning, in order to discover any alternatives and aid in site selection.

Sortie: A sortie refers to a single military aircraft from take-off through final landing, and everything that might be conducted during that flying mission. A sortie will always include more than one operation.

Sortie Operation: A sortie operation is counted each time a single aircraft enters Special Activity Airspace such as an Air Refueling Route or Military Operations Area (MOA).

Sound Exposure Level (SEL): SEL accounts for both the maximum sound level and the length of time a sound lasts. It provides a measure of the total sound exposure for an entire event. Federal Aviation Administration Order 1050.1E defines SEL as a single event metric that takes into account both the noise level and duration of the event and referenced to a standard duration of one second.

Special Status Species: *Special Status Species* are defined as those plant and animal species listed as endangered, threatened, and species proposed for listing by the United States Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA), and by state agencies. The federal ESA protects federally listed endangered and threatened plant and animal species. Critical habitat is a term defined and used in the ESA. It is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Federally identified candidate species (species proposed for listing) are not protected under law; however, these species could become listed, and therefore, protected at any time. Their consideration early in the planning process may avoid future conflicts that could otherwise occur. Additionally, the corresponding state regulatory agencies (Kansas Department of Wildlife, Parks and Tourism; New Jersey Division of Fish and Wildlife; New Hampshire Fish and Game; Pennsylvania Department of Conservation and Natural Resources; and Ohio Department of Natural Resources) protect state-listed plant and animal species through State fish and wildlife and administrative codes.

State Historic Preservation Office (SHPO): State department responsible for assigning protected status for cultural and historic resources.

Stationary Sources: A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses, etc.

Traditional/Cultural Resource: Cultural and traditional resources are any prehistoric or historic district, site or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes.

Visual Flight Rule (VFR): A standard set of rules that all pilots, both civilian and military, must follow when not operating under Instrument Flight Rule. These rules require that pilots remain clear of clouds and avoid other aircraft. See Instrument Flight Rule.

Warning Areas: A warning area is airspace of defined dimensions, extending from 3 nautical miles outward from the coast of the United States, containing activity that may be hazardous to non-participating aircraft. The purpose of such areas is to warn non-participating pilots of the potential danger. A warning area may be located over domestic or international waters or both. A warning area may be located over domestic or international waters or both. The airspace is designated with a "W" followed by a number (e.g., W-237).

Wetland, Jurisdictional: A jurisdictional wetland is a wetland that meets all three United States Army Corps of Engineers' criterion for jurisdictional status: appropriate hydrologic regime, hydric soils, and facultative to obligate wetland plant communities under normal growing conditions.

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Appendix A

Resource Definitions and Methodologies

APPENDIX A RESOURCE DEFINITIONS AND METHODOLOGIES

This appendix provides a definition of each resource described in Chapter 3 and analyzed in Chapter 4 that would be affected by implementation of the various alternatives described in Chapter 2. This appendix also provides a description of the methodologies used in Chapter 4 to analyze the various potential impacts to those resources presented in Chapter 3.

The affected environment is described for 11 resource topics: Noise, Air Quality, Safety, Soils and Water, Biological Resources, Cultural Resources, Land Use, Infrastructure and Transportation, Hazardous Materials and Waste, Socioeconomics, and Environmental Justice and the Protection of Children. The following sections for each resource topic begin with an introduction that defines the resources addressed in the section, summarizes applicable laws and regulations that apply to all installations, defines key terms as necessary, and describes the general region of influence (ROI) within which the effects from implementation of the various alternatives are anticipated to occur. The ROI varies from resource to resource, but in general, effects from the proposed activities are expected to be concentrated around each of the alternative installations. A more specific ROI for each installation/resource is described within Chapter 3, as are any local/regional regulations.

The methodology used in Chapter 4 to analyze potential impacts for each resource follows the definition of the resource sections in this appendix. In general, throughout this EIS, the levels of significance of impacts are classified as major, moderate, minor, negligible or "no impact." An impact is considered major if it would result in a substantial adverse change to the environment. An impact is considered moderate or minor if it would not result in substantial adverse environmental effects but could still have some effect. The determination of whether an impact is moderate or minor is described within each resource category. In contrast to "no impact," a negligible impact could occur but at the lowest limits of detection of an effect. In cases where no impact would occur, this conclusion is noted. Quantitative thresholds are applied, where appropriate, to determine the level of significance (for example, quantitative thresholds are commonly used to determine impact levels in the areas of noise and air quality). Other issues are assessed qualitatively based on context and intensity.

A.1 NOISE

A.1.1 Definition of the Resource

Noise is considered to be unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or

impulsive, stationary or transient. Stationary sources are normally related to specific land uses (e.g., housing tracts or industrial plants). Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports) or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source (e.g., an aircraft) and the receptor (e.g., a person or animal). The duration of a noise event, and the number of times noise events occur, are also important considerations in assessing noise impacts.

As a basis for comparison when noise levels are considered, it is useful to note that at distances of about 3 feet, typical kitchen appliances range from about 83 to 88 decibels (dB), rock bands approach 110 dB, and normal conversation from about 3 feet would be approximately 60 dB. Figure C-2 in Appendix C depicts typical A-weighted sound pressure levels for various common sources.

A.1.1.1 Noise Metrics

To assess noise impacts in the vicinity of each installation, the United States Air Force (USAF) has used both a cumulative metric, known as the Day-Night Average Sound Level (DNL), and a single event metric, known as the Sound Exposure Level (SEL). DNL is used to analyze a community's exposure to noise while SEL is useful in describing what an individual might experience on the ground as an aircraft passes by and to assess potential for sleep disturbance and interference with activities. SEL is used to assess the potential impacts of noise on structures and animals. Appendix C provides more detailed information regarding noise and the analysis of impacts from changes to the noise environment.

The frequency, sound level, and duration of aircraft overflight noise events depend on variables including aircraft type and model (engine type), aircraft configuration (i.e., flaps, landing gear, etc.), engine power setting, aircraft speed, distance between the observer and the aircraft flight track, temperature, humidity, and altitude. Therefore, extensive noise data are collected for various types of aircraft/engines at different power settings and phases of flight. This database of aircraft noise provides a basis for calculation of average individual-event sound descriptors for specific aircraft operations at any location under varying meteorological conditions. The reference values are adjusted to any location by applying appropriate corrections for the variables.

Averaged Noise Metrics

DNL is a composite metric that accounts for all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, a 10 dB penalty is applied to nighttime events (10 p.m. to 7 a.m.). This "noise penalty" is an effort to account for increased human sensitivity to late night noise events. The summation of sound during a 24-hour period does not ignore the louder single events; it actually tends to emphasize both the sound level and number of those events. The logarithmic nature of the dB unit causes sound levels of the loudest events to control the 24-hour average.

DNL is the accepted unit for quantifying annoyance to humans from general environmental noise, including aircraft noise. The Federal Interagency Committee on Urban Noise (FICUN) developed land use compatibility guidelines for noise exposure areas (FICUN 1980). Based upon these FICUN guidelines, the Federal Aviation Administration (FAA) developed recommended land uses in aircraft noise exposure areas. The USAF and FAA use DNL as the method to estimate the amount of exposure to aircraft noise and predict impacts. Land use compatibility and incompatibility are determined by comparing the predicted DNL at a site with the recommended land uses (Appendix C).

A.1.1.2 Noise Modeling

There are a variety of tools available to model noise at and around airfields. NOISEMAP is a computer program used to model noise exposure in the vicinity of military airfields due to aircraft flights and engine run-up activities. Noise contours generated by NOISEMAP are used in support of the USAF Air Installation Compatible Use Zone (AICUZ) program and National Environmental Policy Act (NEPA) documentation, such as this Environmental Impact Statement (EIS). The model generates noise contours based on numerous input data that are used to evaluate noise in the vicinity of airfields where military activity occurs. Part 150 of the Federal Aviation Regulations (FAR), *Airport Noise Compatibility Planning*, sets forth standards for airport operators to use in documenting noise exposure in the civilian airport environs and establishing programs to minimize noise-related land use incompatibilities. The FAA uses the Integrated Noise Model (INM), a computer model that evaluates aircraft noise impacts in the vicinity of commercial airports.

A.1.1.3 Potential Hearing Loss

Noise-related hearing loss risk has been studied extensively. Findings of studies and resulting policies and regulations are discussed briefly below and in more detail in Appendix C. As per Department of Defense (DoD) policy memorandum (2009), populations exposed to noise greater than 80 dB DNL were identified as being at the most risk for potential hearing loss (Undersecretary of Defense for Acquisition Technology and Logistics 2009). The DoD policy

directs that hearing loss risk should be assessed using the methodology described in United States Environmental Protection Agency (USEPA) Report No. 550/9-82-105, *Guidelines for Noise Impact Analysis* (USEPA 1982). USEPA's *Guidelines for Noise Impact Analysis* quantify hearing loss risk in terms of Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in the threshold level below which a sound cannot be heard. NIPTS is stated in terms of the average threshold shift at several frequencies that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with exposure lasting 8 hours per day for 5 days per week.

The actual value of NIPTS for any given person depends on that individual's physical sensitivity to noise. Over a 40-year working lifetime, some people will experience more loss of hearing than others. The actual noise exposure for any person living in an area subject to 80 dB DNL or greater is determined by the length of time that a person is outdoors and directly exposed to the noise. For example, noise exposure within an 80 dB DNL noise contour near an airfield would be affected by whether a person was at home during the daytime hours when most flying occurs. Many people would be inside their homes and would, therefore, be exposed to lower noise levels due to noise attenuation provided by the house structure.

Workplace Noise

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dB as an 8-hour time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss (NIOSH 1998). Following the reevaluation using a new risk assessment technique, NIOSH published another criteria document in 1998 that reaffirmed the 85 dB recommended exposure limit (NIOSH 1998). Active-duty and reserve components of the USAF (including the Air National Guard [ANG]), as well as civilian employees and contracted personnel working on USAF bases and ANG installations must comply with Occupational Safety and Health Administration (OSHA) regulations (29 Code of Federal Regulations [CFR] § 1910.95 *Occupational Noise Exposure*), DoD Instruction 6055.12, *Hearing Conservation Program*; Air Force Occupational Safety and Health (AFOSH) Standard 48-20 (June 2006), and *Occupational Noise and Hearing Conservation Program* (including material derived from the International Standards Organization 1999.2 *Acoustics-Determination of Occupational Noise Exposure and Estimation of Noise Induced Impairment*). Per AFOSH Standard 48-20, the Hearing Conservation Program is designed to protect workers from the harmful effects of hazardous noise by identifying all areas where workers are exposed to hazardous noise. The following are the primary components of the program:

1. Identify noise hazardous areas or sources and ensure these areas are clearly marked.

2. Use engineering controls as the primary means of eliminating personnel exposure to potentially hazardous noise. All practical design approaches to reduce noise levels to below hazardous levels by engineering principles shall be explored. Priorities for noise control resources shall be assigned based on the applicable risk assessment code. Where engineering controls are undertaken, the design objective shall be to reduce steady-state levels to below 85 dB, regardless of personnel exposure time, and to reduce impulse noise levels to below 140 dB peak sound pressure level.

3. Ensure workers with an occupational exposure to hazardous noise complete an initial/reference audiogram within 30 days from the date of the workers' initial exposure to hazardous noise.

4. Ensure new equipment being considered for purchase has the lowest sound emission levels that are technologically and economically possible and compatible with performance and environmental requirements. 42 United States Code (USC) Section 4914, *Public Health and Welfare, Noise Control, Development of Low-Noise Emission Products*, applies.

5. Education and training regarding potentially noise hazardous areas and sources, use and care of hearing protective devices, the effects of noise on hearing, and the Hearing Conservation Program.

A.1.2 Methodology

A.1.2.1 Aircraft Noise

Noise associated with flying operations and construction activities related to the Proposed Action are considered and compared with baseline conditions to assess potential impacts. Data developed during this process also supports analyses in the biological, cultural, land use, and environmental justice and the protection of children resource areas. When analyzing noise effects on humans, public annoyance is the most common impact associated with exposure to elevated noise levels, and the DNL noise metric has been strongly correlated to public annoyance. When subjected to a DNL of 65 dB, approximately 12 percent of the persons exposed would be expected to be "highly annoyed" by the noise (Finegold *et al.* 1994). At levels below 60 dB DNL, the percentage of annoyance is substantially lower (less than 8 percent), and at levels above 70 dB DNL it is substantially higher (approximately 25 percent) (Table A.1.2-1). A 75 dB DNL is also the threshold above which effects other than annoyance may occur (Committee on Hearing, Bioacoustics, and Biomechanics 1977). According to USAF land use guidelines, 65 dB DNL is the highest aircraft noise level that is normally compatible with residential uses (FICUN 1980). Even with special noise attenuation measures installed, residential developments are never considered to be compatible with a DNL of 75 dB or higher.

Table A.1.2-1. Theoretical Percentage of Population Highly Annoyed by Noise Exposure

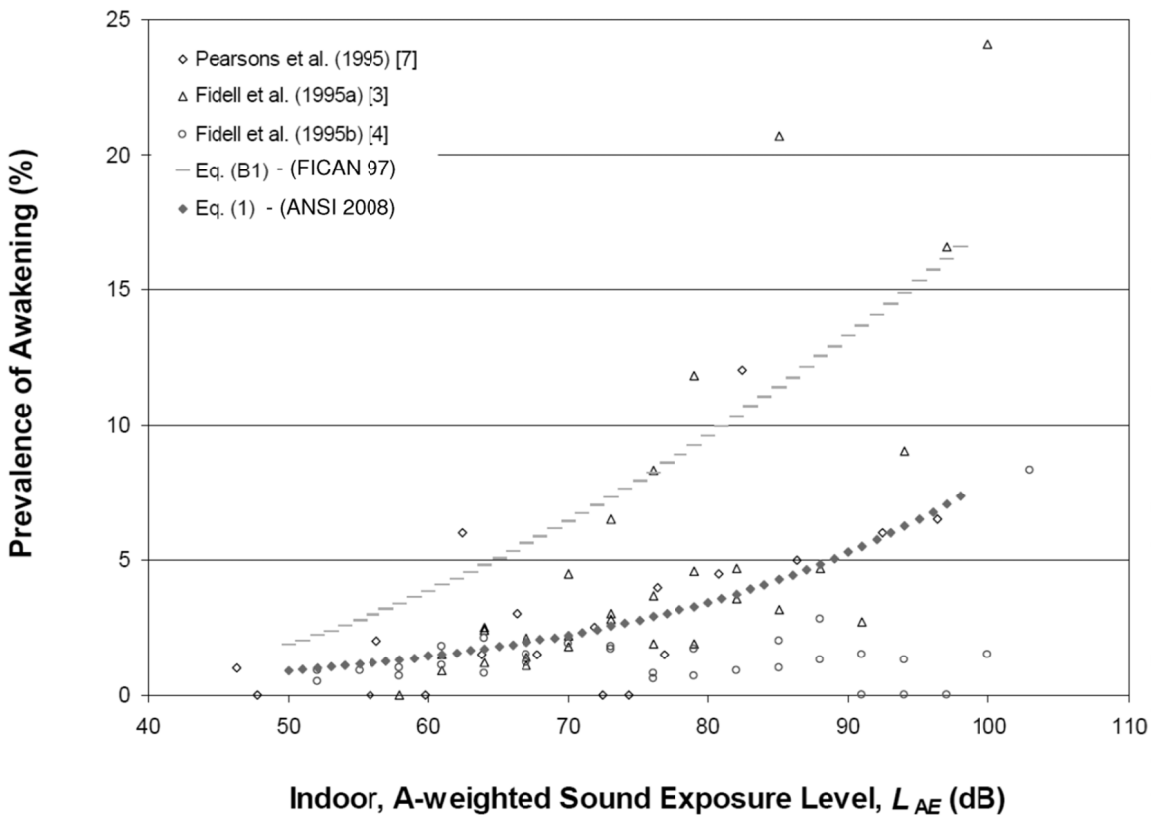
DNL Intervals in dB	*Percentage of Persons Highly Annoyed*
<65	<12
65-70	12-22
70-75	22-37
75-80	37-54
>80	>61

Note: Noise impacts to individuals vary as do individual reaction to noise. This is a general prediction of the percent community highly annoyed based on environmental noise surveys conducted around the world.

dB = decibel; DNL = Day-Night Average Sound Level

Source: Finegold *et al.* 1994.

Sleep disturbance is often considered an adverse reaction from aircraft operations in the vicinity of an airport. While there are currently no established criteria for evaluating sleep disturbance from aircraft overflights, recent studies suggest setting the threshold of outdoor SEL of 90 dB, an indoor SEL of 65 dB (25 dB lower) when windows are closed, and an indoor SEL of 75 dB (15 dB lower) when windows are open (DNWG 2009). Figure A.1.2-1 depicts the prevalence of awakening based on indoor SELs. This analysis is based on the change in aircraft operations resulting from the conversion of the KC-135 to the KC-46A. The total number of operations flown by all other aircraft would not change and sleep disturbance from those activities would remain as they are today. Based on the minor changes to the noise environment, sleep disturbance was dismissed from detailed analysis.



Source: ANSI S12.9-2008 Plot of Sleep Awakening Data versus indoor SEL

Figure A.1.2-1. Prevalence of Awakening

Speech Interference is a primary cause for annoyance and often leads to disruption of routine activities such as listening to the radio or television, using a telephone or having conversations. The quality of speech communication is also linked to disruption of classrooms and the potential for adverse effects on children's learning ability. Those areas where speech interference occurs from current KC-135 aircraft operations would be expected to continue with the beddown of the KC-46A. This analysis is based on the change in aircraft operations resulting from the conversion of the KC-135 to the KC-46AA. The total number of operations flown by all other aircraft would not change and speech interference from those activities would remain as they are today. Based on the minor changes to the noise environment, speech disturbance was dismissed from detailed analysis.

For the purposes of this EIS, the significance of potential noise impacts is based on the noise sensitivity in areas affected by substantially increased noise levels under the Proposed Action. Generally, noise impacts could be considered significant if they would:

- increase in DNL by greater than 1.5 dB at one or more noise sensitive locations (e.g., residential areas) within the 65 dB DNL noise contour;

- newly expose noise-sensitive land uses, such as residential areas, to noise levels at which they are not considered to be compatible without sound attenuation (at or above 65 dB DNL), according to federal land use guidelines; and
- increase noise levels at any facility to a point at which current functions could not be carried out efficiently.

Actual noise measurements for the KC-46A have not been obtained. Therefore, the USAF developed a set of noise data that can be used as a substitute for the KC-46A until such time as actual noise data becomes available. This data is not available in the INM program; therefore, the B767-300 was used as a substitute aircraft at civilian airports. Based on this substitute data, on a one-to-one basis, the KC-46A is slightly quieter than both the KC-135 and B767-300 (Table A.1.2-2).

Table A.1.2-2. Aircraft Noise Level Comparison

Aircraft	*Power Setting*	SEL (dB) at Overflight Altitude in Feet			
		1,000 feet	*2,000 feet*	*5,000 feet*	*10,000 feet*
Landing					
KC-46A	60% N1	85	79	70	61
KC-135	65% NF	90	84	75	67
B767-300	12,000 lbs	89	83	76	67
Takeoff					
KC-46A	92% N1	96	88	78	69
KC-135	90% NF	95	91	81	73
B767-300	33,000 lbs	95	90	80	74

Notes: Power Setting nomenclature is based on the instruments available in each aircraft.
Power Unit: lbs = Pounds of Thrust; NF = Engine Fan; N1 = Engine Speed
Standard Atmospheric Data, airspeeds normalized to 160 knots indicated airspeed.
Sources: NOISEMAP 7 Omega 10 Results; INM 2007.

Baseline and proposed noise contours were developed using the noise model that was used to generate the most current noise contour for each installation. For Joint Base McGuire-Dix-Lakehurst (JB MDL) and Forbes Air National Guard Station (ANGS), noise modeling was completed using the NOISEMAP program, and for Pease ANGS, Pittsburgh ANGS, and Rickenbacker ANGS, the FAA's INM model was used. Where NOISEMAP was used, the USAF-developed KC-46A substitute noise data was used. At airports where INM was used, the KC-46A was modeled using the B767-300 as the substitute aircraft. The KC-46A is a militarized version of the B767-300 with both aircraft powered by two Pratt and Whitney PW4062 turbofan engines. Information specific to each location is presented in Chapter 3 of each alternative.

There are a variety of data that are input into the NOISEMAP and INM computer programs to develop noise contours, and include such variables as: physical description of the airport, number and mix of aircraft operations, aircraft configurations (engine power, airspeed, altitude), day-night split of operations (by aircraft type), runway utilization rates, prototypical flight track

descriptions, and flight track utilization rates. This information by type of aircraft/engine and meteorological variables are assembled and processed for input into either the NOISEMAP or INM programs. Contours are generated as 5 dB intervals beginning at 65 dB DNL. DNL less than 65 dB are considered unconditionally compatible with residential land use (see Table A.1.7-1). While there is no technical reason why a at or above a DNL 65 dB cannot be measured or calculated for comparison purposes, this DNL provides a valid basis for comparing and assessing community noise effects, and when in the airport vicinity, represents a noise exposure level that is normally dominated by aircraft noise rather than other community or nearby highway noise sources.

A.1.2.2 Construction Noise

Construction noise is generated by the use of heavy equipment on job sites and is short-term in duration (i.e., the duration of the construction period). Typical noise levels from heavy equipment range from 69 to 84 dB at 100 feet from the source (FHA 2006). Noise from construction would be temporary and construction projects would be undertaken adjacent to the flightline away from any off-base communities. Construction noise would be expected to be contained within base environs and therefore has not been carried forward for detailed analysis in this EIS.

A.2 AIR QUALITY

A.2.1 Definition of Resource

Ambient air quality refers to the atmospheric concentration of a specific compound that occurs at a particular geographic location. The ambient air quality levels measured at a particular location are determined by the interactions of emissions, meteorology, and chemistry. When discussing air quality, it is important to consider the types, amounts, and locations of pollutants emitted into the atmosphere. Meteorological factors that affect air quality include wind and precipitation patterns that can affect the distribution, dilution, and removal of pollutant emissions from the atmosphere. Furthermore, chemical reactions in the atmosphere can transform pollutant emissions into other chemical substances. Ambient air quality data are generally reported as a mass per unit volume (e.g., micrograms per cubic meter [$\mu g/m^3$] of air) or as a volume fraction (e.g., parts per million [ppm] by volume).

Air quality is defined by ambient air concentrations of specific pollutants determined by the USEPA to be of concern with respect to the health and welfare of the general public. Pollutant emissions typically refer to the amount of pollutants or pollutant precursors introduced into the atmosphere by a source or group of sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutant concentrations

measured in the ambient air or by interacting in the atmosphere to form criteria pollutants. Primary pollutants, such as carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), and some particulates, are emitted directly into the atmosphere from emission sources.

Secondary pollutants, such as ozone (O_3), nitrogen dioxide (NO_2), and some particulates, are formed through atmospheric chemical reactions that are influenced by meteorology, ultraviolet light, and other atmospheric processes. Suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}) and particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$) are generated as primary pollutants by various mechanical processes (for example, abrasion, erosion, mixing, or atomization) or combustion processes. However, PM_{10} and $PM_{2.5}$ can also be formed as secondary pollutants through chemical reactions or by gaseous pollutants that condense into fine aerosols. In general, emissions that are considered "precursors" to secondary pollutants in the atmosphere (such as volatile organic compounds [VOCs] and oxides of nitrogen [NO_x], which are considered precursors for O_3) are the pollutants for which emissions are evaluated to control the level of O_3 in the ambient air.

The ROI for this discussion can vary according to pollutant. For pollutants that do not undergo a chemical reaction after being emitted from a source (i.e., direct emissions), the ROI is generally restricted to a region in the immediate vicinity of the installation. These pollutants include CO, SO_2, and directly-emitted PM_{10} and $PM_{2.5}$. For pollutants that undergo chemical reactions and interact within the atmosphere to form secondary pollutants, such as O_3 and its precursors NO_x and VOCs, and precursors of PM_{10} and $PM_{2.5}$, the ROI is a larger regional area. The chemical transformations and interactions that create O_3 and secondary PM_{10} and $PM_{2.5}$ can take hours to occur; therefore, the precursor pollutants may be emitted some distance from the impact area depending on weather conditions.

Mixing height is another factor used in defining the ROI for various pollutants. The mixing height is the upper vertical limit of the volume of air in which emissions may affect air quality. Emissions released *above* the mixing height are typically restricted from affecting ground level ambient air quality in the region, while emissions of pollutants released *below* the mixing height may affect ground level concentrations. The portion of the atmosphere that is completely mixed begins at ground level and may extend up to heights of a few thousand feet. Mixing height varies from region to region based on daily temperature changes, amount of sunlight, and other climatic factors. The USEPA has defined a default mixing height as 3,000 feet above ground level (AGL); however, a more refined mixing height may be used based on regional parameters. The specific ROI for each installation is discussed under each alternative location section.

A.2.2 Regulatory Setting

A.2.2.1 National Ambient Air Quality Standards

As part of the Clean Air Act (CAA), the USEPA has established criteria for seven major pollutants of concern, called "criteria pollutants." These criteria pollutants include CO, SO_2, NO_2, O_3, PM_{10}, $PM_{2.5}$, and Pb. The criteria set for these pollutants, the National Ambient Air Quality Standards (NAAQS), represent maximum levels of background pollution that are considered safe, with an adequate margin of safety to protect the public health and welfare. Based on measured ambient criteria pollutant data, the USEPA designates areas in the United States (U.S.) as having air quality better than (attainment) or worse than (nonattainment) the NAAQS.

Once a nonattainment area meets the standards and additional redesignation requirements in the CAA (Section 107(d)(3)(E)), USEPA will designate the area as a "maintenance area." Maintenance areas are subject to the requirements of maintenance plans that are designed to ensure that the area continues to meet the standards. A maintenance area remains subject to the General Conformity Rule.

A.2.2.2 Prevention of Significant Deterioration

The CAA also established a national goal of preventing degradation or impairment in federally designated Class I areas. Class I areas are defined as those areas where any appreciable degradation in air quality or associated visibility impairment is considered significant. As part of the Prevention of Significant Deterioration (PSD) Program, Congress assigned mandatory Class I status to all national parks, national wilderness areas (excluding wilderness study areas or wild and scenic rivers), and memorial parks greater than 5,000 acres. In Class I areas, visibility impairment is defined as atmospheric discoloration (such as from an industrial smokestack), and a reduction in regional visual range. Visibility impairment or haze results from smoke, dust, moisture, and vapor suspended in the air. Very small particles are either formed from gases (sulfates, nitrates) or are emitted directly into the atmosphere from sources like electric utilities, industrial processes, and vehicle emissions. Stationary sources are regulated under the PSD Program, and the PSD permitting process requires a review of impacts to all Class I areas within 62 miles (100 kilometers) of any proposed major stationary source. Mobile sources, including aircraft and associated operations such as those occurring at the alternative ANG installations being considered under this Proposed Action, are not subject to the requirements of PSD.

A.2.2.3 Hazardous Air Pollutants

In addition to criteria pollutants, the USEPA has defined 187 substances as hazardous air pollutants (HAPs). HAPS are substances that have been determined to present some level of

acute or chronic health risk (cancer or non-cancer) to the general public. These pollutants may be emitted in trace amounts from various types of sources, including combustion sources. HAPs are regulated for specific source categories under the USEPA's *National Emission Standards for Hazardous Air Pollutants* regulations.

A.2.2.4 Greenhouse Gases

Greenhouse gases (GHGs) are also regulated under the federal CAA. The USEPA defines GHGs as any of the following compounds: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. GHGs have varying global warming potential (GWP). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main GHGs that have been attributed to human activity include CH_4, which has a GWP of 21, and N_2O, which has a GWP of 310. Carbon dioxide equivalent (CO_2e) emissions are defined as the amount of CO_2 that would have the same GWP, when measured over a specified timescale (generally, 100 years). CO_2e emissions are calculated by multiplying the mass emissions by the GWP.

A.2.2.5 State Implementation Plan

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. Each state enforces air pollution regulations and sets guidelines to attain and maintain the NAAQS and state Ambient Air Quality Standards (AAQS) within each respective state associated with the Proposed Action; these guidelines are found in each state's State Implementation Plan (SIP).

Some of the state AAQS are more stringent than the NAAQS, which translates into more emissions reductions generally within the region being required to show that it has attained an applicable AAQS than will be required to show its attainment of the comparable NAAQS.

Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule, states that a federal agency cannot issue a permit for or support an activity unless the agency determines that it will conform to the most recent USEPA-approved SIP. This means that projects using federal funds or requiring federal approval must not: 1) cause or contribute to any new violation of a NAAQS, 2) increase the frequency or severity of any existing violation, or 3) delay the timely attainment of any standard, interim emission reduction, or other milestone. If emissions of one or more of these compounds exceed a *de minimis* threshold, the USAF must demonstrate conformity under one of the methods prescribed by the General Conformity Rule.

A.2.3 Methodology

The Proposed Action involves both the beddown of the KC-46A aircraft and its operational emissions, construction of new facilities to accommodate the new aircraft, and emissions related to a minor change in personnel commuting to the alternative installations. Environmental consequences to air quality were evaluated to assess whether degradation in air quality would be anticipated from implementation of the Proposed Action at any of the alternative installations. Air quality impacts from the KC-46A beddown were reviewed for significance relative to federal, state, and local air pollution standards and regulations. In the case of criteria pollutants for which the ROI is in attainment of the NAAQS, the analysis used the PSD threshold for new major sources of 250 tons per year (tpy) of that pollutant as an indicator of significance or non-significance of projected air quality impacts. In the case of criteria pollutants for which the project region does not attain an NAAQS or is in a maintenance area, the analysis used the pollutant threshold that triggers a conformity determination (the *de minimis* threshold) under the General Conformity Rule. If proposed emissions exceed a PSD threshold for attainment pollutants or a *de minimis* threshold for nonattainment pollutants, further analysis was conducted to determine whether impacts would be significant. In such cases, if emissions attributable to the Proposed Action (1) do not contribute to an exceedance of an ambient air quality standard, or (2) conform to the approved SIP, air quality impacts would be less than significant.

Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (USEPA 1995), the USEPA NONROAD 2008a model for nonroad construction equipment (USEPA 2009), and the USEPA MOVES 2010b model for on-road vehicles (USEPA 2013b).

The Proposed Action would include construction activities at the alternative installations. Emissions associated with construction were calculated using construction source emission rates from the *Compilation of Air Pollutant Emission Factors,* AP-42, Volume I (USEPA 1995), the USEPA NONROAD2008 model for nonroad construction equipment (USEPA 2009), and the emission factors for vehicles from the Air Force Civil Engineer Center (AFCEC) *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013) to calculate emissions from fugitive dust, construction equipment, and vehicles. Appendix D includes data and assumptions used to calculate proposed construction emissions.

Air quality impacts from construction would occur from (1) combustion emissions due to the use of fossil fuel-powered equipment and vehicles, and (2) fugitive dust emissions (PM_{10}) during demolition activities, earth-moving activities, and the operation of equipment on bare soil. Fugitive dust emissions were calculated based on the total site disturbance projected for each construction project for all construction years. Equipment usage was based on similar construction projects to estimate project combustion and fugitive dust emissions.

Inclusion of standard construction practices and Leadership in Energy and Environmental Design (LEED) certification level of Silver into proposed construction activities would minimize air quality impacts from proposed construction activities. For example, the analysis reduced fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels to simulate implementation of standard construction practices for fugitive dust control.

These standard construction practices for fugitive dust control include the following.

- Use water trucks to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust.
- Minimize the amount of disturbed ground area at a given time.
- Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site and stabilize all disturbed areas with water application.
- Designate personnel to monitor the dust control program and to increase watering, as necessary, to minimize the generation of dust.

Operational emissions associated with each alternative associated with the Proposed Action include emissions associated with aircraft operations and associated equipment. Mobile source emissions include emissions from aircraft operations (take-offs and landings), aerospace ground equipment (AGE), privately owned vehicle (POV) operations, and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Air quality impacts associated with the Proposed Action for the KC-46A aircraft were assessed by comparing the projected net emissions associated with KC-46A operations with emissions associated with existing operations for the KC-135 aircraft. Emissions evaluated for both the baseline and the Proposed Action at each alternative installation include (1) aircraft operations; (2) POVs, (3) engine run-ups, and (4) AGE use. It was assumed that there would be no net change in use of government motor vehicles (GMVs), construction (outside of the construction activities associated with the Proposed Action), or stationary sources. Emissions from these categories of sources were calculated based on guidance from the USAF in their *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013) utilizing the latest air emissions modeling tools. Factors used to calculate combustive emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A and KC-135 engines are based on those currently used for the KC-135 aircraft in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). A detailed description of the methodology and assumptions used for each source category is provided in Appendix D.

There are no final guidelines for discussing the potential GHG impacts in Environmental Impact Analysis Process documents. The Council on Environmental Quality (CEQ) proposed draft guidance for public comment and review on February 18, 2010, but this draft has never been formally adopted by CEQ. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this EIS for information and comparison purposes.

A.3 SAFETY

A.3.1 Definition of Resource

The USAF manages risk as outlined in Air Force Instruction (AFI) 90-802 *Risk Management* (USAF 2013a). Requirements defined in this document provide a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety analysis contained in this EIS addresses issues related to the health and well-being of both military personnel and civilians living in the vicinity of the alternative airfields. Specifically, this section provides information on both ground and flight safety. Ground safety includes discussions of fire/crash response capabilities, Accident Potential Zones (APZs)/Runway Protection Zones (RPZs), explosive safety, and Anti-Terrorism/Force Protection (AT/FP). Flight safety includes discussions on flight safety procedures, aircraft mishaps, bird/wildlife aircraft strike hazards (BASH), and fuel jettison requirements.

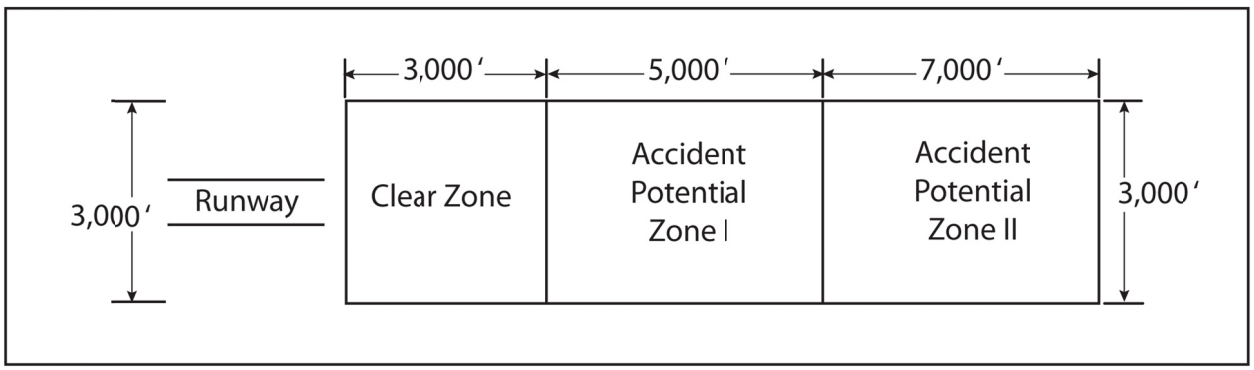
A.3.1.1 Ground Safety

Fire/Crash Response

Military airfields present special hazards to rescue and response personnel. Due to the nature of combustibles involved in an aircraft crash, and the physical forces that are experienced, strategic priorities differ from other types of firefighting scenarios. In Aircraft Rescue and Fire Fighting (ARFF), the emphasis is more heavily weighted toward rescue than in structural firefighting. The rule of thumb is initially to fight only the fire that interferes with the rescue. Under the DoD Instruction 6055.6, *DoD Fire and Emergency Services Program*, each military airport is required to have a dedicated rescue team composed of trained fire fighters whose mission includes specific aircraft rescue tasks. Military airports are equipped with rescue vehicles staffed by ARFF personnel using state-of-the-art rescue tools.

Accident Potential Zone/Runway Protection Zone

Clear Zones and APZs/RPZs are established at military and civilian airfields to delineate recommended surrounding land uses for the protection of people and property on the ground. Clear Zones and APZs define the areas in the vicinity of a military airfield that would have the highest potential to be affected if an aircraft mishap were to occur. The Clear Zone extends 3,000 feet by 3,000 feet off the end of the runway, followed by a 3,000-foot by 5,000-foot APZ I, and a 3,000-foot by 7,000-foot APZ II (Figure A.3.1-1) (DoD Instruction 4165.57, 2011). Similar to APZs, but used at civilian airports, RPZs are trapezoidal zones extending outward from the ends of active runways at commercial airports, and as with APZs, delineate those areas recognized as having the greatest risk of aircraft mishaps, most of which occur during take-off or landing. Development restrictions within RPZs are intended to discourage incompatible land use activities from being established in these areas. The RPZ dimension for a particular runway end is a function of the type of aircraft and minimum approach visibility associated with that runway end. For most commercial airports (e.g., Rickenbacker or Pittsburgh International Airport [IAP]) with large aircraft, the departure RPZ begins 200 feet from the end of the runway and continues out to 1,700 feet, with a width beginning at 500 feet and expanding as the distance from the runway increases to 1,010 feet wide (FAA 2009). The approach RPZ begins 200 feet before the runway threshold and extends out 1,700 feet in a reverse of the departure RPZ (Figure A.3.1-2) (FAA 2009).



Source: DoD 2011.

Figure A.3.1-1. Accident Potential Zones

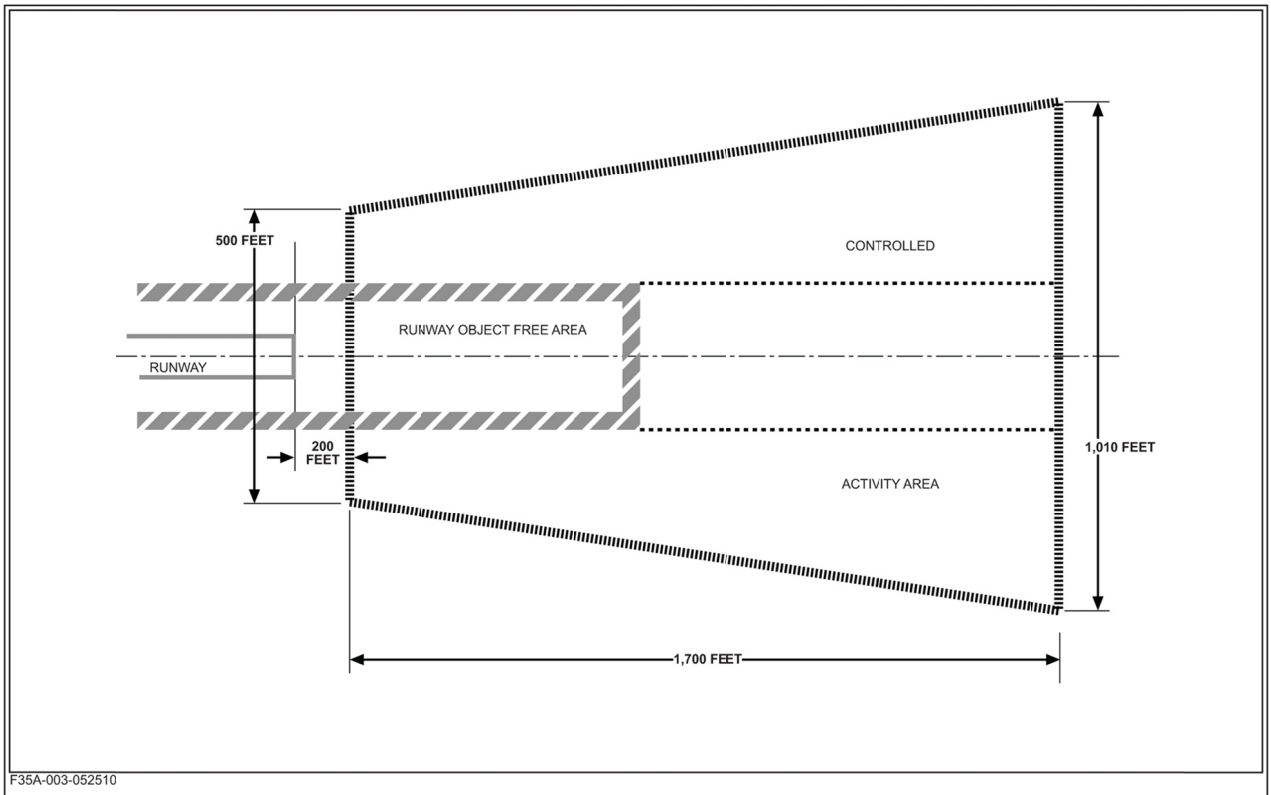


Figure A.3.1-2. Runway Protection Zones

Explosive Safety

Quantity-distance (QD) arcs define levels of risk considered acceptable for potential explosive sites. Separation distances are buffers that provide relative protective or safe distances. QD standards were developed over many years and are based on explosives mishaps and tests. All ordnance is handled and stored in accordance with USAF explosive safety directives (AFI 91-201), and all munitions maintenance is carried out by trained, qualified personnel using USAF-approved technical data.

Anti-Terrorism/Force Protection

AT/FP standards seek effective ways to minimize the likelihood of mass casualties from terrorist attacks against DoD personnel in the buildings in which they work and live. These standards provide minimum levels of protection against terrorist attacks for the occupants of all DoD inhabited buildings. They are intended to be used by security and anti-terrorism personnel and design teams to identify the minimum requirements that must be incorporated into the design of all new construction and major renovations of inhabited DoD buildings. They also include recommendations that should be, but are not required to be, incorporated into all such buildings.

A.3.1.2 Flight Safety

Flight Safety Procedures

The Air Force Safety Center (AFSEC) recently initiated several facets for proactive flight safety. While investigations after an accident have yielded causality of mishaps, proactive safety entails searching for and measuring precursors that can lead to accidents before they occur. In mission planning, pre-flight, and during flight, safety is at the forefront of all USAF operations. By AFI, each unit conducting or supporting flight operations must have a flight safety program to support its mission and foster a culture of mishap prevention (USAF 2013a).

Aircraft Mishaps

Aircraft mishaps are classified as A, B, C, or D (Table A.3.1-1). Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability. It is important to note that in 2010, the threshold for determining Class A and B mishaps was raised from $1 million to $2 million dollars for Class A and the ceiling was raised for Class B to two million dollars. Comparison of Class A mishap rates for various aircraft types, as calculated per 100,000 flying hours, provides the basis for evaluating risks among different aircraft and levels of operations. Each base-specific safety section analyzes existing and projected Class A mishap potentials based on flying hours and aircraft types.

Table A.3.1-1. Aircraft Class Mishaps

Mishap Class	*Total Property Damage*	*Fatality/Injury*
A	$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	$500,000 or more but less than $2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	$50,000 or more but less than $500,000	Nonfatal injury resulting in loss of one or more days from work beyond day/shift when injury occurred
D	$20,000 or more but less than $50,000	Recordable injury or illness not otherwise classified as A, B, or C

Source: DoD 2011.

Bird/Wildlife Aircraft Strike Hazard

BASH and the dangers it presents form another safety concern for aircraft operations. BASH constitutes a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area. Aircraft can encounter birds at nearly all altitudes up to 30,000 feet above mean sea level (MSL); however, most birds fly close to the ground. According to the AFSEC BASH statistics, more than 50 percent of bird/wildlife strikes occur below 400 feet, and 90 percent occur at less than 2,000 feet above ground level (AGL) (AFSEC 2012a). Of these strikes, approximately 49 percent occur in the

airfield environment (AFSEC 2012b). Waterfowl present the greatest BASH potential due to their congregational flight patterns and because, when migrating, they can be encountered at altitudes up to 20,000 feet AGL. Raptors also present a substantial hazard due to their size and soaring flight patterns. In general, the threat of bird/wildlife aircraft strikes increases during March and April and from August through November due to migratory activities. The USAF BASH program was established to minimize the risk for collisions of birds/wildlife and aircraft and the subsequent loss of life and property. In accordance with AFI 91-202_AFGM2, *U.S. Air Force Mishap Prevention Program* (USAF 2013b), each flying unit in the USAF (including the Air Force Reserve Command and ANG) must develop a BASH plan to reduce hazardous bird/wildlife activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at airfields by creating an integrated hazard abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined in the plan include monitoring the airfield for bird and other wildlife activity, issuing bird hazard warnings, initiating bird/wildlife avoidance procedures when potentially hazardous bird/wildlife activities are reported, and submitting BASH reports for all incidents.

Fuel Jettison

Aircraft have two major types of weight limits: the maximum take-off weight and the maximum structural landing weight, with the maximum structural landing weight almost always being the lower of the two. This allows an aircraft on a normal, routine flight to take off at the higher weight, consume fuel en route, and arrive at a lower weight. If a flight takes off at the maximum take-off weight and then faces an emergency situation whereupon it must return to the departure airfield, there will not be time to consume the fuel intended for transit to the original destination, and the aircraft may exceed the maximum landing weight to land at the departure airfield. At this point, if the aircraft is capable, sufficient fuel would be jettisoned to reduce the aircraft's weight below that maximum landing weight limit and then it would land. This rare phenomenon is known as fuel jettisoning. AFIs cover the fuel jettison procedures, and local operating policies define specific fuel jettison areas for each base. The KC-46A, like the KC-135 aircraft, has the ability to jettison fuel in cases of emergency and non-emergency situations. Data on historical KC-135 operations show that slightly less than two sorties per thousand resulted in a release of fuel (Headquarters Air Mobility Command [AMC] 2013). The KC-46A can land at its maximum take-off weight; therefore, KC-46A sorties would rarely require fuel jettison. However, depending on the type and severity of an emergency, there is always the possibility of the requirement to adjust gross weight quickly for aircraft maneuverability/control for safety based on the nature of an emergency. If there are flight control issues, etc. where the aircraft needs to be at a lower gross weight for aircraft safety, then fuel jettisoning could take place.

Current USAF policy is designed to minimize potential impacts of fuel jettison events. The continued use of such strategies, in addition to the following tactics, would minimize the deposition of fuel onto the ground from a KC-46A fuel jettison event:

- Fuel jettison would occur at a minimum altitude of 20,000 feet AGL, whenever possible.
- Release fuel in a straight line.
- Release fuel at a right angle to flight level wind direction.
- Release fuel as slowly as possible.
- Release fuel at as fast of an aircraft speed as possible.
- Release fuel at as high of an altitude as possible.

For this EIS, previous studies and fuel jettisoning models were reviewed to determine if fuel jettisoning impacts were a concern to the well-being of humans and the environment. The analysis concluded that maximum fuel deposition values expected from the KC-46A would not produce substantial or significant impacts to human or natural resources (Headquarters Air Mobility Command AMC 2013).

In addition to military procedures, the FAA sets requirements for when and how fuel jettisoning may occur. The FAA instruction stipulates that, whenever possible, fuel can only be jettisoned above a minimum altitude of 20,000 feet AGL to improve its evaporation, and that a jettisoning aircraft must be separated from other air traffic by at least 5 miles (FAA 2012). Air traffic controllers are also instructed to direct planes dumping fuel away from populated areas and over large bodies of water to the extent practicable. In 2001, the USEPA National Vehicle and Fuel Emissions Laboratory concluded, "Since fuel dumping is a rare event, and the fuel would likely be dispersed over a very large area, we believe its impact to the environment would not be serious" (USEPA 2001).

The primary environmental concern from fuel jettison from an aircraft is for it to negatively impact human health or natural resources. The results of a study by Harvey Clewell concluded that if JP-4 jet fuel was jettisoned above a critical altitude of 20,000 feet AGL, the ultimate ground fall and related environmental impact would be negligible (Clewell 1980). The dumped fuel evaporates completely or it is transformed before reaching the ground. Only at significant lower dumping altitude or during strong precipitation, it may be possible that finest fuel droplets reach the ground.

With the USAF transition to JP-8 jet fuel, further studies on the effects of fuel jettisoning were warranted as the lower volatility of JP-8 fuel increases the time required for complete evaporation at ambient temperatures. Several mathematical models were developed and/or used to assess the impact of jettisoning JP-8 jet fuel, including an Air Force Institute of Technology model, the Fuel Jettisoning Simulation Model, and the Fuel Dumping Impact Assessment Model.

Additionally, a modified version of the Air Force Institute of Technology model, which includes surface evaporation, was used to evaluate the time required to evaporate JP-8 jet fuel after it reaches the surface.

Compared with the impact of JP-4 jet fuel, the jettisoning of JP-8 does result in more fuel reaching the surface. The surface and atmospheric temperatures greatly influence the evaporation rate of the jet fuel. Surface temperatures around 0 degrees Celsius (ºC) (32 degrees Fahrenheit [ºF]) and below result in a greater fraction of fuel reaching the surface. However, assuming a controlled release above 20,000 feet AGL and a non-freezing surface temperature, the deposition value of JP-8 is below known natural resource and human health thresholds for jet fuel and the impact should be negligible (Todd 1995). Accordingly, AFI 11-2KC-135 Volume 3, *C/KC-135 Operations Procedures*, and AMC policy establish 20,000 feet AGL as the minimum fuel jettison altitude.

A.3.2 Methodology

Based on the current commercial Boeing 767 aircraft, development and basing of the KC-46A includes a robust safety clearance program conducted by test pilots in multiple phases at the Boeing aircraft test facility. Modeling, simulation, and ground tests reduce the uncertainties of flight testing, and the flight test program ensures flight safety and reducing risks associated with new technologies.

At publication of this EIS, there have not been enough flight hours to accurately depict the specific safety record for this new aircraft. Therefore, the analysis used the similar airframe of the Boeing 767 aircraft safety records. Mishap analysis was based on that commercial aircraft to draw operational history, as well as the current refueling aircraft, the KC-135.

The assessment of safety examines how implementation of any of the alternatives would affect safety at the particular airfield location. Public safety impacts are considered relative to whether the general public is endangered as a result of proposed USAF activities. For each training activity or group of similar activities, an estimate of risk to the general public was formulated based on USAF safety procedures. Existing AFI and regulations provide operational and safety procedures for all normal USAF aerial events. Several factors were considered in evaluating the effects of USAF proposed activities on public safety. These factors include proximity to the public, access control, scheduling, public notification of events, frequency of events, duration of events, safety procedures, operational control of training events, and safety history.

A.4 SOILS AND WATER RESOURCES

A.4.1 Definition of the Resource

The term "soils" refers to the unconsolidated earthen organic or mineral materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the suitability of the ground to support man-made structures and facilities. Relative to development, soils typically are described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use.

The Farmland Protection Policy Act (FPPA) was passed by Congress as part of the Agriculture and Food Act of 1981 (Public Law 97-98) in response to findings that millions of acres of farmland were being converted to non-farm uses each year. The Agriculture and Food Act was passed in an effort to protect farmland and combat urban sprawl. Additionally, the FPPA is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance.

Water resources analyzed in this EIS include both surface and groundwater quantity and quality, and floodplains. Surface water includes all lakes, ponds, rivers, and streams and is important for a variety of reasons including irrigation, power generation, recreation, flood control, and human health. The nation's waters are protected under the Clean Water Act (CWA). The goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." Pollutants regulated under the CWA include "priority" pollutants, including various toxic pollutants; "conventional" pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH; and "non-conventional" pollutants, including any pollutant not identified as either conventional or priority. Under the CWA Section 402, it is illegal to discharge any point and/or nonpoint pollution sources into any surface water without a National Pollutant Discharge Elimination System (NPDES) permit. Specific State NPDES programs are discussed in Chapter 3 under each installation.

Groundwater includes the subsurface hydrologic resources of the physical environment and is by and large a safe and reliable source of fresh water for the general population, especially those in areas of limited precipitation and is commonly used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater also plays an important part in the overall

hydrologic cycle and its properties are described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition.

Floodplains are defined by Executive Order (EO) 11988, *Floodplain Management*, as "the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, the area subject to a one percent or greater chance of flooding in any given year" (that area inundated by a 100-year flood). Floodplains and riparian habitat are biologically unique and highly diverse ecosystems providing a rich diversity of aquatic and terrestrial species, as well as promoting stream bank stability and regulating water temperatures. EO 11988 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development whenever there is a practicable alternative.

The ROI for soils includes the locations on each installation where construction activities would occur. The ROI for water resources includes each of the five installations, as well as nearby surface waters that receive runoff generated within the specific project areas.

A.4.2 Methodology

Minimization of soil erosion and the siting of facilities in relation to soil limitations are considered when evaluating impacts to soils. Generally, impacts associated with earth resources can be avoided or minimized to a level of insignificance if proper construction techniques, erosion control measures, and structural engineering designs are incorporated into project development. Should the proposed activities have the potential to convert farmland to non-farm use, a land evaluation and site assessment would be conducted and alternative sites considered should potential adverse impacts to farmland exceed the recommended allowable level.

Adverse impacts to soils and the associated potential indirect impacts to water resources can be minimized through the implementation of standard construction practices such as those typically required to be in compliance with the CWA (i.e., the use of well-maintained silt fences or straw wattles, minimizing surficial areas disturbed, stabilization of cut/fill slopes, minimization of earth-moving activities during wet weather, and covering of soil stockpiles, as appropriate). Analysis of impacts to soil resources resulting from proposed activities examines the suitability of locations for proposed operations and activities. Impacts to soil resources can result from earth disturbance that would expose soil to wind or water erosion.

With regard to water resources, the primary concerns associated with the Proposed Action include changes to surface water drainage, effects on water quality during construction activities, and groundwater recharge. Stormwater discharges from construction activities (such as clearing,

grading, excavating, and stockpiling) that disturb 1 or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the NPDES stormwater program. Prior to discharging stormwater, construction operators must obtain coverage under an NPDES permit, which is administered by either the State (if it has been authorized to operate the NPDES stormwater program) or USEPA, depending on where the construction site is located. The permit is based on a project's overall risk and requires measures to prevent erosion and reduce sediment and other pollutants in their discharges. Compliance with this permit involves development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes site-specific management measures.

A.5 BIOLOGICAL RESOURCES

A.5.1 Definition of the Resource

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are generally referred to as *vegetation* and animal species are referred to as *wildlife*. Habitat can be defined as the resources and conditions present in an area that produces occupancy of a plant or animal (Hall *et al.* 1997). Although the existence and preservation of biological resources are intrinsically valuable, these resources also provide aesthetic, recreational, and socioeconomic values to society. This analysis focuses on species or vegetation types that are important to the function of the ecosystem, of special societal importance, or are protected under federal or state law or statute. For purposes of this EIS, these resources are divided into four major categories: vegetation, wildlife, special status species, and wetlands.

Vegetation types include all existing terrestrial plant communities as well as their individual component species. The affected environment for vegetation includes only those areas potentially subject to ground disturbance.

For the purposes of this analysis, *wildlife* includes all fish, amphibian, reptile, bird, and mammal species with the exception of those identified as special status species (special status wildlife species are addressed separately due to their protected status). Wildlife also includes those bird species protected under the federal Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and other species-specific conservation legal authorities. Assessment of a project's effect on migratory birds places an emphasis on "species of concern" as defined by EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Additional assessment of potential impacts to migratory birds that are regionally rare occurs under the special status species category.

Special Status Species are defined as those plant and animal species listed as endangered, threatened, and species proposed for listing by the U.S. Fish and Wildlife Service (USFWS)

under the Endangered Species Act (ESA), and by state agencies. The federal ESA protects federally listed endangered and threatened plant and animal species. Critical habitat is a term defined and used in the ESA. It is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Federally identified candidate species (species proposed for listing) are not protected under law; however, these species could become listed, and therefore, protected at any time. Their consideration early in the planning process may avoid future conflicts that could otherwise occur. Additionally, the corresponding state regulatory agencies (Kansas Department of Wildlife, Parks and Tourism; New Jersey Division of Fish and Wildlife; New Hampshire Fish and Game; Pennsylvania Department of Conservation and Natural Resources, and Ohio Department of Natural Resources) protect state-listed plant and animal species through State fish and wildlife and administrative codes.

Wetlands are considered sensitive habitats and are subject to federal regulatory authority under Section 404 of the CWA and EO 11990, *Protection of Wetlands*. Wetlands are defined by the U.S. Army Corps of Engineers (USACE) as those 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 (Environmental Laboratory 1987). Wetlands generally include swamps, marshes, bogs, and similar areas.

The ROI for biological resources consists of lands within the vicinity of the airfield at the five alternative locations.

A.5.2 Methodology

Analysis of impacts to biological resources focuses on whether and how components of the Proposed Action could affect biological resources. Determination of the significance of potential impacts to biological resources is based on:

- the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource,
- the proportion of the resource that would be affected relative to its occurrence in the region,
- the sensitivity of the resource to proposed activities, and
- the duration of ecological ramifications.

Impacts to biological resources would be considered significant if species or habitats of concern were significantly adversely affected over relatively large areas or disturbances resulted in

reductions in the population size or distribution of a special status species, or if laws, codes, or ordinances protecting special status species were violated.

A.6 CULTURAL RESOURCES

A.6.1 Definition of the Resource

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural resources.

Archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., tools, arrowheads, or bottles). "Prehistoric" refers to resources that predate the advent of written records in a region. These resources can range from a scatter composed of a few artifacts to village sites and rock art. "Historic" refers to resources that postdate the advent of written records in a region. Archaeological resources can include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for protection under existing cultural resource laws. However, more recent structures, such as Cold War era military buildings, may warrant protection if they have exceptional characteristics and the potential to be historically significant structures. Architectural resources must also possess integrity (i.e., its important historic features must be present and recognizable).

Traditional cultural resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the continuance of traditional cultures.

Only cultural resources considered to be significant, known or unknown, warrant consideration with regard to adverse impacts resulting from a proposed action. To be considered significant, archaeological or architectural resources must meet one or more criteria as defined in 36 CFR 60.4 for inclusion in the National Register of Historic Places (NRHP). The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
(b) that are associated with the lives of persons significant in our past; or
(c) that embody the distinctive characteristics of a type, period, or method of construction; or
(d) that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(e) that have yielded, or may be likely to yield, information important in prehistory or history.

Several federal laws and regulations have been established to manage cultural resources, including the National Historic Preservation Act (NHPA) (1966), the Archaeological and Historic Preservation Act (1974), American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and Native American Graves Protection and Repatriation Act (1990). In addition, coordination with federally recognized Native American tribes must occur in accordance with EO 13175, *Consultation and Coordination with Indian Tribal Governments*.

On November 27, 1999, the DoD promulgated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis in recognition of their sovereignty as a nation. This Policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective services (DoD American Indian/Alaska Native Policy), as does DoD Instruction 4710.02, *Interaction with Federally Recognized Tribes* (September 14, 2006).

The ROI for cultural resources includes only those locations on the specific installation where facility renovation or construction and its staging would occur and potential ground disturbance would result. The ROI does not include areas under the airspace used by the units, as there are no relevant changes to use of the airspace. There are no known tribal resources within any installation ROI that would be affected by noise.

A.6.2 Methodology

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.

To complete the analysis of impacts to cultural resources, various sources of information were utilized. This included a review of previous cultural resource survey reports, Integrated Cultural Resource Management Plans, if available, and other documents available from the five installations that contained background information on the histories and the physical landscapes of the installations. Additionally, consultation with federally-recognized American Indian Tribes is in process to assist in determining impacts to traditional cultural resources. The list of Tribes being consulted was primarily compiled using two federal on-line resources: 1) the U.S. Department of Housing and Urban Development Tribal Directory Assessment Tool Version 2.0, which is designed to help users identify tribes by county and state and to provide appropriate tribal contact information to assist in consultation (U.S. Department of Housing and Urban Development 2013); and 2) the Native American Consultation Database, part of the National Native American Graves Protection and Repatriation Act Online Databases, which is a tool for identifying consultation contacts (National Park Service 2013). The JB MDL ANGS has already invited two federally-recognized tribes (Delaware Nation and Delaware Tribe of Indians) to participate in a government-to-government relationship. In the past, the Stockbridge-Munsee Community was invited by JB MDL to participate in government-to-government consultation, but declined interest in being further consulted. At Forbes ANGS, the Tribes to include in consultation were determined from a list provided in the Integrated Cultural Resource Management Plan (Air Force Center for Engineering and the Environment 2010) by the Kansas SHPO as having an interest in Shawnee County. The *Federal Register* was utilized to verify the federally-recognized status of each Tribe (77 *Federal Register* 47868 2012). Table A.6.2-1 lists the federally-recognized tribes for consultation at each installation.

Table A.6.2-1 Federally-recognized Tribes for Consultation

Alternative #	*Installation, State*	*Tribe(s)*[1]
Alternative #1	Forbes ANGS, Kansas	1) Citizen Potawatomi Nation 2) Delaware Nation 3) Kaw Nation 4) Osage Nation of Oklahoma 5) Prairie Band of Potawatomi Nation 6) Absentee Shawnee Tribe of Oklahoma 7) Eastern Shawnee Tribe of Oklahoma 8) Wichita and Affiliated Tribes
Alternative #2	JB MDL, New Jersey	1) Delaware Nation 2) Delaware Tribe of Indians 3) Stockbridge-Munsee Community[2]
Alternative #3	Pease ANGS, New Hampshire	1) Penobscot Indian Nation
Alternative #4	Pittsburgh ANGS, Pennsylvania	1) Cayuga Nation of New York 2) Onondaga Nation of New York 3) Tuscarora Nation of New York 4) Seneca Nation of Indians 5) Tonawanda Band of Seneca
Alternative #5	Rickenbacker ANGS, Ohio	1) Citizen Potawatomi Nation 2) Delaware Nation 3) Prairie Band of Potawatomi Nation 4) Eastern Shawnee Tribe of Oklahoma 5) Forest County Potawatomi Community 6) Hannahville Indian Community 7) Miami Tribe of Oklahoma 8) Ottawa Tribe of Oklahoma 9) Peoria Tribe of Indians Oklahoma 10) Pokagon Band of Potawatomi Indians 11) Shawnee Tribe 12) Turtle Mountain Band of Chippewa Indians of North Dakota 13) Wyandotte Nation

Notes: 1. Several tribes overlap with one or more installations. When this occurred only one letter was sent out discussing each installation they may have an interest in.
2. This Tribe was identified prior to knowledge that they had declined further consultation with JB MDL.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts.

Direct impacts may occur by:

- physically altering, damaging, or destroying all or part of a resource;
- altering characteristics of the surrounding environment that contribute to resource significance;
- introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or
- neglecting the resource to the extent that it deteriorates or is destroyed.

Direct impacts can be assessed by identifying the type and location of the proposed action and by determining the exact locations of cultural resources that could be affected. Indirect impacts primarily result from the effects of project-induced population increases and the resultant need to develop new housing areas, utilities services, and other support functions necessary to accommodate population growth. These activities and subsequent use of facilities can disturb or destroy cultural resources.

A.7 LAND USE

A.7.1 Definition of the Resource

Land use comprises the natural conditions and/or human-modified activities occurring at a particular location. Human-modified land use categories generally include residential, commercial, industrial, agricultural, and other public uses. Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and are often intended to protect specially designated or environmentally sensitive areas and sensitive noise receptors.

Several siting criteria have been established specifically for land development and use at commercial and military airfields. For example, APZs and RPZs, which address height restrictions, development density, and land use in and around airports, are enforced to reduce the potential for aircraft-related hazards.

The Federal Interagency Committee on Urban Noise (FICUN) and the Department of Defense have established guidelines to help assess land use compatibility with aircraft noise exposure. As shown in Table A.7.1-1, a range of noise exposure levels are associated with a given land use. The relative position of the compatibility interval is arbitrarily defined within 5 to 10 dB of an absolute level to indicate compatibility. These guidelines are intended as a planning tool and as such provide general indications as to whether particular land uses are appropriate for certain measured noise exposure levels. The designations in the table do not constitute a federal determination that any land use is acceptable or unacceptable under federal, state, or local law.

The ROI for land use is the area immediately surrounding the airfield at each alternative installation. The ROI does not include the land underneath the Special Use Airspace (SUA) proposed for use since no new airspace or changes to the existing airspace structure are proposed. The proposed increase in operations would not result in changes to the noise environment that would affect existing land uses.

Table A.7.1-1. Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	**65–70**	**70–75**	**75–80**	**80–85**	**Over 85**
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO A..7.1-1

Y (YES) = Land Use and related structures compatible without restrictions.

N (No) = Land Use and related structures are not compatible and should be prohibited.

NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

NOTES FOR TABLE A.7.1-1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(5) Land-use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Source: FICUN 1980.

A.7.2 Methodology

Impacts to land use are evaluated by identifying whether an action is incompatible with an existing land use due to noise, safety, or other issues. The significance of potential land use impacts is based on the level of land use sensitivity in areas affected by a proposed action. In general, land use impacts would be significant if the action would: (1) be inconsistent or non-compliant with applicable land use plans or policies, including the county or city plans; (2) preclude the viability of an existing land use activity within the ROI; (3) preclude continued use or occupation of an area; or (4) be incompatible with adjacent nearby land use to the extent that public health or safety is threatened.

A.8 INFRASTRUCTURE AND TRANSPORTATION

A.8.1 Definition of the Resource

Infrastructure refers to the system of public works, such as utilities and transportation, which provide the underlying framework for a community. Utilities include such amenities as water, power supply, and waste management. Transportation refers to roadway and street systems, the movement of vehicles on roadway networks, pedestrian and bicycle traffic, and mass transit. The infrastructure components to be discussed in this section include the electrical system, natural gas system, wastewater, stormwater, solid waste management, potable water system, and the transportation network.

The ROI for infrastructure primarily consists of the five alternative installations, with additional information presented for the surrounding vicinity, where relevant.

A.8.2 Methodology

Potential impacts to infrastructure elements at the five alternative installations are assessed in terms of effects of the Proposed Action on existing service levels. Impacts to transportation and utilities are assessed with respect to the potential for disruption or improvement of current circulation patterns and utility systems, deterioration or improvement of existing levels of service, and changes in existing levels of transportation and utility safety. Impacts may arise from physical changes to circulation or utility corridors, construction activity, and introduction of construction-related traffic and utility use. Adverse impacts to roadway capacities would be significant if roads with no history of capacity exceedance had to operate at or above their full design capacity as a result of an action. Transportation effects may arise from changes in traffic circulation, delays due to construction activity, or changes in traffic volumes. Utility system effects may include disruption, degradation, or improvement of existing levels of service or potential change in demand for energy or water resources.

For the range of public services discussed, the installations are required to proactively plan for and assess all specific infrastructure and utility requirements and other essential services to ensure that the proposed increase in personnel and their dependents would be accommodated under the Proposed Action. The installations routinely evaluate community facilities and services to account for fluctuations associated with new units assigned to the installation and the deployment of existing units. In addition, the installations identify infrastructure or utility needs within the scope of each corresponding project. If particular projects require additional infrastructure or utilities, they are incorporated as a part of that project. This process ensures that any infrastructure or utility deficiencies are identified in the initial planning stages.

To assess impacts to local landfills associated with solid waste generation as a result of proposed construction projects, a multiplier was used provided by the USEPA to estimate solid waste generation. The estimated pounds of waste generated each year from renovations, as described in *Building-Related Construction and Demolition Materials Amounts* (USEPA 2009), is:

> *(Total square footage of construction renovation per year) x (11.79 pounds/square foot [SF])* = X pounds of debris.*

*11.79 pounds per SF is a USEPA multiplier used to estimated rate of debris generated during nonresidential renovations for an average office renovation based on sampling studies documented in *Building-Related Construction and Demolition Materials Amounts* (USEPA 2009). To estimate construction waste from nonresidential new construction (versus renovation), the USEPA uses a multiplier of 4.34 pounds per SF.

For this analysis, potential infrastructure impacts associated with implementation of the Proposed Action are evaluated. Potential infrastructure impacts would be related to construction activity and facility operations after completion, in addition to any increase in personnel associated with the Proposed Action.

A.9 HAZARDOUS MATERIALS AND WASTES

A.9.1 Definition of the Resource

This EIS analyzes impacts related to hazardous materials, toxic substances, hazardous waste, and contaminated sites. The potential for hazardous materials to be introduced to the alternative installations during the course of site development and construction activities; for toxic and hazardous wastes to be generated as a result of construction and demolition activities; and for encounters with contaminated media during the course of site preparation and construction/demolition activities is analyzed.

Impacts related to the continuing use of hazardous materials and generation of hazardous wastes associated with aircraft operations and maintenance as a result of the proposed aircraft conversion are also analyzed. Operational changes (increases/decreases in flying time) would affect the amount of hazardous materials used and stored at the alternative installations, as well as the amount of hazardous waste generated. In addition, changes in maintenance activities and schedules could result in a change in the use of hazardous or toxic substances or generation of hazardous wastes compared to existing conditions.

The ROI for hazardous materials and waste includes areas that could be exposed to an accidental release of a hazardous substance from construction activities, other specific areas affected by past and current hazardous waste operations, and areas where hazardous materials would be utilized or stored. Therefore, the ROI for this action is defined as the five alternative installations.

A.9.1.1 Hazardous Materials and Waste

Hazardous materials are chemical substances that pose a substantial hazard to human health or the environment. Hazardous materials include hazardous substances, extremely hazardous substances, hazardous chemicals, and toxic chemicals. In general, these materials pose hazards because of their quantity, concentration, physical, chemical, or infectious characteristics. The Resource Conservation and Recovery Act (RCRA) (42 USC 6903[5]) defines a hazardous waste as a solid waste, or combination of solid waste, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may: (1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. For the purpose of this analysis, hazardous wastes include solid wastes that are regulated as hazardous based on either direct listing by USEPA or because they exhibit certain characteristics (ignitability, reactivity, corrosivity, and toxicity), as well as those contaminants present in environmental media (e.g., soil or groundwater).

Hazardous substances are defined and regulated under the laws administered by OSHA, USEPA, and the U.S. Department of Transportation. Each of these agencies incorporates hazardous substance terminology in accordance with its unique Congressional mandate:

- OSHA regulations categorize substances in terms of their impacts to employee and workplace health and safety;
- U.S. Department of Transportation regulations categorize substances in terms of their safety in transportation; and

- USEPA regulations categorize substances in terms of protection of the environment and the public health.

With regard to environmental impacts, hazardous substances are regulated under several federal programs administered by the USEPA, including Comprehensive Environmental Response, Compensation, and Liability Act, Toxic Substances Control Act (TSCA), and RCRA. DoD installations are required to comply with these laws and Emergency Planning and Community Right-to-Know Act (per EO 15314), along with other applicable federal, state, and DoD regulations, as well as with relevant EOs.

When accumulating hazardous waste on-site, large quantity generators must comply with 40 CFR 262.34(a) and small quantity generators must comply with 40 CFR 262.34(d) to avoid the requirement to obtain a hazardous waste treatment, storage, or disposal permit. Generators of 1,000 kilograms/month of hazardous waste or >1 kilogram/month of acute hazardous waste are large quantity generators. A hazardous waste generation point is where the waste is initially created or generated. A satellite accumulation point (SAP) is an area where hazardous waste is initially accumulated at the point of generation and is under the control of the SAP manager. Wastes stored in these areas may be stored for 90 days for large quantity generators and 180 days for small quantity generators. Hazardous wastes initially accumulated at a SAP are accumulated in appropriate containers before being transferred to the installation central accumulation point (CAP).

A.9.1.2 Toxic Substances

The promulgation of TSCA (40 CFR §§ 700-766) represented an effort by the federal government to address those chemical substances and mixtures for which it was recognized that the manufacture, processing, distribution, use, or disposal may present unreasonable risk of personal injury or health of the environment, and to effectively regulate these substances and mixtures in interstate commerce. The TSCA Chemical Substances Inventory lists information on more than 62,000 chemicals and substances. Toxic chemical substances regulated by USEPA under TSCA include asbestos and lead, which for the purposes of this analysis, are evaluated in the most common forms found in buildings, namely asbestos-containing materials (ACMs) and lead-based paint (LBP). TSCA also establishes management obligations for the cleanup of polychlorinated biphenyls (PCBs).

ACMs have been classified as a HAP by the USEPA in accordance with Section 112 of the CAA. Surveys would be conducted for ACMs, as required by 40 CFR § 61.145, during the design phase of each construction project and prior to demolition or renovation of any structure. Any located ACM would be characterized, managed, transported, and disposed of according to

applicable state and federal requirements for protecting human health and safety and the environment.

LBP may also be present in buildings or other facilities that would be modified or demolished as part of the Proposed Action. Similar to ACMs, surveys would be conducted on structures to be modified or demolished for LBP during the design phase of each construction project and prior to structure demolition or renovation. LBP sampling would be conducted on the structures to be removed and analyzed in accordance with USEPA approved Toxicity Characteristic Leaching Procedure methodology. Based on this federal testing methodology, the paint would be considered hazardous if lead is detected at concentrations greater than 5 micrograms per liter. If LBP were detected at hazardous concentrations, these materials would be removed according to accepted methodologies. LBP would be characterized, managed, transported, and disposed of according to applicable state and federal requirements for protecting human health and safety and the environment.

Beginning in the 1920s, PCBs had many common household uses, including applications in electrical transformers, as coolants in refrigeration machinery, and in oil and hydraulic fluids. PCBs are toxic and have been classified as a persistent organic pollutant, acting as carcinogens that do not break down easily in the environment. Thus, the manufacture and use of PCBs in the U.S. was banned by Congress in 1979 and cleanup actions are regulated through TSCA.

A.9.1.3 Contaminated Sites

Potential hazardous waste contamination areas are being investigated as part of the Defense Environmental Restoration Program (DERP). DoD developed the DERP to identify, investigate, and remediate potentially hazardous material disposal sites on DoD property prior to 1984. There are two restoration programs under DERP, the Installation Restoration Program (now known as the Environmental Restoration Program [ERP]) and the Military Munitions Response Program. These programs were instituted to satisfy the requirements of Comprehensive Environmental Response, Compensation, and Liability Act and RCRA for former and current hazardous waste sites.

A.9.2 Methodology

The qualitative and quantitative assessment of impacts from hazardous materials and solid waste management focuses on how and to what degree the alternatives affect hazardous materials usage and management, hazardous waste generation and management, and waste disposal. A substantial increase in the quantity or toxicity of hazardous substances used or generated would be considered potentially significant. Significant impacts could result if a substantial increase in

human health risk or environmental exposure was generated at a level that cannot be mitigated to acceptable standards.

The potential increase in the throughput of petroleum substances and hazardous waste streams was estimated by evaluating the change from the baseline number of flying hours for each alternative installation and comparing that to the proposed 8,040 annual flying hours. The KC-135 has an estimated fuel flow rate to power the aircraft of approximately 2,500 pounds per hour per engine; or an average of 10,000 pounds of fuel per hour. The KC-46A aircraft has a similar estimated fuel flow rate of 4,500 pounds per hour per engine; or an average of 9,000 pounds of fuel per hour. Thus, based on the percent increase in flying hours at each alternative installation, it was assumed that there would be a commensurate increase in the throughput of petroleum substances and hazardous waste streams.

Regulatory standards and guidelines have been applied in evaluating the potential impacts that may be caused by hazardous materials and wastes. The following criteria were used to identify potentially significant impacts:

- Generation of 100 kilograms (or more) of hazardous waste or 1 kilogram (or more) of an acutely hazardous waste in a calendar month, resulting in increased regulatory requirements.
- A spill or release of a reportable quantity of a hazardous substance as defined by the USEPA in 40 CFR Part 302.
- Manufacturing, use, or storage of a compound that requires notifying the pertinent regulatory agency according to the Emergency Planning and Community Right-to-Know Act.
- Exposure of the environment or public to any hazardous material and/or waste through release or disposal practices.

A.10 SOCIOECONOMICS

A.10.1 Definition of the Resource

Socioeconomics comprises the basic attributes and resources associated with the human environment, particularly population and economic activity. Economic activity typically encompasses employment, personal income, and economic growth. Impacts to these fundamental socioeconomic components also influence other issues such as housing availability and the provision of public services. To illustrate local baseline conditions, socioeconomic data provided in this section consists primarily of county and city level data for the areas surrounding the alternative installations. Where 2010 Census data was not yet available for all demographic and economic data, American Community Survey (ACS) 2011 5-year estimates were used (data on employment and school enrollment).

The ROI for socioeconomics associated with the five alternative installations includes the counties, townships, and towns/cities that each installation lies within, as well as those that lie under or near the current and proposed noise contours. The ROI does not include the land below the airspace used since no ground disturbance would occur in these areas and the Proposed Action would generate minimal changes in noise, frequency of use, duration of use, and number of operations at these locations.

A.10.2 Methodology

Socioeconomic impacts are assessed in terms of direct effects to the local economy and population and related indirect effects on other socioeconomic resources within the ROI. Socioeconomic impacts would be considered significant if the Proposed Action resulted in a substantial shift in population trends or notably affected regional employment, earnings, or community resources such as schools.

A.11 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

A.11.1 Definition of the Resource

In 1994, EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued to focus the attention of federal agencies on human health and environmental conditions in minority and low-income communities. EO 12898 aims to ensure that disproportionately high and adverse human health or environmental effects to these communities are identified and addressed. This environmental justice analysis focuses on the distribution of race and poverty status in areas potentially affected by implementation of the Proposed Action.

For the purpose of this analysis, minority populations and low-income populations are defined as:

- *Minority Populations:* All categories of non-white population groups as defined in the U.S. Census, including African American, Hispanic, American Indian and Alaska Native, Asian or Pacific Islander, and other groups.
- *Low-Income Populations:* Persons living below the poverty level, as defined by the 2010 Census.

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

identifies the distribution of children and locations where the number of children in the affected area may be disproportionately high (e.g., schools, childcare centers).

The ROI for environmental justice associated with the five alternative installations includes the counties, townships, and towns/cities that each installation lies within, as well as those that lie under or near the current and proposed noise contours. Total population, minority population, and number of children under the age of 18 were obtained from the 2010 census data. Low-income population numbers are from the 2007-2011 ACS 5-Year Estimates. The ROI does not include the land below the airspace used since no ground disturbance would occur in these areas and the Proposed Action would generate minimal changes in noise, frequency of use, duration of use, and number of operations at these locations.

A.11.2 Methodology

To comply with EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, areas containing relatively high disadvantaged or youth populations are given special consideration regarding potential impacts in order to address the potential for disproportionately high or adverse human health or environmental effects to these communities. Ethnicity and poverty status in the vicinity of the Proposed Action have been examined and compared to city, county, state, and national data to determine if any minority or low-income communities could potentially be disproportionately affected by implementation of any of the alternatives. Geographic Information Systems census block data obtained from the U.S. Census Bureau was used to obtain information on minority and low-income populations located within the vicinity of the Alternative locations. A census block is the smallest geographic unit used by the U.S. Census Bureau for tabulation of 100 percent data (data collected from all houses, rather than a sample of houses).

Three criteria must be met for impacts to minority and low-income communities to be considered significant: (1) there must be one or more such populations within the ROI, (2) there must be adverse (or significant) impacts from the Proposed Action, and (3) the environmental justice populations within the ROI must bear a disproportionate burden of those adverse impacts. If any of these criteria are not met, then impacts with respect to environmental justice would not be significant.

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Appendix C

Background Information for the Noise Analysis

APPENDIX C BACKGROUND INFORMATION FOR THE NOISE ANALYSIS

1. Basics of Sound

Noise is unwanted sound. Sound is all around us; sound becomes noise when it interferes with normal activities, such as sleep or conversation.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (e.g., music) or unpleasant (e.g., jackhammers) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration. First, intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic of sound is frequency, which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. The third important characteristic of sound is duration or the length of time the sound can be detected.

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. Because of this vast range, using a linear scale to represent the intensity of sound becomes very unwieldy. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB; sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 to 140 dB are felt as pain (Berglund and Lindvall 1995).

Because of the logarithmic nature of the decibel unit, sound levels cannot be arithmetically added or subtracted and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

$$60 \text{ dB} + 60 \text{ dB} = 63 \text{ dB, and}$$

$$80 \text{ dB} + 80 \text{ dB} = 83 \text{ dB}.$$

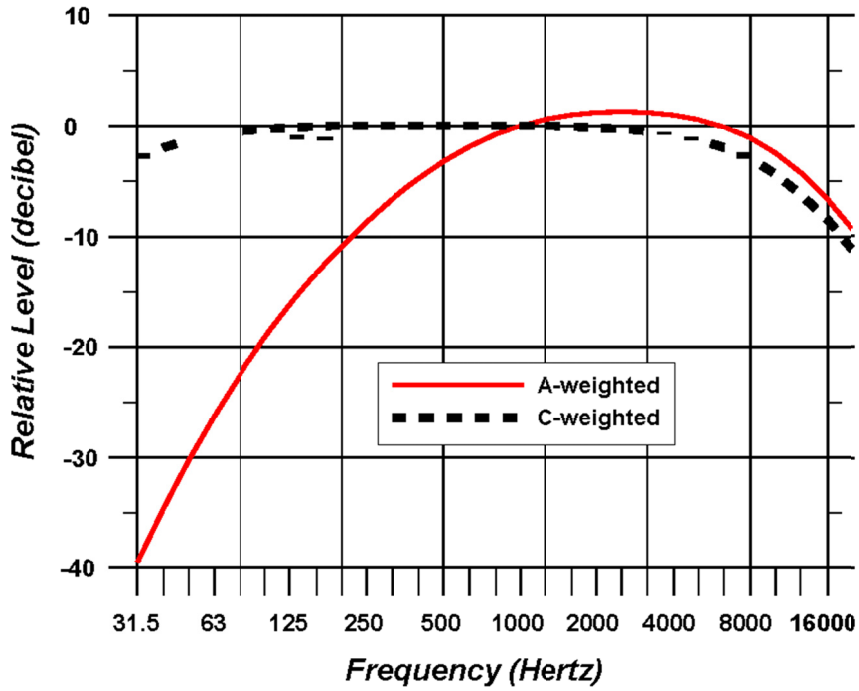
Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

$$60.0 \text{ dB} + 70.0 \text{ dB} = 70.4 \text{ dB}.$$

Because the addition of sound levels is different than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness, and this relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the standard unit for cps. The normal human ear can detect sounds that range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally by the human ear, which is most sensitive to frequencies in the 1,000 to 4,000 Hz range. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. A-weighting accounts for frequency dependence by adjusting the very high and very low frequencies (below approximately 500 Hz and above approximately 10,000 Hz) to approximate the human ear's lower sensitivities to those frequencies. C-weighting is nearly flat throughout the range of audible frequencies, hardly de-emphasizing the low frequency sound while approximating the human ear's sensitivity to higher intensity sounds. The two curves shown in Figure C-1 are also the most adequate to quantify environmental noises.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure C-1. Frequency Response Characteristics of A- and C-Weighting Networks

A-weighted Sound Level

Sound levels that are measured using A-weighting, called A-weighted sound levels, are often denoted by the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the adjective "A-weighted" is often omitted and the measurements are expressed as dB. In this report (as in most environmental impact documents), dB units refer to A-weighted sound levels.

Noise potentially becomes an issue when its intensity exceeds the ambient or background sound pressures. Ambient background noise in metropolitan, urbanized areas typically varies from 60 to 70 dB and can be as high as 80 dB or greater; quiet suburban neighborhoods experience ambient noise levels of approximately 45-50 dB (U.S. Environmental Protection Agency [USEPA] 1978).

Figure C-2 is a chart of A-weighted sound levels from typical sounds. Some noise sources (air conditioner, vacuum cleaner) are continuous sounds which levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle pass-by. Some (urban daytime, urban nighttime) are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.

Aircraft noise consists of two major types of sound events: aircraft takeoffs and landings, and engine maintenance operations. The former can be described as intermittent sounds and the latter as continuous. Noise levels from flight operations exceeding background noise typically occur beneath main approach and departure corridors, in local air traffic patterns around the airfield, and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft in flight gain altitude, their noise contribution drops to lower levels, often becoming indistinguishable from the background.

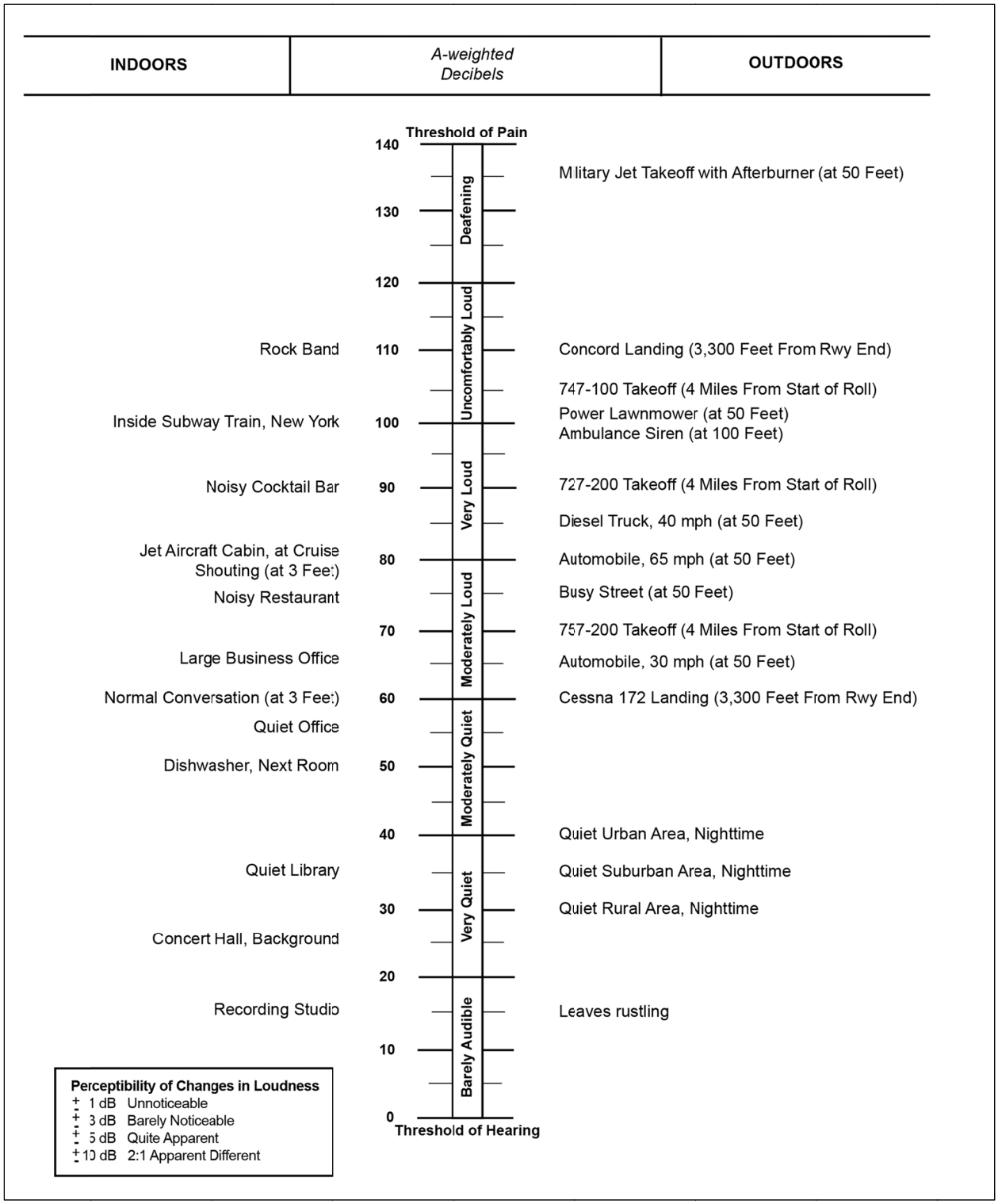
1.1 Noise Metrics

In general, a metric is a statistic for measuring or quantifying. A noise metric quantifies the noise environment. There are three families of noise metrics described herein – one for single noise events such as an aircraft flyby, one for cumulative noise events such as a day's worth of aircraft activity, and one which quantifies the events or time relative to single noise events.

Within the single noise event family, metrics described below include Peak Sound Pressure Level (L_{pk}), Maximum Sound Level (L_{max}) and Sound Exposure Level (SEL). Within the cumulative noise events family, metrics described below include Equivalent Sound Level (L_{eq}), Day-Night Average Sound Level (DNL or L_{dn}), and several others. Within the events/time family, metrics described below include Number of Events Above a Threshold Level and Time Above a Specified Level.

Maximum Sound Level (L_{max})

The highest A-weighted integrated sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or L_{max}.



Source: State of California Department of Transportation 2002.

Figure C-2. Typical Decibel Level of Common Sounds

During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. The L_{max} indicates the maximum sound level occurring for a fraction of a second. For aircraft noise, the "fraction of a second" over which the maximum level is defined is generally one-eighth of a second, and is denoted as "fast" response (ANSI 1988). Slowly varying or steady sounds are generally measured over a period of one second, denoted "slow" response. The L_{max} is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event, because it does not include the period of time that the sound is heard.

Sound Exposure Level (SEL)

SEL is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of the net impact of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft flyover, SEL would include both the L_{max} and the lower noise levels produced during onset and recess periods of the overflight.

SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of a constant sound that would, in one second, generate the same acoustic energy as the actual time-varying noise event. For sound from aircraft overflights, which typically lasts more than one second, the SEL is usually greater than the L_{max} because an individual overflight takes seconds and the L_{max} occurs instantaneously. SEL represents the best metric to compare noise levels from overflights.

Equivalent Sound Level (L_{eq})

A cumulative noise metric useful in describing noise is the L_{eq}. L_{eq} is the continuous sound level that would be present if all of the variations in sound level occurring over a specified time period were smoothed out as to contain the same total sound energy.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise. For example, the sum of all noise-generating events during the period of 7 a.m. to 4 p.m. could provide the relative impact of noise generating events for a school day.

2. Noise Effects

This noise effects section includes discussions of annoyance, speech interference and sleep disturbance, and the effects of noise on hearing, health, performance, learning, animals, property values, terrain and archaeological sites.

2.1 Annoyance

The primary effect of aircraft noise on exposed communities is one of long-term annoyance, defined by the USEPA as any negative subjective reaction on the part of an individual or group. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response because it attempts to account for all negative aspects of effects from noise, e.g., increased annoyance due to being awakened the previous night by aircraft and interference with everyday conversation.

Numerous laboratory studies and field surveys have been conducted to measure annoyance and to account for a number of variables, many of which are dependent on a person's individual circumstances and preferences. Laboratory studies of individual response to noise have helped isolate a number of the factors contributing to annoyance, such as the intensity level and spectral characteristics of the noise, duration, the presence of impulses, pitch, information content, and the degree of interference with activity. Social surveys of community response to noise have allowed the development of general dose-response relationships that can be used to estimate the proportion of people who will be highly annoyed by a given noise level. The results of these studies have formed the basis for criteria established to define areas of compatible land use.

A wide variety of responses have been used to determine intrusiveness of noise and disturbances of speech, sleep, audio/video entertainment, and outdoor living; but the most useful metric for assessing peoples' responses to noise is the percentage of the population expected to be "highly annoyed." The concept of "percent highly annoyed" has provided the most consistent response of a community to a particular noise environment. In his synthesis of several different social surveys that employed different response scales, Schultz (1978) defined "highly annoyed" respondents as those respondents whose self-described annoyance fell within the upper 28 percent of the response scale where the scale was numerical or un-named. For surveys where the response scale was named, Schultz counted those who claimed to be highly annoyed, combining the responses of "very annoyed" and "extremely annoyed." Schultz's definition of "percent highly annoyed" (%HA) became the basis for the federal policy on environmental noise. Daily average sound levels are typically used for the evaluation of community noise effects, such as long-term annoyance.

In general, scientific studies and social surveys have found a correlation between the percentages of groups of people highly annoyed and the level of average noise exposure. Thus, the results are expressed as the average %HA at various exposure levels measured in DNL. The classic analysis is Schultz's original 1978 study, whose results are shown in Figure C-3. This figure is commonly referred to as the Schultz curve. It represents the synthesis of a large number of social surveys (161 data points in all), that relates the long-term community response to various types of noise sources, measured using the DNL metric.

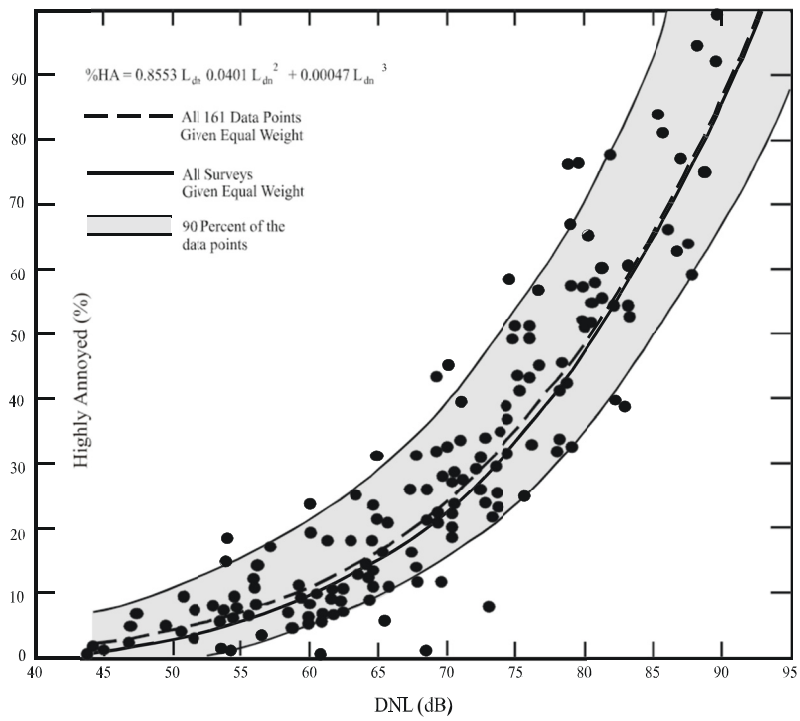
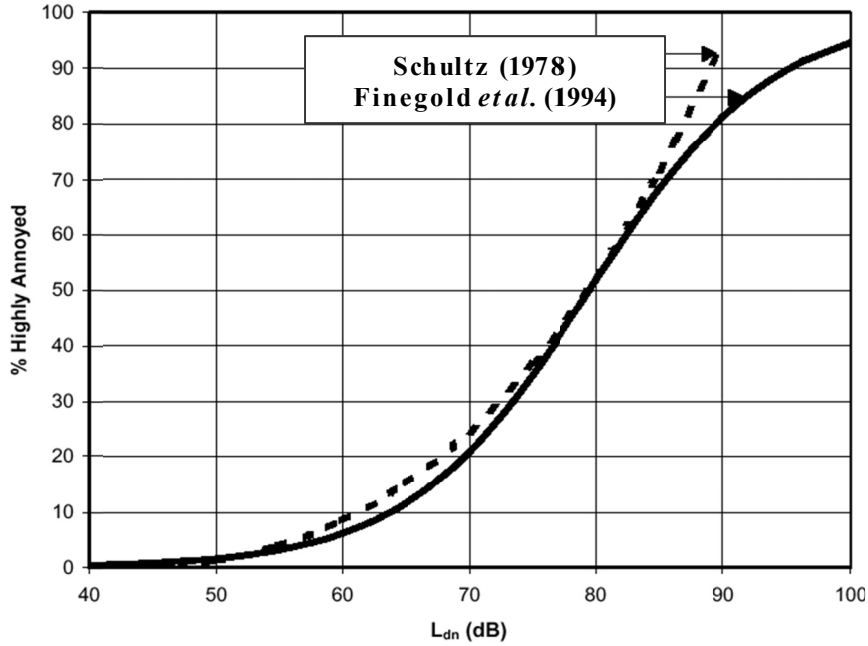


Figure C-3. Community Surveys of Noise Annoyance

An updated study of the original Schultz data based on the analysis of 400 data points collected through 1989 essentially reaffirmed this relationship. Figure C-4 shows an updated form of the curve fit in comparison with the original Schultz curve (Finegold *et al.* 1994). The updated fit, which does not differ substantially from the original, is the preferred form in the U.S. The relationship between %HA and DNL is:

$$\%HA = 100/[1+ \exp(11.13 - 0.141L_{dn})]$$



Sources: (Schultz 1978) and Current (Finegold *et al.* 1994) Curve Fits

Figure C-4. Response of Communities to Noise; Comparison of Original

In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. However, the correlation coefficients for the annoyance of individuals are relatively low, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise.

A number of non-acoustic factors have been identified that may influence the annoyance response of an individual. Newman and Beattie (1985) divided these factors into emotional and physical variables.

Emotional Variables:

- Feelings about the necessity or preventability of the noise;
- Judgment of the importance and value of the activity that is producing the noise;
- Activity at the time an individual hears the noise;
- Attitude about the environment;
- General sensitivity to noise;

- Belief about the effect of noise on health; and
- Feeling of fear associated with the noise.

Physical Variables:

- Type of neighborhood;
- Time of day;
- Season;
- Predictability of noise;
- Control over the noise source; and
- Length of time an individual is exposed to a noise.

The low correlation coefficients for individuals' reactions reflect the large amount of scatter among the data drawn from the various surveys and point to the substantial uncertainty associated with the equation representing the relationship between %HA and DNL. Based on the results of surveys it has been observed that noise exposure can explain less than 50 percent of the observed variance in annoyance, indicating that non-acoustical factors play a major role. As a result, it is not possible to accurately predict individual annoyance in any specific community based on the aircraft noise exposure. Nevertheless, changes in %HA can be useful in giving the decision maker more information about the relative effects that different alternatives may have on the community.

The original Schultz curve and the subsequent updates do not separate out the annoyance from aircraft noise and other transportation noise sources. This was an important element, in that it allowed Schultz to obtain some consensus among the various social surveys from the 1960s and 1970s that were synthesized in the analysis. In essence, the Schultz curve assumes that the effects of long-term annoyance on the general population are the same, regardless of whether the noise source is road, rail, or aircraft. In the years after the classical Schultz analysis, additional social surveys have been conducted to better understand the annoyance effects of various transportation sources.

Miedema and Vos (1998) present synthesis curves for the relationship between DNL and percentage "Annoyed" and percentage "Highly Annoyed" for three transportation noise sources. Separate, non-identical curves were found for aircraft, road traffic, and railway noise. Table C-1 illustrates that, for a DNL of 65 dB, the percent of the people forecasted to be Highly Annoyed is

28 percent for air traffic, 18 percent for road traffic, and 11 percent for railroad traffic. For an outdoor DNL of 55 dB, the percent highly annoyed would be close to 12 percent if the noise is generated by aircraft operations, but only 7 percent and 4 percent, respectively, if the noise is generated by road or rail traffic. Comparing the levels on the Miedema and Vos curve to those on the updated Schultz curve indicates that the percentage of people highly annoyed by aircraft noise may be higher than previously thought when the noise is solely generated by aircraft activity.

Table C-1. Percent Highly Annoyed for Different Transportation Noise Sources

DNL (dB)	PERCENT HIGHLY ANNOYED (%HA)			
	Miedema and Vos			*Schultz Combined*
	Air	*Road*	*Rail*	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos 1998

As noted by the World Health Organization (WHO), even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO 2000). The WHO noted that five major parameters should be randomly distributed for the analyses to be valid: personal, demographic, and lifestyle factors, as well as the duration of noise exposure and the population experience with noise.

The Federal Interagency Committee on Noise (FICON) found that the updated Schultz curve remains the best available source of empirical dosage effect information to predict community response to transportation noise without any segregation by transportation source (FICON 1992); a position held by the FICAN in 1997 (FICAN 1997). However, FICON also recommended further research to investigate the differences in perceptions of aircraft noise, ground transportation noise (highways and railroads), and general background noise.

2.2 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance for communities. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is particularly important in classrooms and offices. In industrial settings it can cause fatigue and vocal strain in those who attempt to communicate over the noise.

The disruption of speech in the classroom is a primary concern, due to the potential for adverse effects on children's learning ability. There are two aspects to speech comprehension:

1. *Word Intelligibility* - the percent of words transmitted and received. This might be important for students in the lower grades who are learning the English language, and particularly for students who have English as a Second Language.

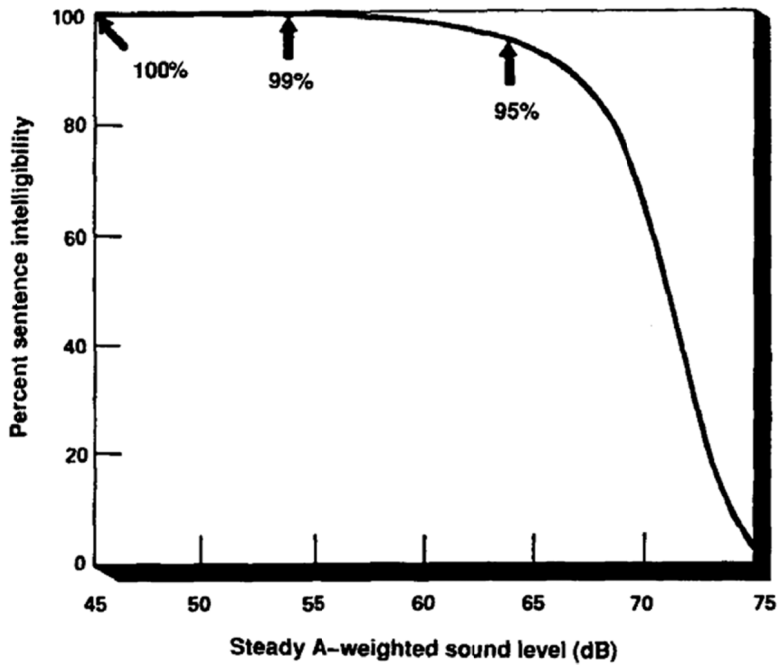
2. *Sentence Intelligibility* – the percent of sentences transmitted and understood. This might be important for high-school students and adults who are familiar with the language, and who do not necessarily have to understand each word in order to understand sentences.

For teachers to be clearly understood by their students, it is important that regular voice communication is clear and uninterrupted. Not only does the background sound level have to be low enough for the teacher to be clearly heard, but intermittent outdoor noise events also need to be minimized. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Several research studies have been conducted and guideline documents been developed resulting in a fairly consistent set of noise level criteria for speech interference. This section provides an overview of the results of these studies.

U.S. Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor 24-hour average sound level $L_{eq(24)}$ of 45 dB to minimize speech interference based on the intelligibility of sentences in the presence of a steady background noise (USEPA 1974). Intelligibility pertains to the percentage of speech units correctly understood out of those transmitted, and specifies the type of speech material used, i.e., sentences or words. The curve displayed in Figure C-5 shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background sound levels indoors of less than 45 dB L_{eq} are expected to allow 100 percent intelligibility of sentences.



Source: USEPA 1974

Figure C-5. Speech Intelligibility Curve

The curve shows 99 percent sentence intelligibility for background levels at a L_{eq} of 54 dB, and less than 10 percent intelligibility for background levels above a L_{eq} of 73 dB. Note that the curve is especially sensitive to changes in sound level between 65 dB and 75 dB - an increase of 1 dB in background sound level from 70 dB to 71 dB results in a 14 percent decrease in sentence intelligibility, whereas a 1 dB increase in background sound level from 60 dB to 61 dB results in less than 1 percent decrease in sentence intelligibility.

Summary

As the previous section demonstrates, research indicates that it is not only important to consider the continuous background levels using time-averaged metrics, but also the intermittent events, using single-event metrics such as L_{max}. Table C-2 provides a summary of the noise level criteria recommended in the scientific literature.

Table C-2. Indoor Noise Level Criteria Based on Speech Intelligibility

Source	*Metric/Level (dB)*	*Effects and Notes*
FAA (1985)	L_{eq}(during school hours) = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used
Lind *et al.* (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / SIL 45	Single event level permissible in the classroom
WHO (2000)	L_{eq} = 35 dB Lmax = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB
ANSI (2002)	L_{eq} = 40 dB, Based on Room Volume	Acceptable background level for continuous noise/ relaxed criteria for intermittent noise in the classroom
UKDFES (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs

When considering intermittent noise caused by aircraft overflights, a review of the relevant scientific literature and international guidelines indicates that an appropriate criteria is a limit on indoor background noise levels of 35 to 40 dB L_{eq} and a limit on single events of 50 dB L_{max}.

2.3 Sleep Disturbance

The disturbance of sleep is a major concern for communities exposed to nighttime aircraft noise. There have been numerous research studies that have attempted to quantify the complex effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies that have been conducted, with particular emphasis placed on those studies that have influenced U.S. federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on laboratory sleep observations.

2. Later studies performed in the 1990s up to the present, where the research was focused on field observations, and correlations to laboratory research were sought.

2.3.1 Initial Studies

The relationship between noise levels and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep, but also on the previous exposure to aircraft noise, familiarity with the surroundings, the physiological and psychological condition of the recipient, and a host of other situational factors. The most readily measurable effect of noise on sleep is the number of arousals or awakenings, and so the body of scientific literature has focused on predicting the percentage of the population that will be awakened at various noise levels. Fundamentally, regardless of the tools used to measure the degree of sleep disturbance

(awakenings, arousals, etc.), these studies have grouped the data points into bins to predict the percentage of the population likely to be disturbed at various sound level thresholds.

FICON produced a guidance document that provided an overview of the most pertinent sleep disturbance research that had been conducted throughout the 1970s (FICON 1992). Literature reviews and meta-analysis conducted between 1978 and 1989 made use of the existing datasets that indicated the effects of nighttime noise on various sleep-state changes and awakenings (Lukas 1978, Griefahn 1978, Pearsons *et al.* 1989). FICON noted that various indoor A-weighted sound levels ranging from 25 to 50 dB were observed to be thresholds below which significant sleep effects were not expected. Due to the large variability in the data, FICON did not endorse the reliability of the results.

However, FICON did recommend the use of an interim dose-response curve—awaiting future research—which predicted the percent of the exposed population expected to be awakened as a function of the exposure to single event noise levels expressed in terms of SEL. This curve was based on the research conducted for the U.S. Air Force (USAF) (Finegold *et al.* 1994). The dataset included most of the research performed up to that point, and predicted that 10 percent of the population would be awakened when exposed to an interior SEL of approximately 58 dB. The data utilized to derive this relationship were primarily the results of controlled laboratory studies.

2.3.2 Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted in the early sleep disturbance research that the controlled laboratory studies did not account for many factors that are important to sleep behavior, such as habituation to the environment and previous exposure to noise and awakenings from sources other than aircraft noise. In the early 1990s, field studies were conducted to validate the earlier laboratory work. The most significant finding from these studies was that an estimated 80 to 90 percent of sleep disturbances were not related to individual outdoor noise events, but were instead the result of indoor noise sources and other non-noise-related factors. The results showed that there was less of an effect of noise on sleep in real-life conditions than had been previously reported from laboratory studies.

2.3.3 Federal Interagency Committee on Aviation Noise

The interim FICON dose-response curve that was recommended for use in 1992 was based on the most pertinent sleep disturbance research that was conducted through the 1970s, primarily in laboratory settings. After that time, considerable field research was conducted to evaluate the sleep effects in peoples' normal, home environment. Laboratory sleep studies tend to show higher values of sleep disturbance than field studies because people who sleep in their own

homes are habituated to their environment and, therefore, do not wake up as easily (FICAN 1997).

Based on the new information, FICAN updated its recommended dose-response curve in 1997, depicted as the lower curve in Figure C-6. This figure is based on the results of three field studies (Ollerhead *et al.* 1992, Fidell *et al.* 1994, 1995a, and 1995b), along with the datasets from six previous field studies.

The new relationship represents the higher end, or upper envelope, of the latest field data. It should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened" or the "maximum percent awakened" for a given residential population. According to this relationship, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB, compared to 10 percent using the 1992 curve. An indoor SEL of 58 dB is equivalent to outdoor SEL's of 73 and 83 dB respectively assuming 15 and 25 dB noise level reduction from outdoor to indoor with windows open and closed, respectively.

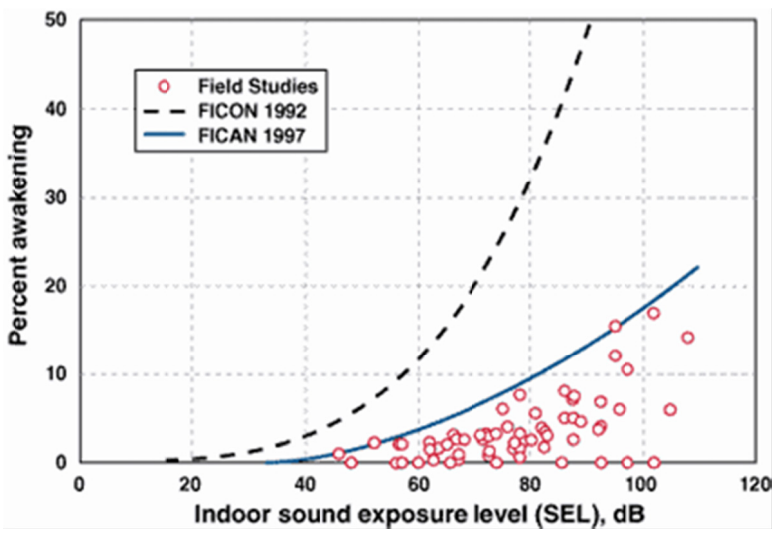


Figure C-6. FICAN's 1997 Recommended Sleep Disturbance Dose-Response Relationship

The FICAN 1997 curve is represented by the following equation:

$$\text{Percent Awakenings} = 0.0087 \times [\text{SEL} - 30]^{1.79}$$

Note the relatively low percentage of awakenings to fairly high noise levels. People think they are awakened by a noise event, but usually the reason for awakening is otherwise. For example, the 1992 United Kingdom Civil Aviation Authority study found the average person was awakened about 18 times per night for reasons other than exposure to an aircraft noise – some of

these awakenings are due to the biological rhythms of sleep and some to other reasons that were not correlated with specific aircraft events.

2.3.4 Number of Events and Awakenings

In recent years, there have been studies and one proposal that attempted to determine the effect of multiple aircraft events on the number of awakenings. The German Aerospace Center (DLR) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and other related human performance factors (Basner 2004). The DLR study was one of the largest studies to examine the link between aircraft noise and sleep disturbance and involved both laboratory and in-home field research phases. The DLR investigators developed a dose-effect curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

In July 2008 ANSI and the Acoustical Society of America (ASA) published a method to estimate the percent of the exposed population that might be awakened by multiple aircraft noise events based on statistical assumptions about the probability of awakening (or not awakening) (ANSI 2008). This method relies on probability theory rather than direct field research/experimental data to account for multiple events.

Figure C-7 depicts the awakenings data that form the basis and equations of ANSI S12.9-2008. The curve labeled 'Eq. (B1)' is the relationship between noise and awakening endorsed by FICAN in 1997. The ANSI recommended curve labeled 'Eq. (1)' quantifies the probability of awakening for a population of sleepers who are exposed to an outdoor noise event as a function of the associated indoor SEL in the bedroom. This curve was derived from studies of behavioral awakenings associated with noise events in "steady state" situations where the population has been exposed to the noise long enough to be habituated. The data points in Figure B-7 come from these studies. Unlike the FICAN curve, the ANSI 2008 curve represents the average of the field research data points.

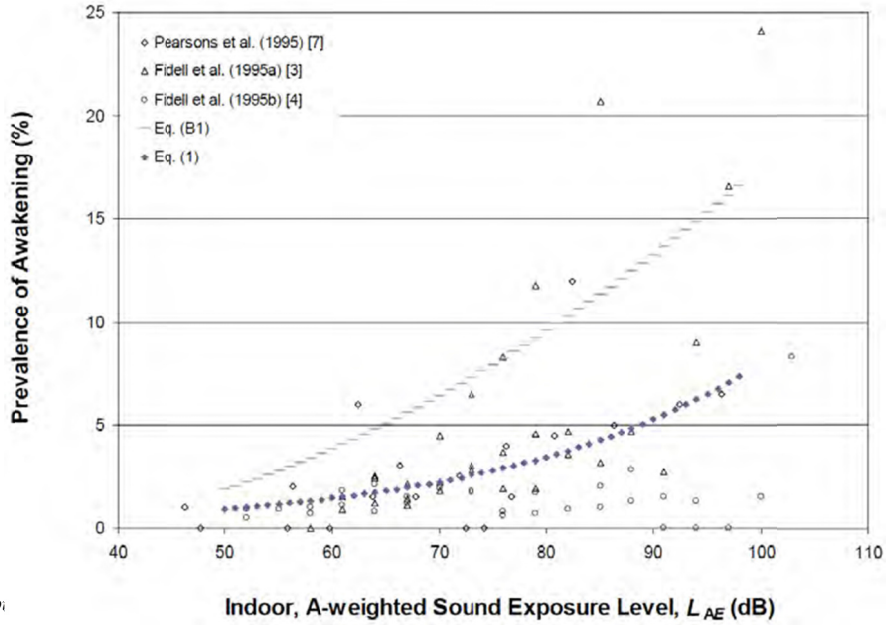


Figure C-7. Plot of Sleep Awakening Data versus Indoor SEL

In December 2008, FICAN recommended the use of this new estimation procedure for future analyses of behavioral awakenings from aircraft noise. In that statement, FICAN also recognized that additional sleep disturbance research is underway by various research organizations, and results of that work may result in additional changes to FICAN's position. Until that time, FICAN recommends the use of ANSI S12.9-2008.

2.4 Noise-Induced Hearing Impairment

This section provides a brief overview of hearing loss caused by noise exposure. The goal is to provide a sense of perspective as to how aircraft noise (as experienced on the ground) compares to other activities that are often linked with hearing loss.

2.4.1 Hearing Threshold Shifts

Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound; i.e., a shift in the hearing threshold to a higher level. This change can either be a Temporary Threshold Shift (TTS), or a Permanent Threshold Shift (PTS) (Berger *et al.* 1995).

TTS can result from exposure to loud noise over a given amount of time, yet the hearing loss is not necessarily permanent. An example of TTS might be a person attending a loud music concert. After the concert is over, the person may experience a threshold shift that may last several hours, depending upon the level and duration of exposure. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the

speech range (typically near 4,000 Hz). Normal hearing ability eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover from the strain and fatigue of exposure. A common example of PTS is the result of working in a loud environment such as a factory. It is important to note that a temporary shift (TTS) can eventually become permanent (PTS) over time with continuous exposure to high noise levels. Thus, even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a TTS results in a PTS is difficult to identify and varies with a person's sensitivity.

2.4.2 Criteria for Permanent Hearing Loss

Considerable data on hearing loss have been collected and analyzed by the scientific/medical community. It has been well established that continuous exposure to high noise levels will damage human hearing (USEPA 1978). The Occupational Safety and Health Administration (OSHA) regulation of 1971 standardizes the limits on workplace noise exposure for protection from hearing loss as an average level of 90 dB over an 8-hour work period or 85 dB over a 16-hour period (the average level is based on a 5 dB decrease per doubling of exposure time) (U.S. Department of Labor 1971). Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) is an average sound level of 70 dB over a 24-hour period.

The USEPA established 75 dB for an 8-hour exposure and 70 dB for a 24-hour exposure as the average noise level standard requisite to protect 96 percent of the population from greater than a 5 dB PTS (USEPA 1978). The National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) identified 75 dB as the minimum level at which hearing loss may occur (CHABA 1977). Finally, the WHO has concluded that environmental and leisure-time noise below an $L_{eq(24)}$ value of 70 dB "will not cause hearing loss in the large majority of the population, even after a lifetime of exposure" (WHO 2000).

2.4.3 Hearing Loss and Aircraft Noise

The 1982 USEPA Guidelines report specifically addresses the criteria and procedures for assessing the noise-induced hearing loss in terms of the Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in hearing level, or threshold, caused by exposure to noise (USEPA 1982). Numerically, the NIPTS is the change in threshold averaged over the frequencies 0.5, 1, 2, and 4 kHz that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at an age of 20 years. A grand average of the NIPTS over time (40 years) and hearing sensitivity (10 to 90 percentiles of the exposed population) is termed the Average NIPTS, or Ave NIPTS

for short. The Ave NIPTS that can be expected for noise exposure as measured by the DNL metric is given in Table C-3.

Table C-3. Ave NIPTS and 10th Percentile NIPTS as a Function of DNL

DNL	*Ave NIPTS dB**	*10th Percentile NIPTS dB**
75-76	1.0	4.0
76-77	1.0	4.5
77-78	1.6	5.0
78-79	2.0	5.5
79-80	2.5	6.0
80-81	3.0	7.0
81-82	3.5	8.0
82-83	4.0	9.0
83-84	4.5	10.0
84-85	5.5	11.0

*Note:**Rounded to the nearest 0.5 dB

For example, for a noise exposure of 80 dB DNL, the expected lifetime average value of NIPTS is 2.5 dB, or 6.0 dB for the 10th percentile. Characterizing the noise exposure in terms of DNL will usually overestimate the assessment of hearing loss risk as DNL includes a 10 dB weighting factor for aircraft operations occurring between 10 p.m. and 7 a.m. If, however, flight operations between the hours of 10 p.m. and 7 a.m. account for 5 percent or less of the total 24-hour operations, the overestimation is on the order of 1.5 dB. From a civilian airport perspective, the scientific community has concluded that there is little likelihood that the resulting noise exposure from aircraft noise could result in either a temporary or permanent hearing loss. Studies on community hearing loss from exposure to aircraft flyovers near airports showed that there is no danger, under normal circumstances, of hearing loss due to aircraft noise (Newman and Beattie 1985). The USEPA criterion ($L_{eq(24)}$ = 70 dBA) can be exceeded in some areas located near airports, but that is only the case outdoors. Inside a building, where people are more likely to spend most of their time, the average noise level will be much less than 70 dBA (Eldred and von Gierke 1993). Eldred and von Gierke also report that "several studies in the U.S., Japan, and the United Kingdom have confirmed the predictions that the possibility for permanent hearing loss in communities, even under the most intense commercial take-off and landing patterns, is remote."

With regard to military airbases, as individual aircraft noise levels are increasing with the introduction of new aircraft, a 2009 Department of Defense (DoD) policy directive requires that hearing loss risk be estimated for the at risk population, defined as the population exposed to DNL greater than or equal to 80 dB (Undersecretary of Defense for Acquisition, Technology and Logistics 2009). Specifically, DoD components are directed to "use the 80 Day-Night A-Weighted (DNL) noise contour to identify populations at the most risk of potential hearing loss."

This does not preclude populations outside the 80 DNL contour, i.e., at lower exposure levels, from being at some degree of risk of hearing loss. However, the analysis should be restricted to populations within this contour area, including residents of on-base housing. The exposure of workers inside the base boundary area should be considered occupational and evaluated using the appropriate DoD component regulations for occupational noise exposure.

2.4.4 Summary

Aviation and typical community noise levels near airports are not comparable to the occupational or recreational noise exposures associated with hearing loss. Studies of aircraft noise levels associated with civilian airport activity have not definitively correlated permanent hearing impairment with aircraft activity. It is unlikely that airport neighbors will remain outside their homes 24 hours per day, so there is little likelihood of hearing loss below an average sound level of 75 dB DNL. Near military airbases, average noise levels above 75 dB may occur, and while new DoD policy dictates that NIPTS be evaluated, no research results to date have definitively related permanent hearing impairment to aviation noise.

2.5 Non-auditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on January 22–24, 1990, in Washington, D.C., which states "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day)" (von Gierke 1990; parenthetical wording added for clarification). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss; and even above these criteria, results regarding such health effects were ambiguous.

Consequently, it can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place.

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies

regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles researchers found a relation between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other University of California at Los Angeles professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other University of California at Los Angeles researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds *et al.* 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (Committee of the Health Council of the Netherlands 1996), analyzed currently available published information on this topic. The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 a.m. to 10:00 p.m.) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with DNL, this corresponds to DNL of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB. The potential for noise to affect physiological health, such as the cardiovascular system, has been speculated; however, no unequivocal evidence exists to support such claims (Harris 1997). Conclusions drawn from a review of health effect studies involving military low-altitude flight noise with its unusually high maximum levels and rapid rise in sound level have shown no increase in cardiovascular disease (Schwartze and Thompson 1993). Additional claims that are unsupported include flyover noise producing increased mortality rates and increases in cardiovascular death, aggravation of post-traumatic stress syndrome, increased stress, increase in admissions to mental hospitals, and adverse effects on pregnant women and the unborn fetus (Harris 1997).

2.5.1 Performance Effects

The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have established links between continuous high noise levels and performance loss. Noise-induced performance losses are most frequently reported in studies employing noise levels in excess of 85 dB. Little change has been found in low-noise cases. It has been cited that moderate noise levels appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task.

While the results of research on the general effect of periodic aircraft noise on performance have yet to yield definitive criteria, several general trends have been noted including:

- A periodic intermittent noise is more likely to disrupt performance than a steady-state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady-state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme demands on the worker.

2.6 Noise Effects on Children

In response to noise-specific and other environmental studies, Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (1997), requires federal agencies to ensure that policies, programs, and activities address environmental health and safety risks to identify any disproportionate risks to children.

A review of the scientific literature indicates that there has not been a tremendous amount of research in the area of aircraft noise effects on children. The research reviewed does suggest that environments with sustained high background noise can have variable effects, including noise effects on learning and cognitive abilities, and reports of various noise-related physiological changes.

2.6.1 Effects on Learning and Cognitive Abilities

In 2002, ANSI refers to studies that suggest that loud and frequent background noise can affect the learning patterns of young children (ANSI 2002). ANSI provides discussion on the relationships between noise and learning, and stipulates design requirements and acoustical performance criteria for outdoor-to-indoor noise isolation. School design is directed to be cognizant of, and responsive to surrounding land uses and the shielding of outdoor noise from the indoor environment. The ANSI acoustical performance criteria for schools include the

requirement that the one-hour-average background noise level shall not exceed 35 dBA in core learning spaces smaller than 20,000 cubic feet and 40 dBA in core learning spaces with enclosed volumes exceeding 20,000 cubic feet. This would require schools be constructed such that, in quiet neighborhoods indoor noise levels are lowered by 15 to 20 dBA relative to outdoor levels. In schools near airports, indoor noise levels would have to be lowered by 35 to 45 dBA relative to outdoor levels (ANSI 2002).

The studies referenced by ANSI to support the new standard are not specific to jet aircraft noise and the potential effects on children. However, there are references to studies that have shown that children in noisier classrooms scored lower on a variety of tests. Excessive background noise or reverberation within schools causes interferences of communication and can therefore create an acoustical barrier to learning (ANSI 2002). Studies have been performed that contribute to the body of evidence emphasizing the importance of communication by way of the spoken language to the development of cognitive skills. The ability to read, write, comprehend, and maintain attentiveness, is in part, based upon whether teacher communication is consistently intelligible (ANSI 2002).

Numerous studies have shown varying degrees of effects of noise on the reading comprehension, attentiveness, puzzle-solving, and memory/recall ability of children. It is generally accepted that young children are more susceptible than adults to the effects of background noise. Because of the developmental status of young children (linguistic, cognitive, and proficiency), barriers to hearing can cause interferences or disruptions in developmental evolution.

Research on the impacts of aircraft noise, and noise in general, on the cognitive abilities of school-aged children has received more attention in recent years. Several studies suggest that aircraft noise can affect the academic performance of schoolchildren. Although many factors could contribute to learning deficits in school-aged children (e.g., socioeconomic level, home environment, diet, sleep patterns), evidence exists that suggests that chronic exposure to high aircraft noise levels can impair learning.

Specifically, elementary school children attending schools near New York City's two airports demonstrated lower reading scores than children living farther away from the flight paths (Green *et al.* 1982). Researchers have found that tasks involving central processing and language comprehension (such as reading, attention, problem solving, and memory) appear to be the most affected by noise (Evans and Lepore 1993, Hygge 1994, and Evans *et al.* 1998). It has been demonstrated that chronic exposure of first- and second-grade children to aircraft noise can result in reading deficits and impaired speech perception (i.e., the ability to hear common, low-frequency [vowel] sounds but not high frequencies [consonants] in speech) (Evans and Maxwell 1997).

The Evans and Maxwell (1997) study found that chronic exposure to aircraft noise resulted in reading deficits and impaired speech perception for first- and second-grade children. Other studies found that children residing near the LAX had more difficulty solving cognitive problems and did not perform as well as children from quieter schools in puzzle-solving and attentiveness (Bronzaft 1997, Cohen *et al.* 1980). Children attending elementary schools in high aircraft noise areas near London's Heathrow Airport demonstrated poorer reading comprehension and selective cognitive impairments (Haines *et al.* 2001a and 2001b). Similarly, a 1994 study found that students exposed to aircraft noise of approximately 76 dBA scored 20 percent lower on recall ability tests than students exposed to ambient noise of 42-44 dBA (Hygge 1994). Similar studies involving the testing of attention, memory, and reading comprehension of school children located near airports showed that their tests exhibited reduced performance results compared to those of similar groups of children who were located in quieter environments (Evans *et al.* 1998, Haines *et al.* 1998). The Haines and Stansfeld study indicated that there may be some long-term effects associated with exposure, as one-year follow-up testing still demonstrated lowered scores for children in higher noise schools (Haines *et al.* 2001a and 2001b). In contrast, a 2002 study found that although children living near the old Munich airport scored lower in standardized reading and long-term memory tests than a control group, their performance on the same tests was equal to that of the control group once the airport was closed (Hygge *et al.* 2002).

Finally, although it is recognized that there are many factors that could contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led the WHO and a North Atlantic Treaty Organization working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (WHO 2000, North Atlantic Treaty Organization 2000).

2.6.2 Health Effects

Physiological effects in children exposed to aircraft noise and the potential for health effects have also been the focus of limited investigation. Studies in the literature include examination of blood pressure levels, hormonal secretions, and hearing loss.

As a measure of stress response to aircraft noise, authors have looked at blood pressure readings to monitor children's health. Children who were chronically exposed to aircraft noise from a new airport near Munich, Germany, had modest (although significant) increases in blood pressure, significant increases in stress hormones, and a decline in quality of life (Evans *et al.* 1998). Children attending noisy schools had statistically significant average systolic and diastolic blood pressure ($p<0.03$). Systolic blood pressure means were 89.68 millimeters (mm) for children attending schools located in noisier environments compared to 86.77 mm for a

control group. Similarly, diastolic blood pressure means for the noisier environment group were 47.84 mm and 45.16 mm for the control group (Cohen *et al.* 1980).

Although the literature appears limited, studies focused on the wide range of potential effects of aircraft noise on school children have also investigated hormonal levels between groups of children exposed to aircraft noise compared to those in a control group. Specifically, two studies analyzed cortisol and urinary catecholamine levels in school children as measurements of stress response to aircraft noise (Haines *et al.* 2001b and 2001c). In both instances, there were no differences between the aircraft-noise-exposed children and the control groups.

Other studies have reported hearing losses from exposure to aircraft noise. Noise-induced hearing loss was reportedly higher in children who attended a school located under a flight path near a Taiwan airport, as compared to children at another school far away (Chen *et al.* 1997). Another study reported that hearing ability was reduced significantly in individuals who lived near an airport and were frequently exposed to aircraft noise (Chen and Chen 1993). In that study, noise exposure near the airport was reportedly uniform, with DNL greater than 75 dB and maximum noise levels of about 87 dB during overflights. Conversely, several other studies that were reviewed reported no difference in hearing ability between children exposed to high levels of airport noise and children located in quieter areas (Fisch 1977, Andrus *et al.* 1975, Wu *et al.* 1995).

2.7 Effects on Domestic Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci *et al.* (1988) assert that the consequences physiological effects may have on behavioral patterns is vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intra-inter specific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those

studies that have focused on the observations of the behavioral effects that jet aircraft have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci *et al.* (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci *et al.* 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights. Secondary effects may include non-auditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith *et al.* 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci *et al.* 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Apparently, animal responses to aircraft are influenced

by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith *et al.* 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the 1988 Manci *et al.*, literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci *et al.* (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

2.7.1 Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci *et al.* 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

2.7.2 Summary

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The literature does suggest that common responses include the "startle" or "fright" response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

2.8 Property Values

Property within a noise zone (or Accident Potential Zone) may be affected by the availability of federally guaranteed loans. According to U.S. Department of Housing and Urban Development (HUD), Federal Housing Administration (FHA), and Veterans Administration (VA) guidance, sites are acceptable for program assistance, subsidy, or insurance for housing in noise zones of less than 65 dB DNL, and sites are conditionally acceptable with special approvals and noise attenuation in the 65 to 75 dB DNL noise zone and the greater than 75 dB DNL noise zone. HUD's position is that noise is not the only determining factor for site acceptability, and properties should not be rejected only because of airport influences if there is evidence of acceptability within the market and if use of the dwelling is expected to continue. Similar to the Navy's and USAF's Air Installation Compatible Use Zone Program, HUD, FHA, and VA recommend sound attenuation for housing in the higher noise zones and written disclosures to all prospective buyers or lessees of property within a noise zone (or Accident Potential Zone).

Newman and Beattie (1985) reviewed the literature to assess the effect of aircraft noise on property values. One paper by Nelson (1978), reviewed by Newman and Beattie, suggested a 1.8 to 2.3 percent decrease in property value per decibel at three separate airports, while at another period of time, they found only a 0.8 percent devaluation per decibel change in DNL. However, Nelson also noted a decline in noise depreciation over time which he theorized could be due to either noise sensitive people being replaced by less sensitive people or the increase in commercial value of the property near airports; both ideas were supported by Crowley (1978). Ultimately, Newman and Beattie summarized that while an effect of noise was observed, noise is

only one of the many factors that is part of a decision to move close to, or away from, an airport, but which is sometimes considered an advantage due to increased opportunities for employment or ready access to the airport itself.

More recently Fidell *et al.* (1996) studied the influences of aircraft noise on actual sale prices of residential properties in the vicinity of two military facilities and found that equations developed for one area to predict residential sale prices in areas unaffected by aircraft noise worked equally well when applied to predicting sale prices of homes in areas with aircraft noise in excess of 65 dB DNL. Thus, the model worked equally well in predicting sale prices in areas with and without aircraft noise exposure. This indicates that aircraft noise had no meaningful effect on residential property values. In some cases, the average sale prices of noise exposed properties were somewhat higher than those elsewhere in the same area. In the vicinity of Davis-Monthan Air Force Base (AFB) in Tucson, Arizona, Fidell found the homes near the AFB were much older, smaller, and in poorer condition than homes elsewhere. These factors caused the equations developed for predicting sale prices in areas further away from the base to be inapplicable with those nearer the AFB. However, again Fidell found that, similar to other researchers, differences in sale prices between homes with and without aircraft noise were frequently due to factors other than noise itself.

2.8.1 Noise Effects on Structures

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally used to determine the possibility of damage. In general, with peak sound levels above 130 dB, there is the possibility of the excitation of structural component resonances. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (CHABA 1977).

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or rattling of objects within the dwelling such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise. In general, such noise- induced vibrations occur at peak sound levels of 110 dB or greater. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

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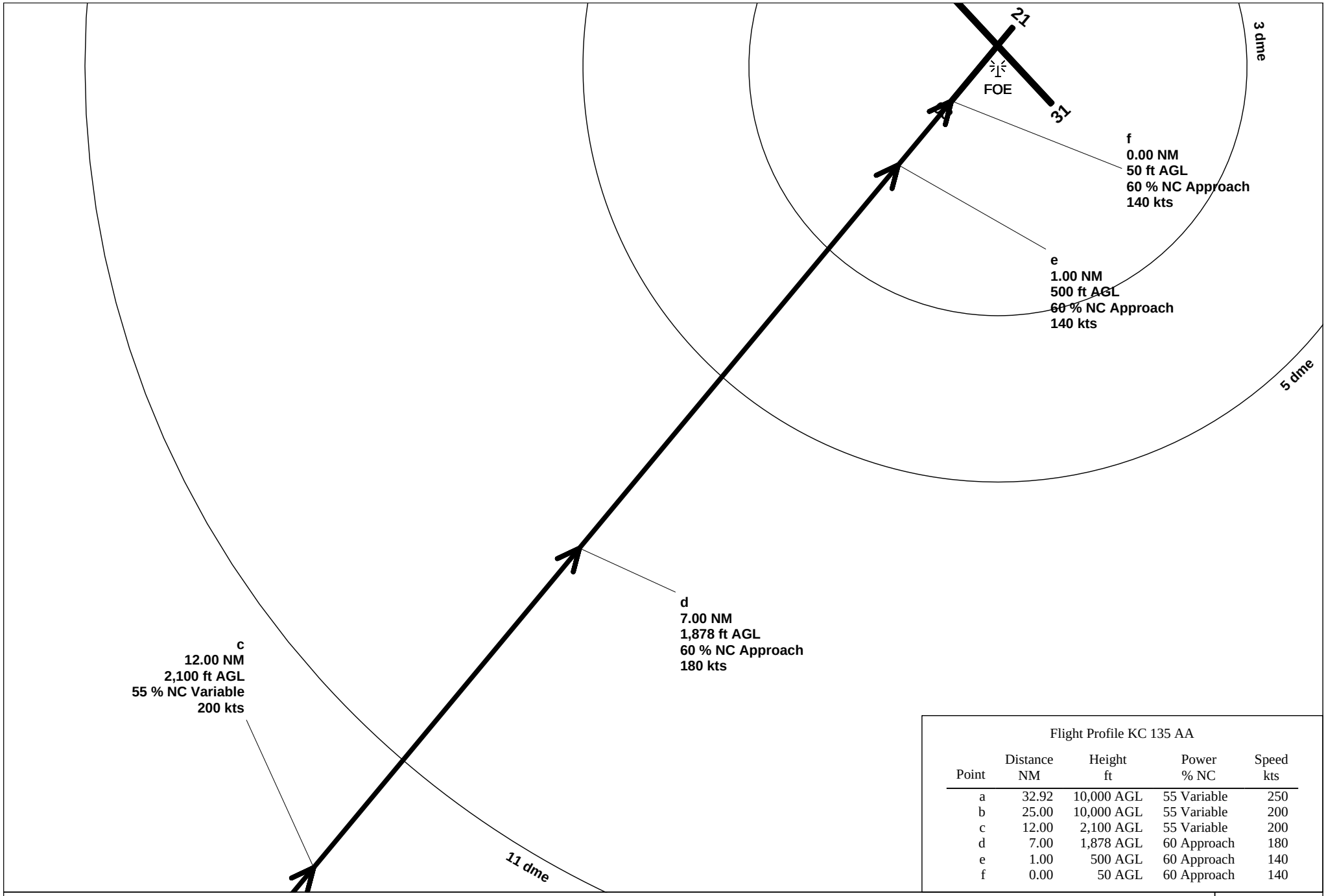
Noise Modeling Input Data, Sample for KC-135 and KC-46A

Example Flight Profiles



Flight Profile KC 135 AA

Point	Distance NM	Height ft	Power % NC	Speed kts
a	32.92	10,000 AGL	55 Variable	250
b	25.00	10,000 AGL	55 Variable	200
c	12.00	2,100 AGL	55 Variable	200
d	7.00	1,878 AGL	60 Approach	180
e	1.00	500 AGL	60 Approach	140
f	0.00	50 AGL	60 Approach	140

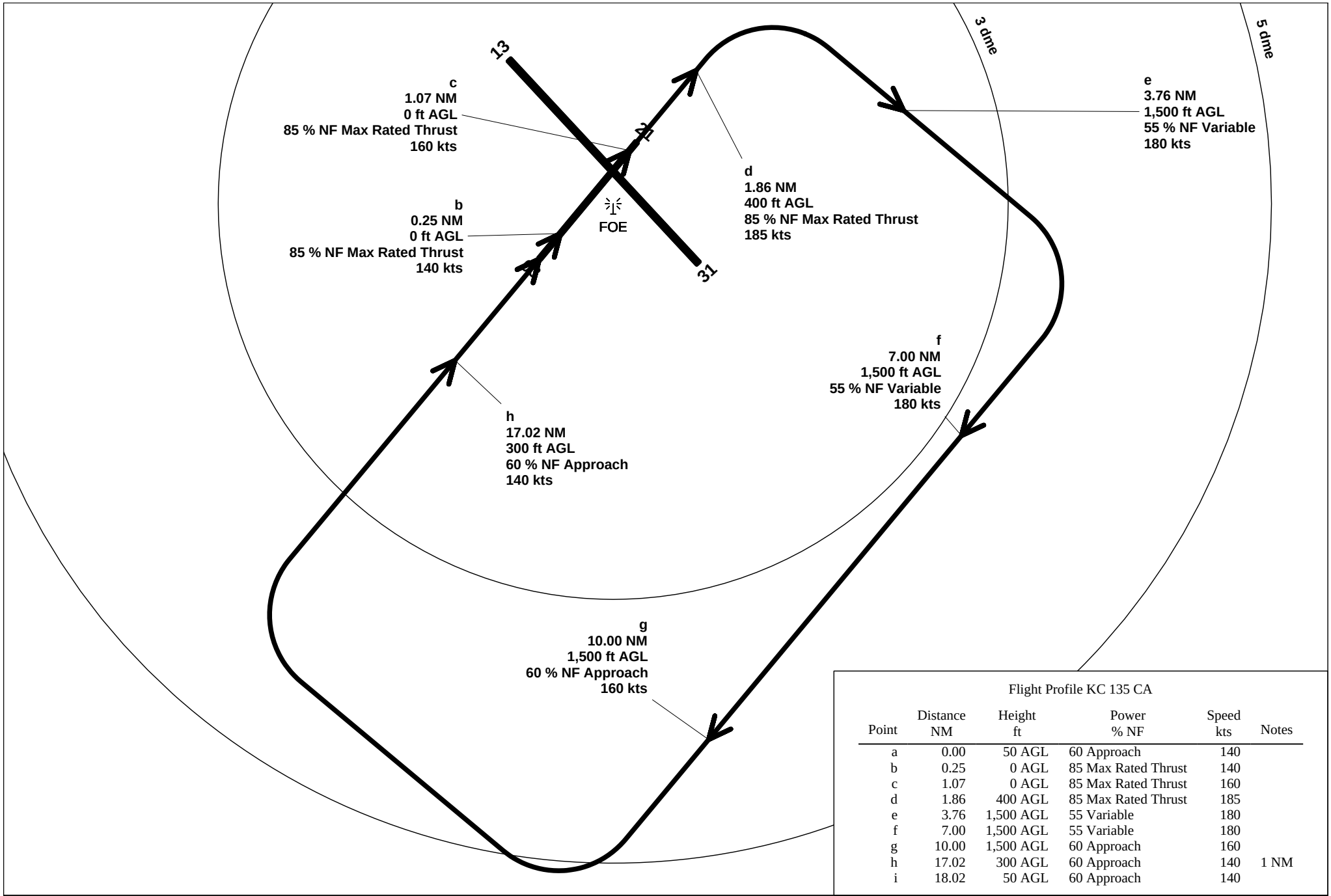
Flight Profile KC 135 AA

ST-IN FROM SOUTHWEST

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:109,000 (1 inch = 9,100 feet)

N



Flight Profile KC 135 CA

Point	Distance NM	Height ft	Power % NF	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.25	0 AGL	85 Max Rated Thrust	140	
c	1.07	0 AGL	85 Max Rated Thrust	160	
d	1.86	400 AGL	85 Max Rated Thrust	185	
e	3.76	1,500 AGL	55 Variable	180	
f	7.00	1,500 AGL	55 Variable	180	
g	10.00	1,500 AGL	60 Approach	160	
h	17.02	300 AGL	60 Approach	140	1 NM
i	18.02	50 AGL	60 Approach	140	

Flight Profile KC 135 CA

VFR RIGHT TURNS SOUTH SIDE, (TANKER AND LARGE AIRCRAFT)

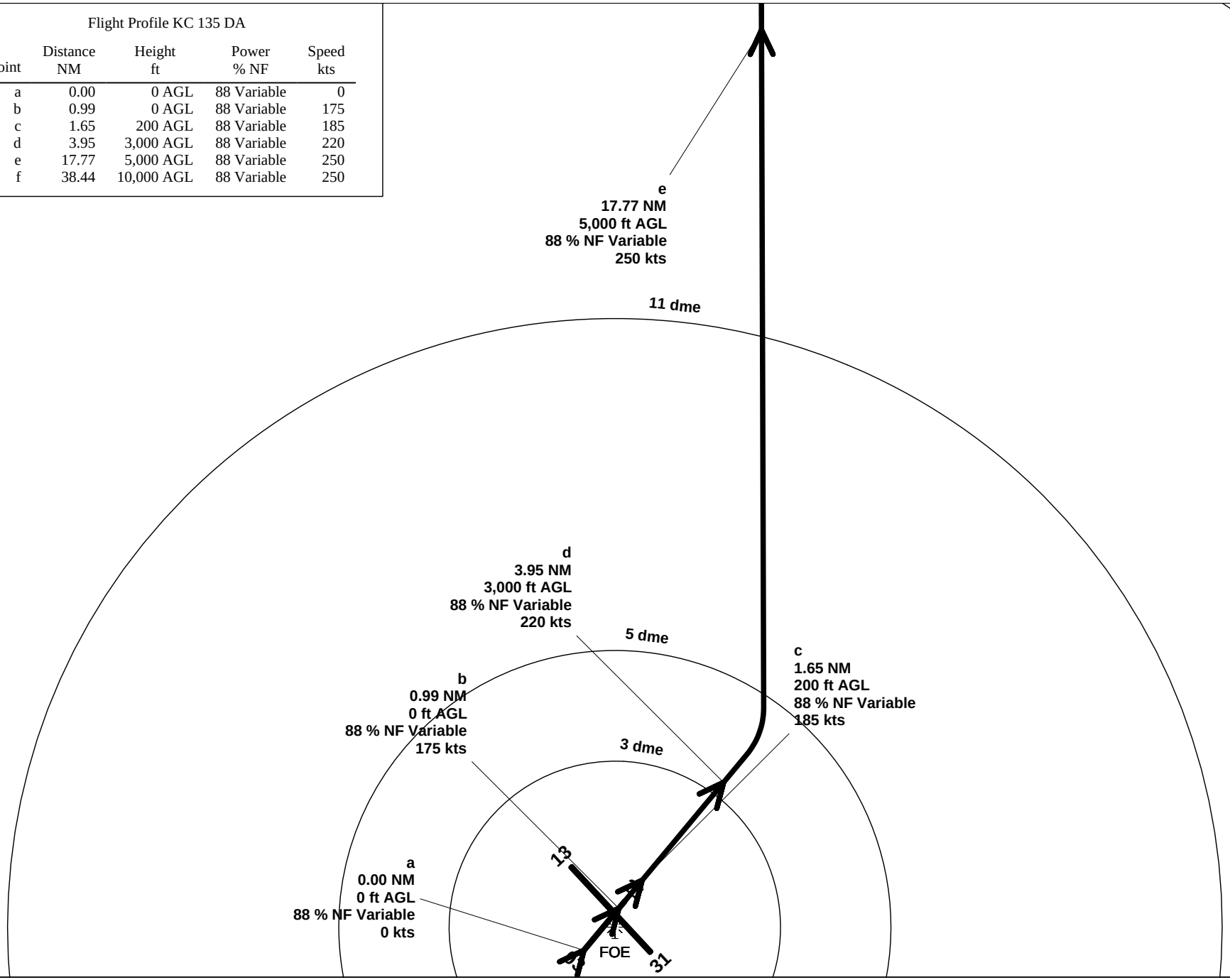
0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:69,100 (1 inch = 5,760 feet)

N

Flight Profile KC 135 DA

Point	Distance NM	Height ft	Power % NF	Speed kts
a	0.00	0 AGL	88 Variable	0
b	0.99	0 AGL	88 Variable	175
c	1.65	200 AGL	88 Variable	185
d	3.95	3,000 AGL	88 Variable	220
e	17.77	5,000 AGL	88 Variable	250
f	38.44	10,000 AGL	88 Variable	250



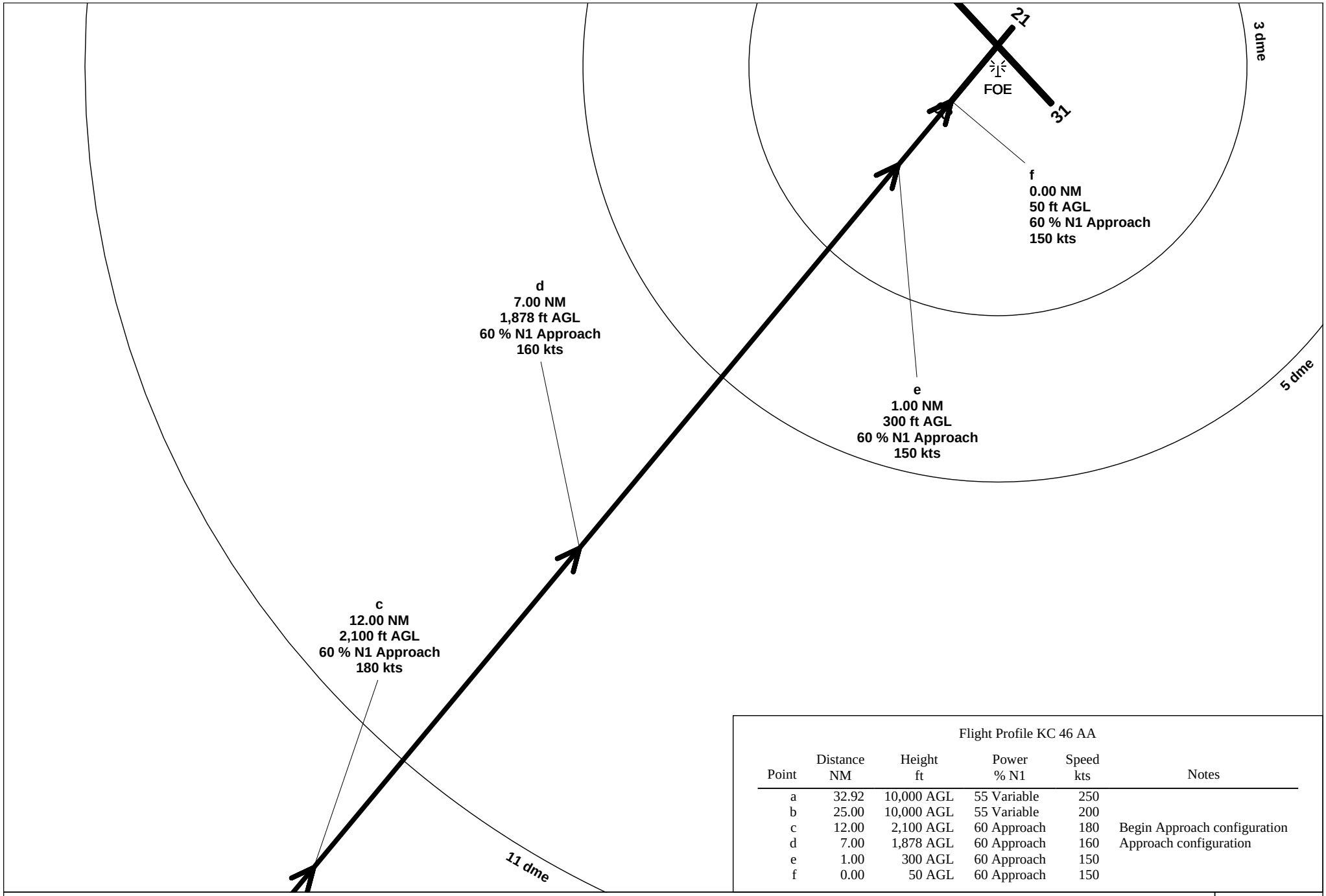
Flight Profile KC 135 DA

LEFT TURN TO NORTH

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:180,000 (1 inch = 15,000 feet)

N



Flight Profile KC 46 AA

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	32.92	10,000 AGL	55 Variable	250	
b	25.00	10,000 AGL	55 Variable	200	
c	12.00	2,100 AGL	60 Approach	180	Begin Approach configuration
d	7.00	1,878 AGL	60 Approach	160	Approach configuration
e	1.00	300 AGL	60 Approach	150	
f	0.00	50 AGL	60 Approach	150	

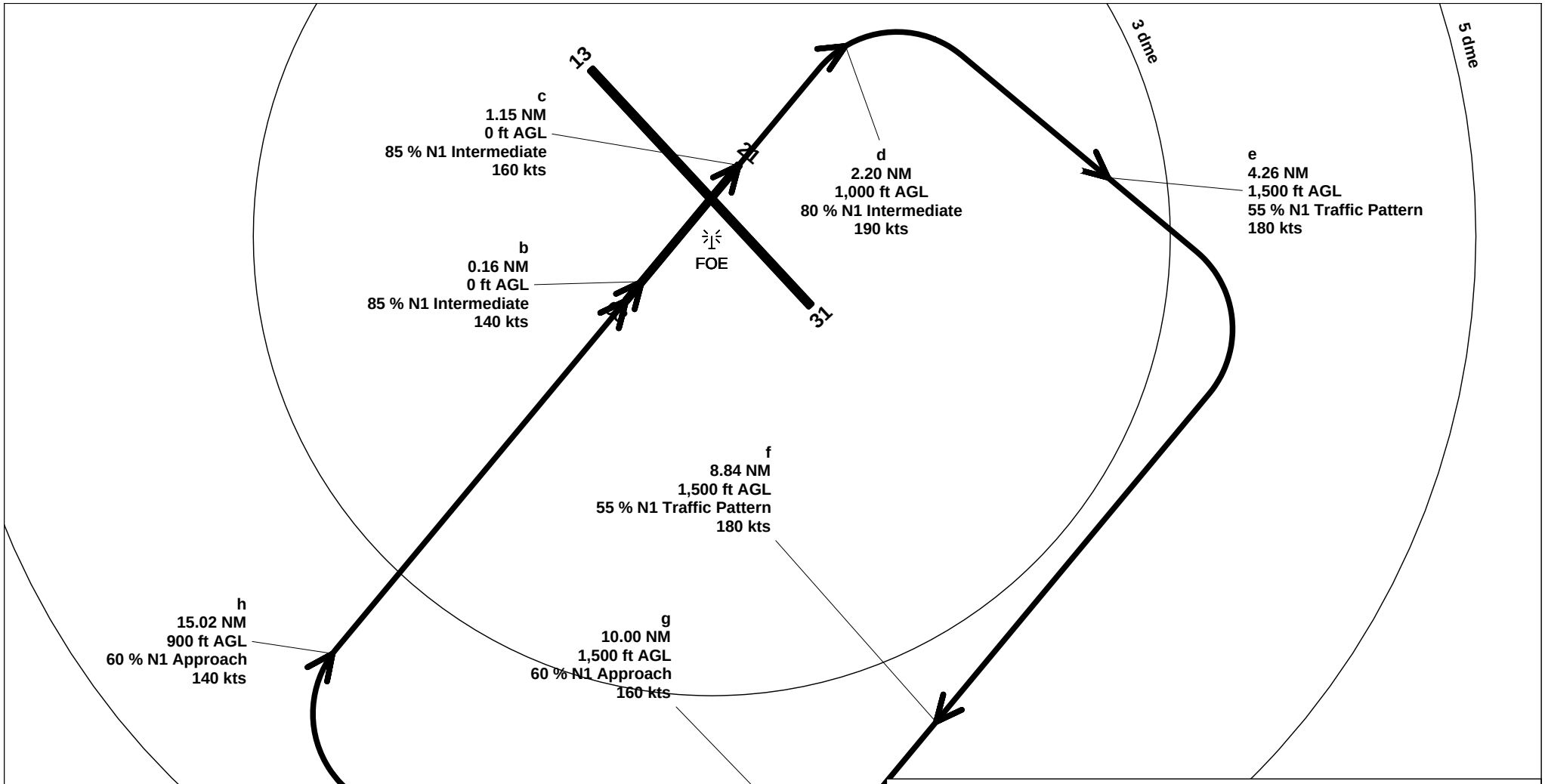
Flight Profile KC 46 AA

ST-IN FROM SOUTHWEST

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:109,000 (1 inch = 9,100 feet)

N



Flight Profile KC 46 CA

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	50 AGL	60 Approach	140	
b	0.16	0 AGL	85 Intermediate	140	1000 foot touch down
c	1.15	0 AGL	85 Intermediate	160	6000 foot lift off
d	2.20	1,000 AGL	80 Intermediate	190	
e	4.26	1,500 AGL	55 Traffic Pattern	180	Pattern altitude
f	8.84	1,500 AGL	55 Traffic Pattern	180	
g	10.00	1,500 AGL	60 Approach	160	
h	15.02	900 AGL	60 Approach	140	3 NM Final
i	18.02	50 AGL	60 Approach	140	

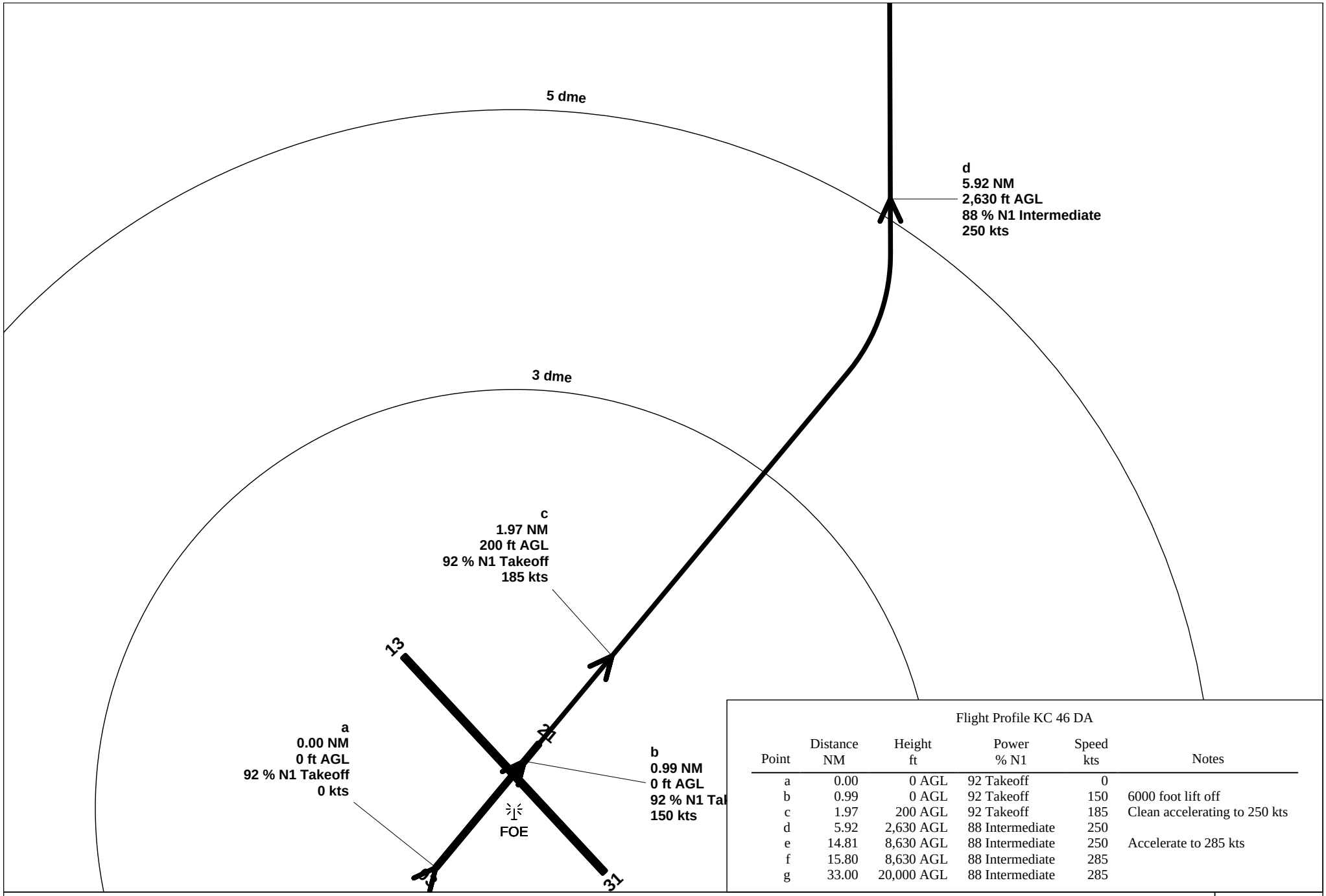
Flight Profile KC 46 CA

VFR RIGHT TURNS SOUTH SIDE, (TANKER AND LARGE AIRCRAFT)

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:69,100 (1 inch = 5,760 feet)

N



Flight Profile KC 46 DA

Point	Distance NM	Height ft	Power % N1	Speed kts	Notes
a	0.00	0 AGL	92 Takeoff	0	
b	0.99	0 AGL	92 Takeoff	150	6000 foot lift off
c	1.97	200 AGL	92 Takeoff	185	Clean accelerating to 250 kts
d	5.92	2,630 AGL	88 Intermediate	250	
e	14.81	8,630 AGL	88 Intermediate	250	Accelerate to 285 kts
f	15.80	8,630 AGL	88 Intermediate	285	
g	33.00	20,000 AGL	88 Intermediate	285	

Flight Profile KC 46 DA

LEFT TURN TO NORTH

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:65,000 (1 inch = 5,410 feet)

N

Appendix D

Air Quality

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Appendix D1

Air Quality Background Information

APPENDIX D1 AIR QUALITY BACKGROUND INFORMATION

This appendix provides assumptions used to calculate emissions for the Proposed Action alternatives, as well as tables showing the emission calculations. Emissions from these categories of sources were calculated based on guidance from the United States Air Force (USAF) in their *Air Emissions Guide for Air Force Mobile Sources – Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations* (Air Force Civil Engineer Center [AFCEC] 2013), utilizing the latest air emissions modeling tools. Each category of emissions is discussed in the sections below.

1.0 Construction Assumptions

It was assumed that each construction project associated with the Proposed Action would be constructed in a single year, and that all construction would occur in Fiscal Year (FY) 2015. Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (United States Environmental Protection Agency [USEPA] 1995), the USEPA NONROAD2008a model for nonroad construction equipment (USEPA 2009), and the USEPA MOVES2010b model for on-road vehicles (USEPA 2013b).

Operational emissions from sources operating in association with the Proposed Action include aircraft operations, aerospace ground equipment (AGE), engine testing, and personal vehicle use. Calculation methodologies for each emission category and assumptions used to calculate emissions for the Proposed Action alternatives are discussed below.

2.0 Aircraft Operations

The methodology for estimating aircraft emissions involves evaluating the type of operations for each type of aircraft, the number of hours of operation for each aircraft type, the type of engine in each aircraft, and the mode of operation for each type of aircraft engine. Aircraft emissions are calculated based on the type of aircraft, the engine model, the operational mode and time-in-mode (TIM) for each mode, the power setting associated with each operational mode, the fuel flow rate associated with each power setting, engine-specific emission factors, the mixing zone height, and the number of landing-takeoff (LTO) cycles conducted during the course of a year. As TIM and fuel flow for each power setting varies among aircraft engines and airframes, the calculation procedure was repeated for individual aircraft types.

The types of aircraft and numbers and type of operations were obtained from the installations for both existing conditions (KC-135 aircraft) and Proposed Action alternatives (KC-46A aircraft). The operational profiles from the noise modeling analysis conducted for the Proposed Action were used to calculate emissions, accounting for the mode of operation for aircraft engines, engine speed, and elevation above ground level.

As discussed in the USAF guidance document, because estimating emissions using an LTO approach accounts for exhaust emissions associated with aircraft operations occurring both on the ground and up to the mixing zone height, the choice of a mixing zone height will have a direct impact on total emissions. Mixing zone height is used to adjust the TIM during the approach and climb out modes of an LTO when calculating emissions. Thus a shallow mixing zone height will result in a shorter TIM (and fewer emissions), and a high mixing zone height will result in a longer TIM (and more emissions). While emissions occurring anywhere within this zone will impact ground-level pollutant concentrations, emissions occurring above it will generally not be mixed to the ground. Because atmospheric stability (and hence inversions) are a function of temperature, mixing zone height varies depending on location, hour, and season, and is affected by local topography, time of day, and time of year. USEPA guidance notes that in most instances where oxides of nitrogen (NO_x) emissions are not a local air quality concern, a default mixing zone height of 3,000 feet can be used. If, however, NO_x emissions are considered an important component of the emission inventory, specific mixing height data must be gathered and used. The Federal Aviation Administration (FAA) has adopted this USEPA default value in its recommended procedures. For purposes of maximizing the accuracy of the inventory, location specific climate and meteorological data should be used where available to determine seasonal or annual average mixing height.

For conservative purposes, the mixing height was assumed to be 3,000 feet above ground level (AGL).

Emissions were calculated for individual flight operations as follows:

Emissions = TIM/60 x FFR/1000 x EI x NE x N

Where,

TIM = Time spent in each mode (min/cycle)

60 = Factor for converting minutes into hours

FFR = Fuel flow rate per engine (lb/hr)

1000 = Factor for converting lb/hr to 1000 lb/hr

EI = Emission factor (lb/1000 lb)

NE = Number of engines/aircraft

N = number of operations

The KC-135 aircraft are equipped with four engines, and the KC-46A aircraft are equipped with two engines. Based on the flight profiles for the two aircraft provided for the noise analysis, training flight profiles would have the same TIM and same profiles.

Emission calculations for the baseline condition and Proposed Action alternatives are provided in this appendix.

3.0 Aircraft Ground Equipment

AGE includes onsite mobile support equipment such as tow tractors, reciprocating engines, and gas turbines used to support aircraft operations. Based on information from the *Air Emissions Guide for Air Force Mobile Sources – Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations* (AFCEC 2013), emissions for AGE were calculated assuming AGE usage rates per LTO from the *Air Emissions Factor Guide*.

Emission estimates for AGE are provided in this appendix.

4.0 Engine Testing

Baseline emissions from on-wing engine testing were obtained from the operations shown in the Static Pad Summary. It was assumed that the number of engines tested annually would be proportional to the number of aircraft operations at each installation. Engine testing was calculated for the KC-135 engines for baseline conditions and for the KC-46A engines based on similar testing profiles, adjusting for the number of aircraft operations at the installation.

Emission estimates are provided in this appendix.

5.0 Ground Vehicles

Emissions from ground vehicles were calculated using emission factors from the *Air Emissions Guide for Air Force Mobile Sources – Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations* (AFCEC 2013). Ground vehicles operations associated with the baseline and Proposed Action alternatives were calculated based on estimates of personnel that would be associated with the Proposed Action at each installation. It was assumed that vehicles would travel 1 mile on base. The distance traveled off base was estimated based on the distance from the installation to the nearest population center (i.e., downtown metropolitan area). Emission estimates include emissions from startups, hot soak, diurnal evaporative emissions, resting loss, and running loss, as well as running exhaust emissions in grams per mile. Emission estimates are provided in this appendix.

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_____. 2009. NONROAD 2008a Model. http://www.epa.gov/otaq/nonrdmdl.html.

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Appendix D2

Conformity Applicability

APPENDIX D2 CONFORMITY APPLICABILITY ANALYSIS

This appendix presents the Clean Air Act (CAA) General Conformity Applicability Analysis for the KC-46A Beddown at Alternative Air National Guard (ANG) Installations.

1.0 BACKGROUND

The 1990 CAA Amendments revised Section 176(c) to, among other things, require the U.S. Environmental Protection Agency (USEPA) to promulgate regulations establishing the criteria and procedures for determining conformity of federal actions to the applicable State Implementation Plan (SIP) or Federal Implementation Plan. General conformity to a SIP or Federal Implementation Plan means that a Federal agency's activities will not produce new air quality violations, worsen existing violations, or delay an area's timely attainment of the National Ambient Air Quality Standards (NAAQS). On November 30, 1993, the USEPA promulgated regulations, entitled *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, that were codified at 40 Code of Federal Regulations (CFR) Part 51 Subpart W and at 40 CFR Part 93 Subpart B. The regulations at 40 CFR Part 93 were interim regulations until states amended their SIPs per the regulations in 40 CFR Part 51. In 1995, Congress added subparagraph (5) to CAA Section 176(c), limiting the section's applicability to areas designated either nonattainment or maintenance.

2.0 REGULATORY REQUIREMENTS

Under the provisions of 40 CFR Parts 51 and 93, Federal actions are required to conform with the approved SIP for those areas that are categorized as nonattainment or maintenance areas for any criteria pollutant. The purpose of the General Conformity Rule is to demonstrate that the Proposed Action will not cause or contribute to a violation of an air quality standard, and that the project will not adversely affect the air basin's ability to attain and maintain the ambient air quality standards.

The first step in the evaluation is to determine whether the project's emissions of nonattainment pollutants or precursors would exceed the regulatory *de minimis* thresholds established in 40 CFR 93. The following sections discuss the attainment status and General Conformity Rule requirements for each of the alternative ANG installations.

2.1 190th Air Refueling Wing

Forbes Air National Guard Station (ANGS), home of the 190th Air Refueling Wing (190 ARW) of the Kansas Air National Guard (KS ANG), is located on Forbes Field Airport, approximately 5 miles south of Topeka in Shawnee County, Kansas. The USEPA has classified the state of

Kansas as an attainment/unclassified area for all criteria pollutants. The Proposed Action is therefore not subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule.

2.2 108th Wing

Joint Base McGuire-Dix-Lakehurst (JB MDL) is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. The USEPA has classified the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey as nonattainment for the ozone (O_3) (marginal nonattainment) and particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$) NAAQS, and a maintenance area for carbon dioxide (CO). The region is designated attainment/unclassified area for all other criteria pollutants. The proposed action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (oxides of nitrogen [NO_x] and volatile organic compounds [VOCs]) is 100 tons per year (tpy), and the *de minimis* emission thresholds for $PM_{2.5}$ and CO emissions are also 100 tpy.

2.3 157th Air Refueling Wing

Pease ANGS, home of the 157th Air Refueling Wing (157 ARW) of the New Hampshire Air National Guard (NH ANG), is located in Newington, New Hampshire approximately 1 mile west of Portsmouth, New Hampshire. The USEPA had previously classified the Boston-Manchester-Portsmouth area as a moderate nonattainment area for the 1997 O_3 standard. On January 31, 2013, the USEPA formally redesignated southeastern New Hampshire as an attainment area for the 1997 O_3 standard. The region is therefore considered a maintenance area for O_3. The region is designated attainment/unclassified area for all other criteria pollutants. The proposed action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the classification for the region as a maintenance area, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (NO_x and VOCs) is 100 tpy.

2.4 171st Air Refueling Wing

The USEPA has classified Allegheny County as a moderate nonattainment area for the O_3 NAAQS, and a nonattainment area for $PM_{2.5}$. Pittsburgh is also designated as a nonattainment area for CO, but this designation applies only in high traffic areas in the central business district of the city. The region is designated attainment/unclassified area for all other criteria pollutants. Alternative #4 is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3

precursors (NO_x and VOCs) is 100 tpy, and the *de minimis* emission threshold for $PM_{2.5}$ emissions is also 100 tpy.

2.5 121st Air Refueling Wing

Rickenbacker ANGS is located approximately 12 miles south of downtown Columbus, Ohio in Franklin County. The USEPA has classified the Columbus area, including all of Franklin County, as nonattainment for the O_3 and $PM_{2.5}$ NAAQS. The region is designated attainment/unclassified area for all other criteria pollutants. The proposed action is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (NO_x and VOCs) is 100 tpy, and the *de minimis* emission threshold for $PM_{2.5}$ emissions is also 100 tpy.

Table 2.5-1 summarizes the *de minimis* emission thresholds for the alternatives.

Table 2.5-1. General Conformity *De Minimis* Thresholds, tons per year

Installation	*VOCs*	*NO_x*	*CO*	*SO_2*	*PM_{10}*	*$PM_{2.5}$*
190 ARW – Forbes	NA	NA	NA	NA	NA	NA
108 WG – JBMDL	100	100	100	NA	NA	100
157 ARW – Pease	100	100	NA	NA	NA	NA
171 ARW – Pittsburgh	100	100	NA	NA	NA	100
121 ARW - Rickenbacker	100	100	NA	NA	NA	100

Notes: NA – *de minimis* threshold not applicable – installation is in attainment/unclassified area for this pollutant. VOC = volatile organic compound; NO_x = oxides of nitrogen; CO = carbon dioxide; SO_2 = sulfur dioxide; PM10 = particulate matter less than or equal to 10 microns in diameter; PM2.5 = particulate matter less than or equal to 2.5 microns in diameter; 190 ARW = 190th Air Refueling Wing; 108 WG = 108th Wing; 157 ARW = 157th Air Refueling Wing; 171 ARW = 171st Air Refueling Wing; 121 ARW = 121st Air Refueling Wing

3.0 EMISSIONS ASSOCIATED WITH THE FEDERAL ACTION

This section of the Conformity Applicability Analysis presents estimates of emissions associated with the proposed alternatives, and an evaluation of the applicability of the General Conformity Rule to the proposed alternatives.

3.1 190th Air Refueling Wing

Because the 190 ARW is not subject to the General Conformity Rule, the rule is not applicable and no further analysis is required.

3.2 108th Wing

The emissions associated with the proposed action at JBMDL include construction emissions and operational emissions. Construction emissions are summarized in Table 3.2-1. As shown in Table 3.2-1, emissions would be below the *de minimis* thresholds for all pollutants.

Table 3.2-1. Annual Construction Emissions under Alternative #2 – 108 WG Installation

Construction Project	Annual Emissions, tons/year			
	CO	*NO_x*	*VOC*	*$PM_{2.5}$*
Total Construction Emissions	**8.01**	**16.11**	**2.08**	**7.23**
***de minimis* Threshold**	**100**	**100**	**100**	**100**

Table 3.2-2 presents the net annual operational emissions increase (decrease) associated with the beddown of the KC-46A aircraft at JB MDL. As shown in Table 3.2-2, emissions are below the *de minimis* thresholds for all pollutants except NO_x. Emissions of NO_x would exceed the *de minimis* threshold, and this alternative would therefore require a Conformity Determination under the General Conformity Rule.

Table 3.2-2. Comparison of Baseline and Proposed Annual Operational Emissions, 108 WG

Baseline	Annual Emissions, tons/year			
	VOC	*CO*	*NO_x*	*$PM_{2.5}$*
Aircraft Operations	3.21	49.03	83.34	0.39
AGE	0.01	0.01	0.09	0.00
Engine Tests	0.14	2.01	0.55	0.01
POVs	5.12	110.72	5.20	0.12
Total	**8.48**	**161.78**	**89.18**	**0.53**
Proposed Action	***VOC***	***CO***	***NO_x***	***$PM_{2.5}$***
Aircraft Operations	26.19	100.37	294.03	0.96
AGE	0.01	0.02	0.17	0.01
Engine Tests	1.53	5.23	1.38	0.01
POVs	4.75	126.34	3.97	0.12
Total	**32.48**	**231.97**	**299.54**	**1.11**
Net Increase	**24.01**	**70.19**	**210.36**	**0.58**
***de minimis* Threshold**	**100**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding
CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; VOC = volatile organic compound

3.3 157th Air Refueling Wing

The emissions associated with the proposed action at Pease ANGS include construction emissions and operational emissions. Construction emissions are summarized in Table 3.3-1. As shown in Table 3.3-1, emissions would be below the *de minimis* thresholds for all pollutants.

Table 3.3-1. Annual Construction Emissions under Alternative #3 – 157 ARW Installation

Construction Project	ANNUAL EMISSIONS, TONS/YEAR	
	NO_x	*VOC*
Total Construction Emissions	**10.99**	**1.64**
***de minimis* Threshold**	**100**	**100**

Table 3.3-2 presents the net annual operational emissions increase (decrease) associated with the beddown of the KC-46A aircraft at Pease ANGS. As shown in Table 3.3-2, emissions would be below the *de minimis* thresholds for all pollutants. This alternative would therefore not be subject to the requirements of the General Conformity Rule for a Conformity Determination, and a Record of Non-Applicability would be prepared for this alternative.

Table 3.3-2. Comparison of Baseline and Proposed Annual Operational Emissions, 157 ARW

Baseline	ANNUAL EMISSIONS, TONS/YEAR	
	VOC	*NO_x*
Aircraft Operations	2.41	73.94
AGE	0.00	0.07
Engine Tests	0.10	0.40
POVs	1.11	0.91
Total	**3.62**	**75.32**
Proposed Action	***VOC***	***NO_x***
Aircraft Operations	15.24	157.41
AGE	0.01	0.10
Engine Tests	0.77	0.71
POVs	0.91	0.70
Total	**16.93**	**158.92**
Net Increase	**13.31**	**83.60**
***de minimis* Threshold**	**100**	**100**

Notes: Numbers may not add precisely due to rounding
NO_x = oxides of nitrogen; VOC = volatile organic compound

3.4 171st Air Refueling Wing

The emissions associated with the proposed action at Pittsburgh ANGS include construction emissions and operational emissions. Construction emissions are summarized in Table 3.4-1. As shown in Table 3.4-1, emissions would be below the *de minimis* thresholds for all pollutants.

Table 3.4-1. Annual Construction Emissions under Alternative #4 – 171 ARW Installation

Construction Project	ANNUAL EMISSIONS, TONS/YEAR		
	NO_x	*VOC*	*$PM_{2.5}$*
Total Construction Emissions	**14.68**	**1.91**	**6.60**
***de minimis* Threshold**	**100**	**100**	**100**

Table 3.4-2 presents the net annual operational emissions increase (decrease) associated with the beddown of the KC-46A aircraft at Pittsburgh International Airport (IAP). As shown in Table 3.4-2, emissions are below the *de minimis* thresholds for all pollutants. This alternative would

therefore not be subject to the requirements of the General Conformity Rule for a Conformity Determination, and a Record of Non-Applicability would be prepared for this alternative.

Table 3.4-2. Comparison of Baseline and Proposed Annual Operational Emissions, 171 ARW

	Annual Emissions, tons/year		
Baseline	***VOC***	***NO_x***	***$PM_{2.5}$***
Aircraft Operations	3.42	67.79	0.33
AGE	0.01	0.10	0.00
Engine Tests	0.11	0.46	0.01
POVs	4.27	3.37	0.06
Total	**7.81**	**71.72**	**0.40**
Proposed Action	***VOC***	***NO_x***	***$PM_{2.5}$***
Aircraft Operations	20.22	158.42	0.56
AGE	0.01	0.13	0.01
Engine Tests	0.80	0.74	0.01
POVs	3.44	2.52	0.06
Total	**24.48**	**161.81**	**0.64**
Net Increase	**16.67**	**90.09**	**0.24**
***de minimis* Threshold**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding
NO_x = oxides of nitrogen; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; VOC = volatile organic compound

3.5 121st Air Refueling Wing

The emissions associated with the proposed action at Rickenbacker ANGS include construction emissions and operational emissions. Construction emissions are summarized in Table 3.5-1. As shown in Table 3.5-1, emissions would be below the *de minimis* thresholds for all pollutants.

Table 3.5-1. Annual Construction Emissions under Alternative #5 – 121 ARW Installation

Construction Project	***NO_x***	***VOC***
Total Construction Emissions	**24.82**	**2.80**
***de minimis* Threshold**	**100**	**100**

Table 3.5-2 presents the net annual operational emissions increase (decrease) associated with the beddown of the KC-46A aircraft at Rickenbacker ANGS. As shown in Table 3.5-2, emissions are below the *de minimis* thresholds for all pollutants. This alternative would therefore not be subject to the requirements of the General Conformity Rule for a Conformity Determination, and a Record of Non-Applicability would be prepared for this alternative.

Table 3.5-2. Comparison of Baseline and Proposed Annual Operational Emissions, 121 ARW

	ANNUAL EMISSIONS, TONS/YEAR	
Baseline	***VOC***	***NO_x***
Aircraft Operations	4.63	64.35
AGE	0.01	0.15
Engine Tests	0.11	0.43
POVs	4.55	3.55
Total	**9.29**	**68.48**
Proposed Action	***VOC***	***NO_x***
Aircraft Operations	21.71	123.58
AGE	0.01	0.15
Engine Tests	0.59	0.54
POVs	4.09	2.68
Total	**26.43**	**126.95**
Net Increase	**17.13**	**58.47**
***de minimis* Threshold**	**100**	**100**

Notes: Numbers may not add precisely due to rounding
NO_x = oxides of nitrogen; VOC = volatile organic compound

In accordance with the requirements of the General Conformity Rule, a conformity determination is required for each pollutant where the total of direct and indirect emissions associated with the federal action would equal or exceed any of the *de minimis* thresholds. Should Alternative #2 be chosen as the Proposed Action, the ANG would be required to make a determination as to the conformity of emissions of NO_x with the O_3 SIP for the air basin in which the Proposed Action occurs.

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Appendix D3

Emission Calculations

Forbes ANGS

Table D3.1-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle (9%)	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach (30%)	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate (70%)	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military (78%)	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle (7%)	1,663	12.49	42.61	3.78	1.06	0.11	0.10	3,216	0.09	0.10
Approach (30%)	5,702	0.10	1.93	12.17	1.06	0.05	0.04	3,216	0.09	0.10
Climbout (80%)	16,870	0.08	0.50	25.98	1.06	0.07	0.06	3,216	0.09	0.10
Take-Off (100%)	21,622	0.09	0.61	34.36	1.06	0.08	0.07	3,216	0.09	0.10
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135 has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table D3.1-2. HAP Emission Factors, KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135 has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table D3.1-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table D3.1-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table D3.1-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table D3.1-6. Annual Air Operations for Aircraft at Forbes - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	946	4280	10452

Table D3.1-7. KC-135 Aircraft Closed Pattern Operations at Forbes, Baseline

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)					
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	70%	73%	85%
KC-135 CA VFR Right Turns South Side	0.02334748	100	1.08073231	1.05954148	3.23876605	0.6250811	0.10721551	0.60319134
KC-135 CB VFR Right Turns Southwest Side	0.44317768	1897	1.08073231	1.05954148	3.23876605	0.6250811	0.10721551	0.60319134
KC-135 CC IFR Right Turns Southwest Side	0.01552456	66	5.90400061	2.76893508	3.98841687	0.6250811	0.10721551	0.60319134
KC-135 CC_2 IFR Right Turns Southwest Side	0.01552456	66	7.81529572	2.8536984	3.907219	0.6250811	0.10721551	0.60319134
KC-135 CD IFR Right Turns Southwest Side	0.00078836	3	5.93735654	2.82544396	6.5061229	0.6250811	0.10721551	0.60319134
KC-135 CD_2 IFR Right Turns Southwest Side	0.00078836	3	5.93735654	2.82544396	6.5061229	0.6250811	0.10721551	0.60319134
KC-135 CE VFR Left Turns South Side	0.02334748	100	1.61109169	1.44097642	1.12190307	0.6250811	0.10721551	0.60319134
KC-135 CF VFR Left Turns Southwest Side	0.44317768	1897	1.61109169	1.44097642	1.12190307	0.6250811	0.10721551	0.60319134
KC-135 CG IFR Left Turns Southwest Side	0.03104912	133	7.81529572	1.51161252	4.17139801	0.6250811	0.10721551	0.60319134
KC-135 CH IFR Left Turns Southwest Side	0.00327471	14	2.36827143	7.25432736	7.71408428	0.6250811	0.10721551	0.60319134
Total Ops		4280						

Table D3.1-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

			Engine Setting					
Factor			55%	58%	60%	70%	73%	85%
Fuel Use, lbs/hr			19910.88	20916.72	21922.56	25945.92	27589.32	31204.8
Emission Factors, lbs/1000 lbs fuel								
VOC			0.0704	0.0683	0.0661	0.0575	0.0539	0.0460
CO			1.6313	1.3744	1.1175	0.0900	0.0900	0.0900
NOx			13.0750	13.5625	14.0500	16.0000	16.7813	18.5000
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
PM2.5			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
CO2			3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.1-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 CA VFR Right Turns South Side			0.1614	2.4721	37.2809	2.6974	0.1393	0.1393	8183.7166	0.2265	0.2545
KC-135 CB VFR Right Turns Southwest Side			0.1614	2.4721	37.2809	2.6974	0.1393	0.1393	8183.7166	0.2265	0.2545
KC-135 CC IFR Right Turns Southwest Side			0.3329	6.2082	70.1391	5.3160	0.2713	0.2713	16128.5599	0.4463	0.5015
KC-135 CC_2 IFR Right Turns Southwest Side			0.3776	7.2503	78.4159	5.9882	0.3054	0.3054	18167.9580	0.5028	0.5649
KC-135 CD IFR Right Turns Southwest Side			0.3959	7.2813	83.4757	6.3237	0.3213	0.3213	19185.9407	0.5310	0.5966
KC-135 CD_2 IFR Right Turns Southwest Side			0.3959	7.2813	83.4757	6.3237	0.3213	0.3213	19185.9407	0.5310	0.5966
KC-135 CE VFR Left Turns South Side			0.1317	2.0776	30.5185	2.2050	0.1152	0.1152	6689.9507	0.1851	0.2080
KC-135 CF VFR Left Turns Southwest Side			0.1317	2.0776	30.5185	2.2050	0.1152	0.1152	6689.9507	0.1851	0.2080
KC-135 CG IFR Left Turns Southwest Side			0.3521	6.7151	73.4267	5.5946	0.2857	0.2857	16973.7203	0.4697	0.5278
KC-135 CH IFR Left Turns Southwest Side			0.4470	7.9644	95.1308	7.1727	0.3628	0.3628	21761.7260	0.6022	0.6767
Emissions, closed pattern ops, tons/year			0.3440	5.5160	78.4510	5.7133	0.2958	0.2958	17333.8109	0.4797	0.5390

Table D3.1-10. Annual Air Emissions for KC-135 Aircraft Operations at Forbes - Baseline

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	3.28	48.57	20.78	2.77	0.15	0.15	8401.07	0.23	0.26
KC-135 Closed Pattern Ops	0.34	5.52	78.45	5.71	0.30	0.30	17333.81	0.48	0.54
Total Existing	3.63	54.09	99.23	8.48	0.45	0.45	25734.88	0.71	0.80

Table D3.1-11. Annual HAP Emissions for KC-135 Aircraft Operations at Forbes - Baseline

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.16	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
KC-135 Closed Pattern Ops	0.05	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.20	0.01
Total Existing	0.20	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.01	0.01	0.35	0.03

Table D3.1-12. JP-8 AGE Equipment Emissions, Forbes, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	946																
	Hours/Sortie																
Generator A/M32A-86	10	9460.00	6.47	79036.77	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.27E+02	9.53E+00	6.13E+00	1.90E+00	1.86E+00	9.59E-01
Start Cart A/M32A-60A	1	946.00	10.16	9612.58	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	3.80E+00	1.14E+01	5.63E-01	4.40E-01	4.28E-01	1.50E-01
Start Cart A/M32A-95	0.1	94.60	8.75	827.75	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	3.07E-01	1.22E+00	1.46E-01	2.29E-02	2.23E-02	1.29E-02
Heater/AC Ace 802-993 AC	10	9460.00	6.80	145256.77	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	6.13E+01	3.13E+00	4.25E+00	4.13E+00	4.00E+00	1.00E+00
MA-3C Air Conditioner	2	1892.00	7.12	12816.77	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.74E+01	1.32E+00	2.21E-01	4.55E-01	4.38E-01	2.09E-01
H1	5	4730.00	0.39	1735.60	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.65E+00	1.89E+00	1.04E+00	1.14E+00	1.14E+00	3.13E-02
1H1	4	3784.00	0.39	1388.48	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.32E+00	1.51E+00	8.34E-01	9.09E-01	9.09E-01	2.50E-02
Light Cart NF-2	2	1892.00	1.02	1922.52	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	4.59E-01	3.34E-01	4.17E-02	4.17E-02	4.17E-02	3.00E-02
Air Compressor MC-1A	0.33	312.18	1.09	324.26	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	2.88E-01	1.84E-01	1.84E-01	4.89E-02	4.68E-02	5.51E-03
Total JP-8 AGE, Tons/year				hp-hrs	4480324.112							1.07E-01	1.53E-02	6.71E-03	4.54E-03	4.44E-03	1.21E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.1-13. AGE HAP Emissions, Forbes, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	2.42E+01	7.00E-02	
Acrolein		6.48E-04	2.90E+00		
Benzene	7.65E-03	6.50E-03	2.91E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.23E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	3.72E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	2.66E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	5.38E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.30E+01		
Xylenes		2.00E-03	8.96E+00		
Total			1.10E-02		

Table D3.1-14. JP-8 AGE Equipment GHG Emissions, Forbes, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	946										
	Hours/Sortie										
Generator A/M32A-86	10	9460.00	6.47	79036.77	148	2.11E+01	5.91E-04	6.80E-04	1.67E+06	4.67E+01	5.37E+01
Start Cart A/M32A-60A	1	946.00	10.16	9612.58	180	2.11E+01	5.91E-04	6.80E-04	2.03E+05	5.68E+00	6.54E+00
Start Cart A/M32A-95	0.1	94.60	8.75	827.75	155	2.11E+01	5.91E-04	6.80E-04	1.75E+04	4.89E-01	5.63E-01
Heater/AC Ace 802-993 AC	10	9460.00	6.80	145256.77	272	2.11E+01	5.91E-04	6.80E-04	3.06E+06	8.58E+01	9.88E+01
MA-3C Air Conditioner	2	1892.00	7.12	12816.77	120	2.11E+01	5.91E-04	6.80E-04	2.70E+05	7.57E+00	8.72E+00
H1	5	4730.00	0.39	1735.60	6.5	2.11E+01	5.91E-04	6.80E-04	3.66E+04	1.03E+00	1.18E+00
1H1	4	3784.00	0.39	1388.48	6.5	2.11E+01	5.91E-04	6.80E-04	2.93E+04	8.21E-01	9.44E-01
Light Cart NF-2	2	1892.00	1.02	1922.52	18	2.11E+01	5.91E-04	6.80E-04	4.06E+04	1.14E+00	1.31E+00
Air Compressor MC-1A	0.33	312.18	1.09	324.26	18.4	2.11E+01	5.91E-04	6.80E-04	6.84E+03	1.92E-01	2.20E-01
Total JP-8 AGE, Metric Tons/year									2.42E+03	6.78E-02	7.80E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.1-15. Aircraft Engine Emissions - Engine Tests, Forbes, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	26	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	27.73	404.59	52.72	13.97	1.61	1.61
Maintenance Run	104	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	295.84	4,315.64	562.30	149.01	17.12	17.12
TRT Run 2 Engine	12	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	8.53	124.49	16.22	4.30	0.49	0.49
	12	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.72	1.40	288.64	16.54	1.71	1.71
TRT Run 4 Engine	9	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	12.80	186.73	24.33	6.45	0.74	0.74
	9	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	1.08	2.11	432.97	24.81	2.57	2.57
												0.17	2.52	0.69	0.11	0.01	0.01

Table D3.1-16. HAP Emissions, Engine Tests, Forbes, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	26	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	104	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	12	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	12	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	9	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	9	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
1.25	0.00	0.00	0.04	0.03	0.12	0.01	0.02	0.02	0.03	0.01	0.01	0.89	0.06	
13.37	0.00	0.00	0.41	0.27	1.26	0.10	0.23	0.21	0.32	0.13	0.14	9.49	0.68	
0.39	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.27	0.02	
0.11	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.01	0.03	0.04	
0.58	0.00	0.00	0.02	0.01	0.05	0.00	0.01	0.01	0.01	0.01	0.01	0.41	0.03	
0.16	0.00	0.00	0.00	0.03	0.03	0.00	0.01	0.00	0.03	0.01	0.01	0.05	0.06	
0.00792974	0	0	0.000237642	0.00017734	0.0007567	5.6051E-05	0.00014176	0.00012128	0.000212308	8.13888E-05	8.87628E-05	0.00556955	0.00044463	0.01581717

Table D3.1-17. GHG Emissions, Engine Tests, Forbes, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	26	Idle	0.50	1	1,014	3,216.0	0.1	0.1	42,383.28	1.17	1.32
Maintenance Run	104	Idle	0.33	4	1,014	3,216.0	0.1	0.1	452,088.30	12.51	14.06
TRT Run 2 Engine	12	Idle	0.17	2	1,014	3,216.0	0.1	0.1	13,041.01	0.36	0.41
	12	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	50,177.32	1.39	1.56
TRT Run 4 Engine	9	Idle	0.17	4	1,014	3,216.0	0.1	0.1	19,561.51	0.54	0.61
	9	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	75,265.98	2.08	2.34
Total, tpy									296	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.1-18. Annual Worker Population and VMT at Forbes - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT[1]	Annual Off-Base VMT[2]
Existing	945	245700	1941030
Proposed Action	1126	292760	2312804

[1]On-Base mileage based on 1.00 miles from 2010 AEI; total mileage obtained from AEI.

[2]Off-Base mileage based on distance to downtown Topeka, 7.9 miles; assume 260 days/year

Table D3.1-19. Annual Average On-Road Vehicle Emission Factors - Forbes

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.606	9.55	0.449	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.851	11.32	0.695	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.125	28.16	1.198	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	3.29	27.81	0.84	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.459	8.66	0.321	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.683	9.88	0.522	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.815	26.48	0.675	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	3.29	27.81	0.84	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table D3.1-20. Annual Average On-Base Vehicle Emissions, Forbes

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	123.26	1942.47	91.33	1.42	5.09	2.24	74871.66
LDDT	0.03	0.02	0.13	0.03	0.00	0.01	0.01	51.03
LDGT	60.32	278.06	3698.70	227.08	3.27	8.17	3.59	168630.79
LDDT	0.2	0.43	0.77	0.50	0.01	0.07	0.05	649.15
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	33.86	286.22	8.65	0.03	0.38	0.22	1825.78
Total Existing, tons/year		0.22	2.96	0.16	0.00	0.01	0.00	123.01
Proposed Action (Year 2018) (1)								
LDGV	37.55	111.24	2098.82	77.80	1.70	6.06	2.67	89187.92
LDDT	0.03	0.02	0.13	0.02	0.00	0.01	0.00	60.82
LDGT	60.32	265.91	3846.51	203.23	3.89	9.73	4.28	201124.05
LDDT	0.2	0.39	0.77	0.41	0.01	0.06	0.04	772.71
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	40.35	341.04	10.30	0.04	0.45	0.26	2175.48
Total Proposed Action, tons/year		0.21	3.14	0.15	0.00	0.01	0.00	146.66

Table D3.1-21. Annual Average Off-Base Vehicle Emissions, Forbes

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	973.76	15345.54	721.48	11.25	40.17	17.68	591486.09
LDDT	0.03	0.17	1.04	0.26	0.00	0.07	0.05	403.11
LDGT	60.32	2196.64	29219.75	1793.97	25.81	64.53	28.39	1332183.25
LDDT	0.2	3.36	6.06	3.94	0.05	0.51	0.38	5128.27
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	267.50	2261.12	68.30	0.24	3.01	1.71	14423.68
Total Existing, tons/year		1.72	23.42	1.29	0.02	0.05	0.02	971.81
Proposed Action (Year 2018) (1)								
LDGV	37.55	737.55	13915.43	515.80	11.25	40.17	17.68	591325.40
LDDT	0.03	0.11	0.89	0.11	0.00	0.05	0.03	403.23
LDGT	60.32	1762.99	25502.75	1347.41	25.81	64.53	28.39	1333473.87
LDDT	0.2	2.61	5.14	2.71	0.05	0.40	0.27	5123.13
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	267.50	2261.12	68.30	0.24	3.01	1.71	14423.68
Total Proposed Action, tons/year		1.39	20.84	0.97	0.02	0.05	0.02	972.37

Table D3.1-22. Annual Air Operations for Aircraft at Forbes - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	1286	5995	14562

Table D3.1-23. KC-46A Aircraft Closed Pattern Operations at Forbes - KC-46A Proposed Scenarios

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)						
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	68%	73%	83%	85%
KC-46A CA VFR Right Turns South Side	0.02336246	140	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A CB VFR Right Turns Southwest Side	0.44393009	2661	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A CC IFR Right Turns Southwest Side	0.01553171	93	5.24755579	1.580018	4.11836013	1.16386557	0.06861792	0.39455307	0.33222512
KC-46A CC_2 IFR Right Turns Southwest Side	0.01553171	93	5.24755579	1.03333177	6.83322258	1.16386557	0.06861792	0.39455307	0.33222512
KC-46A CD IFR Right Turns Southwest Side	0.00082201	5	10.6572214	1.00489145	2.43021817	1.16386557	0.06861792	0.39455307	0.33222512
KC-46A CD_2 IFR Right Turns Southwest Side	0.00082201	5	10.6572214	1.00489145	2.43021817	1.16386557	0.06861792	0.39455307	0.33222512
KC-46A CE VFR Left Turns South Side	0.02336246	140	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A CF VFR Left Turns Southwest Side	0.44393009	2661	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A CG IFR Left Turns Southwest Side	0.03106342	186	5.24755579	0.52140594	6.25469204	1.16386557	0.06861792	0.39455307	0.33222512
KC-46A CH IFR Left Turns Southwest Side	0.00164403	10	9.93973526	0.96065095	2.97021433	1.16386557	0.06861792	0.39455307	0.33222512
Total Ops		5995							

Table D3.1-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

			Engine Setting/Time in Mode per Operation (Minutes)						
Factor			55%	58%	60%	68%	73%	83%	85%
Fuel Use, lbs/hr			22572	23688.8	24805.6	28379.36	30389.6	34928	36116
Emission Factors, lbs/1000 lbs									
VOC			0.0920	0.0909	0.0897	0.0860	0.0840	0.0819	0.0834
CO			1.2150	1.1435	1.0720	0.8432	0.7145	0.5138	0.5275
NOx			19.0750	19.7655	20.4560	22.6656	23.9085	27.0275	28.0750
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0600	0.0610	0.0620	0.0652	0.0670	0.0713	0.0725
PM2.5			0.0500	0.0510	0.0520	0.0552	0.0570	0.0613	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.1-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A CA VFR Right Turns South Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CB VFR Right Turns Southwest Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CC IFR Right Turns Southwest Side			0.4768	5.6496	109.9461	5.6344	0.3311	0.2780	17094.6253	0.4731	0.5315
KC-46A CC_2 IFR Right Turns Southwest Side			0.5579	6.6060	128.6396	6.5954	0.3876	0.3254	20010.1143	0.5538	0.6222
KC-46A CD IFR Right Turns Southwest Side			0.5808	7.1145	130.0011	6.8112	0.3961	0.3319	20664.7895	0.5719	0.6426
KC-46A CD_2 IFR Right Turns Southwest Side			0.5808	7.1145	130.0011	6.8112	0.3961	0.3319	20664.7895	0.5719	0.6426
KC-46A CE VFR Left Turns South Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CF VFR Left Turns Southwest Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CG IFR Left Turns Southwest Side			0.5180	6.1185	119.7521	6.1276	0.3604	0.3026	18590.9093	0.5145	0.5781
KC-46A CH IFR Left Turns Southwest Side			0.5744	7.0059	129.0739	6.7432	0.3927	0.3291	20458.5274	0.5662	0.6361
Emissions, closed pattern ops, tons/year			0.8111	9.1567	195.1626	9.6741	0.5776	0.4863	29350.8442	0.8123	0.9127

Table D3.1-26. Annual Air Emissions for KC-46A Aircraft Operations at Forbes - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	21.40	74.33	48.79	3.78	0.31	0.27	11462.73	0.32	0.36
KC-46A T&G	0.81	9.16	195.16	9.67	0.58	0.49	29350.84	0.81	0.91
APU	0.05	0.45	9.16	0.76	0.07	0.05	1871.62	0.00	0.00
Total Proposed Action	22.27	83.94	253.12	14.22	0.95	0.81	42685.20	1.13	1.27

Table D3.1-27. Annual HAP Emissions for KC-46A Aircraft Operations at Forbes - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A LTOs	3.06	1.06	0.61	0.13	0.42	0.16	0.04	0.07	0.08	0.01	0.00	0.00	0.19	0.01
KC-46A Closed Pattern Ops	0.11	0.04	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.35	0.03
Total Proposed Action	3.17	1.10	0.63	0.14	0.43	0.17	0.04	0.07	0.08	0.02	0.01	0.01	0.54	0.04

Table D3.1-28. JP-8 AGE Equipment Emissions, Forbes, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	1286																
	Hours/Sortie																
Generator A/M32A-86	10	12860.00	6.47	107443.23	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.73E+02	1.30E+01	8.34E+00	2.58E+00	2.52E+00	1.30E+00
Start Cart A/M32A-60A	1	1286.00	10.16	13067.42	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	5.16E+00	1.55E+01	7.65E-01	5.98E-01	5.81E-01	2.04E-01
Start Cart A/M32A-95	0.1	128.60	8.75	1125.25	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	4.17E-01	1.66E+00	1.98E-01	3.12E-02	3.03E-02	1.75E-02
Heater/AC Ace 802-993 AC	10	12860.00	6.80	197463.23	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	8.33E+01	4.25E+00	5.78E+00	5.61E+00	5.44E+00	1.36E+00
MA-3C Air Conditioner	2	2572.00	7.12	17423.23	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.36E+01	1.80E+00	3.01E-01	6.18E-01	5.95E-01	2.84E-01
H1	5	6430.00	0.39	2359.40	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.24E+00	2.57E+00	1.42E+00	1.55E+00	1.55E+00	4.25E-02
1H1	4	5144.00	0.39	1887.52	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.79E+00	2.05E+00	1.13E+00	1.24E+00	1.24E+00	3.40E-02
Light Cart NF-2	2	2572.00	1.02	2613.48	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	6.24E-01	4.54E-01	5.67E-02	5.67E-02	5.67E-02	4.07E-02
Air Compressor MC-1A	0.33	424.38	1.09	440.81	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	3.92E-01	2.50E-01	2.50E-01	6.64E-02	6.36E-02	7.48E-03
Total JP-8 AGE, Tons/year				hp-hrs	6090588.592							1.45E-01	2.08E-02	9.12E-03	6.17E-03	6.04E-03	1.65E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.1-29. AGE HAP Emissions, Forbes, Proposed Action

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.29E+01	7.00E-02	
Acrolein		6.48E-04	3.95E+00		
Benzene	7.65E-03	6.50E-03	3.96E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.67E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	5.06E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	3.62E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	7.31E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.77E+01		
Xylenes		2.00E-03	1.22E+01		
Total			1.49E-02		

Table D3.1-30. JP-8 AGE Equipment GHG Emissions, Forbes, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46A AGE											
Sorties:	1286										
	Hours/Sortie										
Generator A/M32A-86	10	12860.00	6.47	107443.23	148	2.11E+01	5.91E-04	6.80E-04	2.27E+06	6.35E+01	7.31E+01
Start Cart A/M32A-60A	1	1286.00	10.16	13067.42	180	2.11E+01	5.91E-04	6.80E-04	2.76E+05	7.72E+00	8.89E+00
Start Cart A/M32A-95	0.1	128.60	8.75	1125.25	155	2.11E+01	5.91E-04	6.80E-04	2.37E+04	6.65E-01	7.65E-01
Heater/AC Ace 802-993 AC	10	12860.00	6.80	197463.23	272	2.11E+01	5.91E-04	6.80E-04	4.17E+06	1.17E+02	1.34E+02
MA-3C Air Conditioner	2	2572.00	7.12	17423.23	120	2.11E+01	5.91E-04	6.80E-04	3.68E+05	1.03E+01	1.18E+01
H1	5	6430.00	0.39	2359.40	6.5	2.11E+01	5.91E-04	6.80E-04	4.98E+04	1.39E+00	1.60E+00
1H1	4	5144.00	0.39	1887.52	6.5	2.11E+01	5.91E-04	6.80E-04	3.98E+04	1.12E+00	1.28E+00
Light Cart NF-2	2	2572.00	1.02	2613.48	18	2.11E+01	5.91E-04	6.80E-04	5.51E+04	1.54E+00	1.78E+00
Air Compressor MC-1A	0.33	424.38	1.09	440.81	18.4	2.11E+01	5.91E-04	6.80E-04	9.30E+03	2.61E-01	3.00E-01
Total JP-8 AGE, Metric Tons/year									3.29E+03	9.22E-02	1.06E-01

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.1-31. Aircraft Engine Emissions - Engine Tests, Proposed Action, Forbes

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	36	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	373.89	1,275.64	113.16	31.73	3.29	2.99
Maintenance Run	145	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	2,007.93	6,850.67	607.73	170.42	17.69	16.08
TRT Run 1 Engine	17	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	58.85	200.80	17.81	5.00	0.52	0.47
	17	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.92	11.95	620.89	25.33	1.67	1.43
TRT Run 2 Engine	13	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	90.01	307.10	27.24	7.64	0.79	0.72
	13	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	2.94	18.28	949.59	38.74	2.56	2.19
												1.27	4.33	1.17	0.14	0.01	0.01

Table D3.1-32. HAP Emissions, Engine Tests, Proposed Action, Forbes

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	36	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	145	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	17	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	17	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	13	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	13	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr															
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
18.53	10.62	2.35	7.29	2.78	0.76	1.22	1.34	0.10	0.03	0.03	2.02	0.15	0.15	
99.50	57.05	12.61	39.17	14.96	4.06	6.57	7.21	0.53	0.15	0.16	10.85	0.78	0.78	
2.92	1.67	0.37	1.15	0.44	0.12	0.19	0.21	0.02	0.00	0.00	0.32	0.02	0.02	
0.27	0.10	0.05	0.01	0.04	0.01	0.00	0.01	0.01	0.04	0.02	0.01	1.21	0.06	
4.46	2.56	0.57	1.76	0.67	0.18	0.29	0.32	0.02	0.01	0.01	0.49	0.03	0.03	
0.42	0.15	0.08	0.02	0.06	0.02	0.01	0.01	0.01	0.06	0.03	0.02	1.85	0.09	
0.0630491	0.03607154	0.00801257	0.024696031	0.00947242	0.0025763	0.00414673	0.0045497	0.00034409	0.000145698	0.000122073	0.006854255	0.00202076	0.00056816	0.16262942

Table D3.1-33. GHG Emissions, Engine Tests, Proposed Action, Forbes

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	36	Idle	0.50	1	1,663	3,216.0	0.1	0.1	96,279.32	2.66	2.99
Maintenance Run	145	Idle	0.33	2	1,663	3,216.0	0.1	0.1	517,055.62	14.31	16.08
TRT Run 2 Engine	17	Idle	0.17	1	1,663	3,216.0	0.1	0.1	15,155.08	0.42	0.47
	17	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	76,857.90	2.13	2.39
TRT Run 4 Engine	13	Idle	0.17	2	1,663	3,216.0	0.1	0.1	23,178.36	0.64	0.72
	13	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	117,547.37	3.25	3.66
Total, tpy									384	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.1-34. Forbes Comparison of Emissions

Annual Emissions, tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	3.63	54.09	99.23	8.48	0.45	0.45
AGE	0.01	0.02	0.02	0.00	0.00	0.00
Engine Tests	0.17	2.52	0.69	0.11	0.01	0.01
POVs	1.94	26.38	1.46	0.02	0.06	0.03
Total	5.75	83.00	101.39	8.61	0.53	0.49
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	22.27	83.94	253.12	14.22	0.95	0.81
AGE	0.01	0.02	0.02	0.00	0.01	0.01
Engine Tests	1.27	4.33	1.17	0.14	0.01	0.01
POVs	1.59	23.99	1.11	0.02	0.06	0.03
Total	25.14	112.28	255.42	14.38	1.04	0.86
Net Increase	19.40	29.28	154.03	5.77	0.51	0.37

Table D3.1-35. Forbes Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.20	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.01	0.01	0.35	0.03
AGE	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Total	0.23	0.01	0.00	0.01	0.03	0.04	0.00	0.01	0.00	0.01	0.01	0.01	0.35	0.03
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	3.17	1.10	0.63	0.14	0.43	0.17	0.04	0.07	0.08	0.02	0.01	0.01	0.54	0.04
AGE	0.03	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.06	0.04	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Total	3.26	1.15	0.64	0.17	0.46	0.17	0.05	0.08	0.08	0.02	0.01	0.01	0.54	0.04
Net Increase	3.03	1.14	0.64	0.16	0.44	0.13	0.05	0.06	0.08	0.01	0.00	0.01	0.19	0.01

Table D3.1-36. Forbes Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	23347	0.65	0.73	23585
AGE	2421	0.07	0.08	2446
Engine Tests	296	0.01	0.01	299
POVs	993	0.00	0.00	993
Total	27056	0.72	0.81	27324
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	38724	1.02	1.15	39102
AGE	3291	0.09	0.11	3326
Engine Tests	384	0.01	0.01	388
POVs	1015	0.00	0.00	1015
Total	43413	1.13	1.27	43831
Net Increase	16357	0.41	0.46	16507

JB MDL

Table D3.2-1 Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle	1663.2	12.489	42.61	3.78	1.06	0.11	0.1	3216	8.90E-02	1.00E-01
Approach	5702.4	0.1035	1.93	12.17	1.06	0.05	0.04	3216	8.90E-02	1.00E-01
Climbout	16869.6	0.0805	0.5	25.98	1.06	0.07	0.06	3216	8.90E-02	1.00E-01
Take-Off	21621.6	0.092	0.61	34.36	1.06	0.08	0.07	3216	8.90E-02	1.00E-01
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table D3.2-2. HAP Emission Factors - KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table D3.2-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table D3.2-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table D3.2-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table D3.2-6. Annual Air Operations for Aircraft at McGuire - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	834	3336	8340

Table D3.2-7. KC-135 Aircraft Closed Pattern Operations at McGuire, Baseline

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)									
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
CR01 IFR to RWY06 on South Side	0.0530	177	2.1406		8.5008		0.1362	2.0365	1.5710		0.7596	0.4919
CR02 TACAN RWY06 VFR Circle	0.0035	12	0.6319	0.8571	7.1268		0.1362	2.9128	1.5710		0.7596	0.4919
CR03 North Radar Track	0.0141	47	2.1406		5.0742		0.1362	1.6240	1.5710		0.7596	0.4919
CR04 Radar Track on 18C3	0.0059	20	2.1406		8.2663		0.1362	2.1209	1.5710		0.7596	0.4919
CR05 Radar Track on 18C4	0.0059	20	2.1406		6.8000		0.0681	2.1209	1.5710		0.7596	0.5567
CR06 Radar Track Continuous turn 150HDG to 90 HDG	0.0919	307	2.1406		7.4803		0.1362	2.1209	1.5712		0.7594	0.4919
CR07 Radar Track 150HDG for Crosswind	0.0141	47	2.1406		7.6444		0.1362	2.1209	1.5710		0.7596	0.4919
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18	0.0071	24	0.6319	1.0058	7.2052	1.6424	0.1362	2.1650	1.5710		0.7596	0.4919
CR09 Radar track to North	0.0283	94	2.1406		6.5939		0.1362	3.9770	1.5710		0.7596	0.4919
CR10 Radar track on 36C3	0.0059	20	2.1406		7.3686		0.1362		3.6919		0.7596	0.4919
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6	0.0059	20	0.6948	0.8238	7.2755	1.9866	0.1362	1.2953	1.5710		0.7596	0.4919
CV01 - North VFR	0.2122	708	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV02 - West VFR on 18C2	0.0353	118	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV03 - North VFR Inside Housing	0.0382	127	0.7645	1.1669	0.7397	0.7516	0.1362		0.7571		0.3668	0.4919
CV04 - North VFR Outside Housing	0.3775	1259	0.7645	1.1669	0.9721	1.5196	0.0681		0.7571		0.3668	0.5567
CV05 - VFR With Breakout	0.0657	219	0.7645	1.1670	0.6680		0.1362	0.6419	0.7571	2.9350	0.3668	0.4919
CV06 - West VFR on 36C2	0.0353	118	0.7645	1.1669	0.7397	0.8613	0.1362		0.7571		0.3668	0.4919
Total Ops		3336										

Table D3.2-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

			Engine Setting/Time in Mode per Operation (Minutes)									
Factor			48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	**75.0**
Fuel Use, lbs/hr			17295.696	18905.04	19910.88	20916.72	21319.056	21922.56	22123.728	22928.4	26274.6	29232.72
Emission Factors, lbs/1000 lbs fuel												
VOC			0.0760	0.0726	0.0704	0.0683	0.0674	0.0661	0.0657	0.0640	0.0568	0.0503
CO			2.2991	1.8881	1.6313	1.3744	1.2716	1.1175	1.0661	0.8606	0.0900	0.0900
NOx			11.8075	12.5875	13.0750	13.5625	13.7575	14.0500	14.1475	14.5375	16.1563	17.5625
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0554	0.0544	0.0538	0.0531	0.0529	0.0525	0.0524	0.0519	0.0513	0.0625
PM2.5			0.0554	0.0544	0.0538	0.0531	0.0529	0.0525	0.0524	0.0519	0.0513	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.2-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
CR01 IFR to RWY06 on South Side			0.3671	7.5825	73.0690	5.7050	0.2898	0.2898	17308.8124	0.4790	0.5382
CR02 TACAN RWY06 VFR Circle			0.3427	6.7066	69.8701	5.3864	0.2727	0.2727	16342.0124	0.4523	0.5081
CR03 North Radar Track			0.2770	5.5592	56.0837	4.3399	0.2208	0.2208	13167.1627	0.3644	0.4094
CR04 Radar Track on 18C3			0.3636	7.4901	72.4847	5.6552	0.2872	0.2872	17157.7017	0.4748	0.5335
CR05 Radar Track on 18C4			0.3293	6.6684	66.3436	5.1472	0.2618	0.2618	15616.4405	0.4322	0.4856
CR06 Radar Track Continuous turn 150HDG to 90 HDG			0.3453	7.0646	69.0735	5.3787	0.2732	0.2732	16318.7065	0.4516	0.5074
CR07 Radar Track 150HDG for Crosswind			0.3491	7.1534	69.7860	5.4364	0.2761	0.2761	16493.9067	0.4565	0.5129
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18			0.3689	7.3190	74.7264	5.7809	0.2927	0.2927	17538.9678	0.4854	0.5454
CR09 Radar track to North			0.3694	7.3426	74.7566	5.7858	0.2930	0.2930	17553.8740	0.4858	0.5458
CR10 Radar track on 36C3			0.3428	6.9719	68.7658	5.3470	0.2715	0.2715	16222.5155	0.4489	0.5044
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6			0.3550	7.1003	71.6865	5.5544	0.2815	0.2815	16851.8535	0.4664	0.5240
CV01 - North VFR			0.1240	2.4040	25.9387	1.9732	0.1017	0.1017	5986.4890	0.1657	0.1861
CV02 - West VFR on 18C2			0.1240	2.4040	25.9387	1.9732	0.1017	0.1017	5986.4890	0.1657	0.1861
CV03 - North VFR Inside Housing			0.1214	2.3566	25.4126	1.9328	0.0997	0.0997	5863.9644	0.1623	0.1823
CV04 - North VFR Outside Housing			0.1451	2.8224	30.2732	2.3061	0.1188	0.1188	6996.6470	0.1936	0.2176
CV05 - VFR With Breakout			0.1891	3.1850	41.1481	3.0673	0.1550	0.1550	9306.0728	0.2575	0.2894
CV06 - West VFR on 36C2			0.1240	2.4092	25.9314	1.9733	0.1017	0.1017	5986.9753	0.1657	0.1862
Emissions, closed pattern ops, tons/year			0.3160	6.2145	65.0183	4.9886	0.2551	0.2551	15135.2626	0.4189	0.4706

Table D3.2-10. Annual Air Emissions for KC-135 Aircraft Operations at McGuire - Baseline

	Annual Emissions, Tons/year								
Aircraft	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	2.89	42.82	18.32	2.44	0.14	0.14	7406.44	0.20	0.23
KC-135 T&G	0.32	6.21	65.02	4.99	0.26	0.26	15135.26	0.42	0.47
Total Existing	3.21	49.03	83.34	7.43	0.39	0.39	22541.70	0.62	0.70

Table D3.2-11. Annual HAP Emissions for KC-135 Aircraft Operations at McGuire - Baseline

	Annual Emissions, Tons/year													
Aircraft	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.14	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.01
KC-135 Closed Pattern Ops	0.04	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.16	0.01
Total Existing	0.17	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02

Table D3.2-12. JP-8 AGE Equipment Emissions, McGuire, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	834																
	Hours/Sortie																
Generator A/M32A-86	10	8340.00	6.47	69679.35	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.12E+02	8.40E+00	5.41E+00	1.67E+00	1.64E+00	8.46E-01
Start Cart A/M32A-60A	1	834.00	10.16	8474.52	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	3.35E+00	1.01E+01	4.96E-01	3.88E-01	3.77E-01	1.32E-01
Start Cart A/M32A-95	0.1	83.40	8.75	729.75	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	2.70E-01	1.08E+00	1.29E-01	2.02E-02	1.97E-02	1.14E-02
Heater/AC Ace 802-993 AC	10	8340.00	6.80	128059.35	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	5.40E+01	2.76E+00	3.75E+00	3.64E+00	3.53E+00	8.83E-01
MA-3C Air Conditioner	2	1668.00	7.12	11299.35	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.53E+01	1.17E+00	1.95E-01	4.01E-01	3.86E-01	1.84E-01
H1	5	4170.00	0.39	1530.12	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.45E+00	1.66E+00	9.19E-01	1.00E+00	1.00E+00	2.76E-02
1H1	4	3336.00	0.39	1224.10	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.16E+00	1.33E+00	7.35E-01	8.02E-01	8.02E-01	2.21E-02
Light Cart NF-2	2	1668.00	1.02	1694.90	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	4.05E-01	2.94E-01	3.68E-02	3.68E-02	3.68E-02	2.64E-02
Air Compressor MC-1A	0.33	275.22	1.09	285.87	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	2.54E-01	1.62E-01	1.62E-01	4.31E-02	4.13E-02	4.85E-03
Total JP-8 AGE, Tons/year				hp-hrs	3949884.048							9.42E-02	1.35E-02	5.92E-03	4.00E-03	3.92E-03	1.07E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.2-13. AGE HAP Emissions, McGuire, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	2.13E+01	7.00E-02	
Acrolein		6.48E-04	2.56E+00		
Benzene	7.65E-03	6.50E-03	2.57E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.08E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	3.28E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	2.35E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	4.74E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.15E+01		
Xylenes		2.00E-03	7.90E+00		
Total			9.68E-03		

Table D3.2-14. JP-8 AGE Equipment GHG Emissions, McGuire, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	834										
	Hours/Sortie										
Generator A/M32A-86	10	8340.00	6.47	69679.35	148	2.11E+01	5.91E-04	6.80E-04	1.47E+06	4.12E+01	4.74E+01
Start Cart A/M32A-60A	1	834.00	10.16	8474.52	180	2.11E+01	5.91E-04	6.80E-04	1.79E+05	5.01E+00	5.76E+00
Start Cart A/M32A-95	0.1	83.40	8.75	729.75	155	2.11E+01	5.91E-04	6.80E-04	1.54E+04	4.31E-01	4.96E-01
Heater/AC Ace 802-993 AC	10	8340.00	6.80	128059.35	272	2.11E+01	5.91E-04	6.80E-04	2.70E+06	7.57E+01	8.71E+01
MA-3C Air Conditioner	2	1668.00	7.12	11299.35	120	2.11E+01	5.91E-04	6.80E-04	2.38E+05	6.68E+00	7.68E+00
H1	5	4170.00	0.39	1530.12	6.5	2.11E+01	5.91E-04	6.80E-04	3.23E+04	9.04E-01	1.04E+00
1H1	4	3336.00	0.39	1224.10	6.5	2.11E+01	5.91E-04	6.80E-04	2.58E+04	7.23E-01	8.32E-01
Light Cart NF-2	2	1668.00	1.02	1694.90	18	2.11E+01	5.91E-04	6.80E-04	3.58E+04	1.00E+00	1.15E+00
Air Compressor MC-1A	0.33	275.22	1.09	285.87	18.4	2.11E+01	5.91E-04	6.80E-04	6.03E+03	1.69E-01	1.94E-01
Total JP-8 AGE, Metric Tons/year									2.13E+03	5.98E-02	6.88E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.2-15. Aircraft Engine Emissions - Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	21	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	22.40	326.79	42.58	11.28	1.30	1.30
Maintenance Run	83	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	236.10	3,444.22	448.76	118.92	13.67	13.67
TRT Run 2 Engine	10	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	7.11	103.74	13.52	3.58	0.41	0.41
	10	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.60	1.17	240.54	13.78	1.43	1.43
TRT Run 4 Engine	7	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	9.96	145.24	18.92	5.01	0.58	0.58
	7	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.84	1.64	336.75	19.29	2.00	2.00
												0.14	2.01	0.55	0.09	0.01	0.01

Table D3.2-16. HAP Emissions, Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	21	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	83	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	10	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	10	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	7	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	7	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
1.01	0.00	0.00	0.03	0.02	0.10	0.01	0.02	0.02	0.02	0.01	0.01	0.72	0.05	
10.67	0.00	0.00	0.33	0.21	1.01	0.08	0.19	0.17	0.26	0.10	0.11	7.57	0.54	
0.32	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.00	0.00	0.23	0.02	
0.09	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.03	0.03	
0.45	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.32	0.02	
0.13	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.01	0.04	0.04	
0.00633576	0	0	0.000189869	0.00014172	0.0006046	4.4783E-05	0.00011327	9.6899E-05	0.000169651	6.50339E-05	7.09285E-05	0.00444994	0.0003553	0.01263775

Table D3.2-17. GHG Emissions, Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	21	Idle	0.50	1	1,014	3,216.0	0.1	0.1	34,232.65	0.95	1.06
Maintenance Run	83	Idle	0.33	4	1,014	3,216.0	0.1	0.1	360,801.24	9.98	11.22
TRT Run 2 Engine	10	Idle	0.17	2	1,014	3,216.0	0.1	0.1	10,867.51	0.30	0.34
	10	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	41,814.43	1.16	1.30
TRT Run 4 Engine	7	Idle	0.17	4	1,014	3,216.0	0.1	0.1	15,214.51	0.42	0.47
	7	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	58,540.20	1.62	1.82
Total, tpy									237	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.2-18. Annual Worker Population and VMT at McGuire - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT	Annual Off-Base VMT
Existing	1051	273260	4560709.4
Proposed Action	1306	339560	5667256.4

[1]On-Base mileage based on 1.00 miles from 2009 AEI; assume 260 days/year

[2]Off-Base mileage based on distance to downtown Burlington, 16.69 miles; assume 260 days/year

Table D3.2-19. Annual Average On-Road Vehicle Emission Factors - McGuire

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.587	9.65	0.442	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.826	11.45	0.694	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.081	28	1.201	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	2.9	27.28	0.85	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.446	8.78	0.316	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.664	10	0.521	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.784	26.32	0.677	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	2.9	27.28	0.85	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table D3.2-20. Annual Average On-Base Vehicle Emissions

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	132.79	2182.98	99.99	1.58	5.66	2.49	83269.96
LDDT	0.03	0.02	0.15	0.04	0.00	0.01	0.01	56.75
LDGT	60.32	300.16	4160.82	252.19	3.63	9.08	4.00	187545.99
LDDT	0.2	0.47	0.85	0.55	0.01	0.07	0.05	721.96
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	33.19	312.26	9.73	0.03	0.42	0.24	2030.58
Total Existing, tons/year		0.23	3.33	0.18	0.00	0.01	0.00	136.81
Proposed Action (Year 2018) (1)								
LDGV	37.55	125.37	2468.07	88.83	1.97	7.03	3.09	103445.31
LDDT	0.03	0.02	0.16	0.02	0.00	0.01	0.01	70.54
LDGT	60.32	299.84	4515.59	235.26	4.52	11.29	4.97	233275.32
LDDT	0.2	0.46	0.90	0.47	0.01	0.07	0.05	896.23
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	41.25	388.02	12.09	0.04	0.53	0.30	2523.25
Total Proposed Action, tons/year		0.23	3.69	0.17	0.00	0.01	0.00	170.11

Table D3.2-21. Annual Average Off-Base Vehicle Emissions

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	3118.59	43229.91	2620.22	37.76	94.39	41.53	1948555.27
LDDT	0.03	1.19	2.14	1.39	0.02	0.18	0.13	1807.43
LDGT	60.32	6556.26	169819.79	7284.06	103.10	297.18	194.08	5490637.63
LDDT	0.2	13.75	46.55	67.55	0.24	2.59	2.01	25048.26
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	85.20	1677.32	60.37	1.34	4.78	2.10	70302.43
Total Existing, tons/year		4.89	107.39	5.02	0.07	0.20	0.12	3768.18
Proposed Action (Year 2018) (1)								
LDGV	37.55	3115.21	46915.82	2444.31	46.92	117.29	51.61	2423671.37
LDDT	0.03	1.14	2.25	1.19	0.02	0.18	0.12	2243.71
LDGT	60.32	5908.63	198361.15	5102.22	128.12	301.46	188.41	6813011.99
LDDT	0.2	14.57	35.68	47.95	0.30	1.95	1.32	31133.11
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Proposed Action, tons/year		4.52	122.66	3.80	0.09	0.21	0.12	4635.03

Table D3.2-22. Annual Air Operations for Aircraft at McGuire - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	1508	7296	17608

Table D3.2-23. KC-46A Aircraft Closed Pattern Operations at McGuire - KC-46A Proposed Scenarios

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)									
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
CR01 IFR to RWY06 on South Side	0.0559	408	2.1406		8.5008		0.1362	2.0365	1.5710		0.7596	0.4919
CR02 TACAN RWY06 VFR Circle	0.0037	27	0.6319	0.8571	7.1268		0.1362	2.9128	1.5710		0.7596	0.4919
CR03 North Radar Track	0.0150	110	2.1406		5.0742		0.1362	1.6240	1.5710		0.7596	0.4919
CR04 Radar Track on 18C3	0.0063	46	2.1406		8.2663		0.1362	2.1209	1.5710		0.7596	0.4919
CR05 Radar Track on 18C4	0.0063	46	2.1406		6.8000		0.0681	2.1209	1.5710		0.7596	0.5567
CR06 Radar Track Continuous turn 150HDG to 90 HDG	0.0792	578	2.1406		7.4803		0.1362	2.1209	1.5712		0.7594	0.4919
CR07 Radar Track 150HDG for Crosswind	0.0150	110	2.1406		7.6444		0.1362	2.1209	1.5710		0.7596	0.4919
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18	0.0075	55	0.6319	1.0058	7.2052	1.6424	0.1362	2.1650	1.5710		0.7596	0.4919
CR09 Radar track to North	0.0300	219	2.1406		6.5939		0.1362	3.9770	1.5710		0.7596	0.4919
CR10 Radar track on 36C3	0.0063	46	2.1406		7.3686		0.1362		3.6919		0.7596	0.4919
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6	0.0063	46	0.6948	0.8238	7.2755	1.9866	0.1362	1.2953	1.5710		0.7596	0.4919
CV01 - North VFR	0.2135	1557	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV02 - West VFR on 18C2	0.0425	310	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV03 - North VFR Inside Housing	0.0502	366	0.7645	1.1669	0.7397	0.7516	0.1362		0.7571		0.3668	0.4919
CV04 - North VFR Outside Housing	0.3860	2816	0.7645	1.1669	0.9721	1.5196	0.0681		0.7571		0.3668	0.5567
CV05 - VFR With Breakout	0.0090	66	0.7645	1.1670	0.6680		0.1362	0.6419	0.7571	2.9350	0.3668	0.4919
CV06 - West VFR on 36C2	0.0675	493	0.7645	1.1669	0.7397	0.8613	0.1362		0.7571		0.3668	0.4919
Total Ops		7296										

Table D3.2-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

			Engine Setting/Time in Mode per Operation (Minutes)									
Factor			48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
Fuel Use, lbs/hr			19668.32	21455.2	22572	23688.8	24135.52	24805.6	24894.944	25922.4	29496.16	31506.4
Emission Factors, lbs/1000 lbs fuel												
VOC			0.0950	0.0932	0.0920	0.0909	0.0904	0.0897	0.0896	0.0886	0.0849	0.0828
CO			1.4009	1.2865	1.2150	1.1435	1.1149	1.0720	1.0663	1.0005	0.7717	0.6430
NOx			17.2797	18.3845	19.0750	19.7655	20.0417	20.4560	20.5112	21.1465	23.3561	24.5990
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0574	0.0590	0.0600	0.0610	0.0614	0.0620	0.0621	0.0630	0.0662	0.0680
PM2.5			0.0474	0.0490	0.0500	0.0510	0.0514	0.0520	0.0521	0.0530	0.0562	0.0580
CO2			3216	3216	3216	3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.2-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
CR01 IFR to RWY06 on South Side			0.5528	6.9815	119.8938	6.4448	0.3705	0.3097	19553.2901	0.5411	0.6080
CR02 TACAN RWY06 VFR Circle			0.5193	6.4433	114.5336	6.0816	0.3516	0.2942	18451.2142	0.5106	0.5737
CR03 North Radar Track			0.4189	5.2325	91.8159	4.8976	0.2826	0.2364	14859.1404	0.4112	0.4620
CR04 Radar Track on 18C3			0.5478	6.9117	118.9246	6.3883	0.3673	0.3071	19381.7711	0.5364	0.6027
CR05 Radar Track on 18C4			0.4974	6.2328	108.6896	5.8105	0.3349	0.2801	17628.9690	0.4879	0.5482
CR06 Radar Track Continuous turn 150HDG to 90 HDG			0.5206	6.5524	113.2829	6.0748	0.3496	0.2923	18430.6441	0.5101	0.5731
CR07 Radar Track 150HDG for Crosswind			0.5263	6.6274	114.4612	6.1402	0.3533	0.2954	18629.2587	0.5155	0.5793
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18			0.5582	6.9576	122.5660	6.5288	0.3769	0.3153	19808.1470	0.5482	0.6159
CR09 Radar track to North			0.5588	6.9699	122.6205	6.5348	0.3772	0.3155	19826.2219	0.5487	0.6165
CR10 Radar track on 36C3			0.5170	6.4998	112.5958	6.0336	0.3473	0.2904	18305.8273	0.5066	0.5692
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6			0.5366	6.7049	117.5614	6.2726	0.3618	0.3027	19030.9306	0.5267	0.5918
CV01 - North VFR			0.1889	2.3143	42.1492	2.2192	0.1288	0.1079	6732.8662	0.1863	0.2094
CV02 - West VFR on 18C2			0.1889	2.3143	42.1492	2.2192	0.1288	0.1079	6732.8662	0.1863	0.2094
CV03 - North VFR Inside Housing			0.1850	2.2666	41.2817	2.1735	0.1262	0.1057	6594.1730	0.1825	0.2050
CV04 - North VFR Outside Housing			0.2210	2.7109	49.2300	2.5945	0.1505	0.1261	7871.7252	0.2178	0.2448
CV05 - VFR With Breakout			0.2917	3.4477	67.1451	3.4557	0.2028	0.1702	10484.5776	0.2902	0.3260
CV06 - West VFR on 36C2			0.1890	2.3161	42.1379	2.2194	0.1288	0.1079	6733.4865	0.1863	0.2094
Emissions, closed pattern ops, tons/year			1.0238	12.6852	226.0694	11.9930	0.6937	0.5806	36386.3482	1.0070	1.1314

Table D3.2-26. Annual Air Emissions for KC-46A Aircraft Operations at McGuire - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	25.10	87.16	57.22	4.43	0.36	0.32	13441.53	0.37	0.42
KC-46A T&G	1.02	12.69	226.07	11.99	0.69	0.58	36386.35	1.01	1.13
APU	0.06	0.53	10.74	0.90	0.08	0.06	2194.71	0.00	0.00
Total Proposed Action	26.19	100.37	294.03	17.32	1.13	0.96	52022.59	1.38	1.55

Table D3.2-27. Annual HAP Emissions for KC-46A Aircraft Operations at McGuire - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A LTOs	3.58	1.24	0.71	0.16	0.49	0.19	0.05	0.08	0.09	0.01	0.00	0.00	0.22	0.02
KC-46A Closed Pattern Ops	0.14	0.05	0.03	0.01	0.02	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.42	0.03
Total Proposed Action	3.72	1.29	0.74	0.16	0.51	0.19	0.05	0.09	0.09	0.03	0.01	0.01	0.65	0.05

Table D3.2-28. JP-8 AGE Equipment Emissions, Proposed Action, McGuire

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	1508																
	Hours/Sortie																
Generator A/M32A-86	10	15080.00	6.47	125990.97	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	2.03E+02	1.52E+01	9.77E+00	3.03E+00	2.96E+00	1.53E+00
Start Cart A/M32A-60A	1	1508.00	10.16	15323.23	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	6.05E+00	1.82E+01	8.98E-01	7.01E-01	6.82E-01	2.39E-01
Start Cart A/M32A-95	0.1	150.80	8.75	1319.50	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	4.89E-01	1.95E+00	2.33E-01	3.66E-02	3.56E-02	2.06E-02
Heater/AC Ace 802-993 AC	10	15080.00	6.80	231550.97	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	9.77E+01	4.99E+00	6.78E+00	6.58E+00	6.38E+00	1.60E+00
MA-3C Air Conditioner	2	3016.00	7.12	20430.97	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.77E+01	2.11E+00	3.52E-01	7.25E-01	6.98E-01	3.32E-01
H1	5	7540.00	0.39	2766.69	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.63E+00	3.01E+00	1.66E+00	1.81E+00	1.81E+00	4.99E-02
1H1	4	6032.00	0.39	2213.35	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.10E+00	2.41E+00	1.33E+00	1.45E+00	1.45E+00	3.99E-02
Light Cart NF-2	2	3016.00	1.02	3064.65	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	7.31E-01	5.32E-01	6.65E-02	6.65E-02	6.65E-02	4.78E-02
Air Compressor MC-1A	0.33	497.64	1.09	516.90	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	4.60E-01	2.93E-01	2.93E-01	7.79E-02	7.46E-02	8.78E-03
Total JP-8 AGE, Tons/year				hp-hrs	7141996.576							1.70E-01	2.43E-02	1.07E-02	7.24E-03	7.08E-03	1.93E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.2-29. AGE HAP Emissions, Proposed Action, McGuire

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.86E+01	7.00E-02	
Acrolein		6.48E-04	4.63E+00		
Benzene	7.65E-03	6.50E-03	4.64E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.96E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	5.93E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	4.24E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	8.57E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	2.07E+01		
Xylenes		2.00E-03	1.43E+01		
Total			1.75E-02		

Table D3.2-30. JP-8 AGE Equipment GHG Emissions, Proposed Action, McGuire

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46A AGE											
Sorties:	1508										
	Hours/Sortie										
Generator A/M32A-86	10	15080.00	6.47	125990.97	148	2.11E+01	5.91E-04	6.80E-04	2.66E+06	7.45E+01	8.57E+01
Start Cart A/M32A-60A	1	1508.00	10.16	15323.23	180	2.11E+01	5.91E-04	6.80E-04	3.23E+05	9.06E+00	1.04E+01
Start Cart A/M32A-95	0.1	150.80	8.75	1319.50	155	2.11E+01	5.91E-04	6.80E-04	2.78E+04	7.80E-01	8.97E-01
Heater/AC Ace 802-993 AC	10	15080.00	6.80	231550.97	272	2.11E+01	5.91E-04	6.80E-04	4.89E+06	1.37E+02	1.57E+02
MA-3C Air Conditioner	2	3016.00	7.12	20430.97	120	2.11E+01	5.91E-04	6.80E-04	4.31E+05	1.21E+01	1.39E+01
H1	5	7540.00	0.39	2766.69	6.5	2.11E+01	5.91E-04	6.80E-04	5.84E+04	1.64E+00	1.88E+00
1H1	4	6032.00	0.39	2213.35	6.5	2.11E+01	5.91E-04	6.80E-04	4.67E+04	1.31E+00	1.51E+00
Light Cart NF-2	2	3016.00	1.02	3064.65	18	2.11E+01	5.91E-04	6.80E-04	6.47E+04	1.81E+00	2.08E+00
Air Compressor MC-1A	0.33	497.64	1.09	516.90	18.4	2.11E+01	5.91E-04	6.80E-04	1.09E+04	3.05E-01	3.51E-01
Total JP-8 AGE, Metric Tons/year									3.86E+03	1.08E-01	1.24E-01

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.2-31. Aircraft Engine Emissions - Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	44	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	456.98	1,559.12	138.31	38.79	4.02	3.66
Maintenance Run	175	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	2,423.37	8,268.04	733.47	205.68	21.34	19.40
TRT Run 1 Engine	20	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	69.24	236.23	20.96	5.88	0.61	0.55
	20	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	2.26	14.06	730.45	29.80	1.97	1.69
TRT Run 2 Engine	15	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	103.86	354.34	31.43	8.81	0.91	0.83
	15	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	3.40	21.09	1,095.68	44.70	2.95	2.53
												1.53	5.23	1.38	0.17	0.02	0.01

Table D3.2-32. HAP Emissions, Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	44	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	175	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	20	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	20	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	15	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	15	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
22.64	12.98	2.87	8.91	3.40	0.92	1.50	1.64	0.12	0.03	0.04	2.47	0.18	0.18	
120.09	68.85	15.21	47.27	18.05	4.90	7.93	8.70	0.64	0.18	0.19	13.10	0.94	0.94	
3.43	1.97	0.43	1.35	0.52	0.14	0.23	0.25	0.02	0.01	0.01	0.37	0.03	0.03	
0.32	0.11	0.06	0.01	0.04	0.02	0.00	0.01	0.01	0.05	0.02	0.01	1.42	0.07	
5.15	2.95	0.65	2.03	0.77	0.21	0.34	0.37	0.03	0.01	0.01	0.56	0.04	0.04	
0.48	0.17	0.10	0.02	0.07	0.03	0.01	0.01	0.01	0.07	0.03	0.02	2.13	0.11	
0.07605772	0.04351743	0.00966467	0.029796732	0.01142702	0.00310768	0.00500308	0.00548917	0.00041479	0.000173465	0.000146238	0.00826944	0.00237123	0.00068216	0.19612083

Table D3.2-33. GHG Emissions, Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)			Actual Emissions (lb/yr)		
						CO2	CH4	N2O			
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	44	Idle	0.50	1	1,663	3,216.0	0.1	0.1	117,674.73	3.26	3.66
Maintenance Run	175	Idle	0.33	2	1,663	3,216.0	0.1	0.1	624,032.64	17.27	19.40
TRT Run 2 Engine	20	Idle	0.17	1	1,663	3,216.0	0.1	0.1	17,829.50	0.49	0.55
	20	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	90,421.06	2.50	2.81
TRT Run 4 Engine	15	Idle	0.17	2	1,663	3,216.0	0.1	0.1	26,744.26	0.74	0.83
	15	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	135,631.58	3.75	4.22
Total, tpy									459	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.2-34. McGuire Comparison of Emissions

Annual Emissions, Tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	3.21	49.03	83.34	7.43	0.39	0.39
AGE	0.01	0.01	0.09	0.00	0.00	0.00
Engine Tests	0.14	2.01	0.55	0.09	0.01	0.01
POVs	5.12	110.72	5.20	0.07	0.21	0.12
Total	8.48	161.78	89.18	7.59	0.61	0.53
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	26.19	100.37	294.03	17.32	1.13	0.96
AGE	0.01	0.02	0.17	0.00	0.01	0.01
Engine Tests	1.53	5.23	1.38	0.17	0.02	0.01
POVs	4.75	126.34	3.97	0.09	0.22	0.12
Total	32.48	231.97	299.54	17.58	1.38	1.11
Net Increase	24.01	70.19	210.36	9.99	0.77	0.58

Table D3.2-35. McGuire Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.17	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
AGE	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.20	0.01	0.00	0.01	0.02	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	3.72	1.29	0.74	0.16	0.51	0.19	0.05	0.09	0.09	0.03	0.01	0.01	0.65	0.05
AGE	0.03	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.08	0.04	0.01	0.03	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Total	3.83	1.35	0.75	0.20	0.54	0.20	0.06	0.09	0.09	0.03	0.01	0.02	0.65	0.05
Net Increase	3.63	1.34	0.75	0.19	0.52	0.17	0.06	0.08	0.09	0.02	0.01	0.01	0.36	0.03

Table D3.2-36. McGuire Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	20450	0.57	0.64	20659
AGE	2134	0.06	0.07	2157
Engine Tests	237	0.01	0.01	239
POVs	3543	0.00	0.00	3543
Total	26363	0.63	0.71	26597
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	47195	1.25	1.41	47657
AGE	3859	0.11	0.12	3900
Engine Tests	459	0.01	0.01	464
POVs	4359	0.00	0.00	4359
Total	55872	1.37	1.54	56379
Net Increase	29509	0.74	0.83	29782

Pease ANGS

Table D3.3-1 Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle	1663.2	12.489	42.61	3.78	1.06	0.11	0.1	3216	8.90E-02	1.00E-01
Approach	5702.4	0.1035	1.93	12.17	1.06	0.05	0.04	3216	8.90E-02	1.00E-01
Climbout	16869.6	0.0805	0.5	25.98	1.06	0.07	0.06	3216	8.90E-02	1.00E-01
Take-Off	21621.6	0.092	0.61	34.36	1.06	0.08	0.07	3216	8.90E-02	1.00E-01
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table D3.3-2. HAP Emission Factors - KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table D3.3-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table D3.3-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table D3.3-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table D3.3-6. Annual Air Operations for Aircraft at Pease - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	614	2456	6140

Table D3.3-7. KC-135 AirCraft Closed Pattern Operations at Pease

Scenario/Operation	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)						
	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	70%	73%	85%	
KC-135 VFR Profile	0.6225	1529	1.08073231	1.05954148	3.23876605	0.6250811	0.10721551	0.60319134	6.7145
KC-135 IFR Profile	0.3775	927	5.90400061	2.76893508	3.98841687	0.45137435	0.10721551	0.60319134	13.8231
Total Ops		2456							

Table D3.3-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

Factor			Engine Setting/Time in Mode per Operation (Minutes)					
			55%	58%	60%	70%	73%	85%
Fuel Use, lbs/hr			19910.88	20916.72	21922.56	25945.92	27589.32	31204.8
Emission Factors, lbs/1000 lbs fuel								
VOC			0.0704	0.0683	0.0661	0.0575	0.0539	0.0460
CO			1.6313	1.3744	1.1175	0.0900	0.0900	0.0900
NOx			13.0750	13.5625	14.0500	16.0000	16.7813	18.5000
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
PM2.5			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
CO2			3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.3-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 CA VFR Right Turns South Side			0.1614	2.4721	37.2809	2.6974	0.1393	0.1393	8183.7166	0.2265	0.2545
KC-135 CC IFR Right Turns Southwest Side			0.3286	6.2014	68.9372	5.2364	0.2676	0.2676	15886.9857	0.4397	0.4940
Emissions, closed pattern ops, tons/year			0.2757	4.7645	60.4558	4.4894	0.2305	0.2305	13620.6084	0.3769	0.4235

Table D3.3-10. Annual Air Emissions for KC-135 Aircraft Operations at Pease - Baseline

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	2.13	31.52	13.49	1.80	0.10	0.10	5452.70	0.15	0.17
KC-135 T&G	0.28	4.76	60.46	4.49	0.23	0.23	13620.61	0.38	0.42
Total Existing	2.41	36.29	73.94	6.29	0.33	0.33	19073.31	0.53	0.59

Table D3.3-11. Annual HAP Emissions for KC-135 Aircraft Operations at Pease - Baseline

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.01
KC-135 Closed Pattern Ops	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.01
Total Existing	0.13	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.21	0.02

Table D3.3-12. JP-8 AGE Equipment Emissions, Pease, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	614																
	Hours/Sortie																
Generator A/M32A-86	10	6140.00	6.47	51298.71	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	8.26E+01	6.19E+00	3.98E+00	1.23E+00	1.20E+00	6.23E-01
Start Cart A/M32A-60A	1	614.00	10.16	6239.03	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	2.46E+00	7.42E+00	3.65E-01	2.86E-01	2.77E-01	9.72E-02
Start Cart A/M32A-95	0.1	61.40	8.75	537.25	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	1.99E-01	7.93E-01	9.48E-02	1.49E-02	1.45E-02	8.37E-03
Heater/AC Ace 802-993 AC	10	6140.00	6.80	94278.71	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	3.98E+01	2.03E+00	2.76E+00	2.68E+00	2.60E+00	6.50E-01
MA-3C Air Conditioner	2	1228.00	7.12	8318.71	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.13E+01	8.58E-01	1.43E-01	2.95E-01	2.84E-01	1.35E-01
H1	5	3070.00	0.39	1126.49	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.07E+00	1.23E+00	6.77E-01	7.38E-01	7.38E-01	2.03E-02
1H1	4	2456.00	0.39	901.19	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	8.56E-01	9.80E-01	5.41E-01	5.90E-01	5.90E-01	1.62E-02
Light Cart NF-2	2	1228.00	1.02	1247.81	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	2.98E-01	2.17E-01	2.71E-02	2.71E-02	2.71E-02	1.94E-02
Air Compressor MC-1A	0.33	202.62	1.09	210.46	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	1.87E-01	1.19E-01	1.19E-01	3.17E-02	3.04E-02	3.57E-03
Total JP-8 AGE, Tons/year				hp-hrs	2907948.208							6.94E-02	9.91E-03	4.35E-03	2.95E-03	2.88E-03	7.86E-04

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.3-13. AGE HAP Emissions, Pease, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	1.57E+01	7.00E-02	
Acrolein		6.48E-04	1.88E+00		
Benzene	7.65E-03	6.50E-03	1.89E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	7.97E-01		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	2.41E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	1.73E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	3.49E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	8.43E+00		
Xylenes		2.00E-03	5.82E+00		
Total			7.12E-03		

Table D3.3-14. JP-8 AGE Equipment GHG Emissions, Pease, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	614										
	Hours/Sortie										
Generator A/M32A-86	10	6140.00	6.47	51298.71	148	2.11E+01	5.91E-04	6.80E-04	1.08E+06	3.03E+01	3.49E+01
Start Cart A/M32A-60A	1	614.00	10.16	6239.03	180	2.11E+01	5.91E-04	6.80E-04	1.32E+05	3.69E+00	4.24E+00
Start Cart A/M32A-95	0.1	61.40	8.75	537.25	155	2.11E+01	5.91E-04	6.80E-04	1.13E+04	3.18E-01	3.65E-01
Heater/AC Ace 802-993 AC	10	6140.00	6.80	94278.71	272	2.11E+01	5.91E-04	6.80E-04	1.99E+06	5.57E+01	6.41E+01
MA-3C Air Conditioner	2	1228.00	7.12	8318.71	120	2.11E+01	5.91E-04	6.80E-04	1.76E+05	4.92E+00	5.66E+00
H1	5	3070.00	0.39	1126.49	6.5	2.11E+01	5.91E-04	6.80E-04	2.38E+04	6.66E-01	7.66E-01
1H1	4	2456.00	0.39	901.19	6.5	2.11E+01	5.91E-04	6.80E-04	1.90E+04	5.33E-01	6.13E-01
Light Cart NF-2	2	1228.00	1.02	1247.81	18	2.11E+01	5.91E-04	6.80E-04	2.63E+04	7.37E-01	8.49E-01
Air Compressor MC-1A	0.33	202.62	1.09	210.46	18.4	2.11E+01	5.91E-04	6.80E-04	4.44E+03	1.24E-01	1.43E-01
Total JP-8 AGE, Metric Tons/year									1.57E+03	4.40E-02	5.06E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.3-15. Aircraft Engine Emissions - Engine Tests, Pease, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	15	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	16.00	233.42	30.41	8.06	0.46	0.46
Maintenance Run	61	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	173.52	2,531.29	329.81	87.40	4.95	4.95
TRT Run 2 Engine	7	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	4.98	72.62	9.46	2.51	0.14	0.14
	7	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.42	0.82	168.38	9.65	1.00	1.00
TRT Run 4 Engine	5	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	7.11	103.74	13.52	3.58	0.20	0.20
	5	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.60	1.17	240.54	13.78	1.43	1.43
												0.10	1.47	0.40	0.06	0.00	0.00

Table D3.3-16. HAP Emissions, Engine Tests, Pease, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	15	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	61	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	7	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	7	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	5	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	5	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
0.72	0.00	0.00	0.02	0.01	0.07	0.01	0.01	0.01	0.02	0.01	0.01	0.51	0.04	
7.84	0.00	0.00	0.24	0.16	0.74	0.06	0.14	0.12	0.19	0.08	0.08	5.57	0.40	
0.22	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.16	0.01	
0.06	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.02	
0.32	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.00	0.00	0.23	0.02	
0.09	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.03	0.03	
0.00463278	0	0	0.00013891	0.00010328	0.00044193	3.2764E-05	8.2749E-05	7.0892E-05	0.00012369	4.74573E-05	5.17164E-05	0.00325492	0.00025906	0.00924015

Table D3.3-17. GHG Emissions, Engine Tests, Pease, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)			Actual Emissions (lb/yr)		
						CO2	CH4	N2O			
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	15	Idle	0.50	1	1,014	3,216.0	0.1	0.1	24,451.89	0.68	0.76
Maintenance Run	61	Idle	0.33	4	1,014	3,216.0	0.1	0.1	265,167.18	7.34	8.25
TRT Run 2 Engine	7	Idle	0.17	2	1,014	3,216.0	0.1	0.1	7,607.26	0.21	0.24
	7	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	29,270.10	0.81	0.91
TRT Run 4 Engine	5	Idle	0.17	4	1,014	3,216.0	0.1	0.1	10,867.51	0.30	0.34
	5	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	41,814.43	1.16	1.30
Total, tpy									172	0.00	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.3-18. Annual Worker Population and VMT at Pease - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT	Annual Off-Base VMT
Existing	1099	285740	1028664
Proposed Action	1227	319020	1148472

[1]On-Base mileage based on 1.00 miles from 2009 AEI; assume 260 days/year

[2]Off-Base mileage based on distance to downtown Portsmouth, 3.60 miles; assume 260 days/year

Table D3.3-19. Annual Average On-Road Vehicle Emission Factors - Pease

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.567	11.64	0.455	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.825	13.66	0.728	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.021	29.59	1.222	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	2.73	28.73	0.9	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.432	10.69	0.324	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.662	11.91	0.545	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.739	27.82	0.689	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	2.73	28.73	0.9	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table D3.3-20. Annual Average On-Base Vehicle Emissions, Pease

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	134.12	2753.41	107.63	1.66	5.91	2.60	87072.96
LDDT	0.03	0.02	0.15	0.04	0.00	0.01	0.01	59.34
LDGT	60.32	313.49	5190.62	276.63	3.80	9.50	4.18	196111.36
LDDT	0.2	0.50	0.89	0.58	0.01	0.08	0.06	754.93
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	32.68	343.87	10.77	0.04	0.44	0.25	2123.32
Total Existing, tons/year		0.24040363	4.14447428	0.19782454	0.00274987	0.00797091	0.00354783	143.060961
Proposed Action (Year 2018) (1)								
LDGV	37.55	114.09	2823.20	85.57	1.85	6.60	2.91	97187.90
LDDT	0.03	0.02	0.15	0.02	0.00	0.01	0.00	66.27
LDGT	60.32	280.85	5052.75	231.21	4.24	10.61	4.67	219164.48
LDDT	0.2	0.43	0.84	0.45	0.01	0.07	0.05	842.02
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	36.48	383.92	12.03	0.04	0.49	0.28	2370.62
Total Proposed Action, tons/year		0.21593421	4.13043111	0.16463595	0.00307014	0.00888855	0.00395112	159.815646

Table D3.3-21. Annual Average Off-Base Vehicle Emissions, Pease

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	482.84	9912.27	387.46	5.96	21.29	9.37	313462.67
LDDT	0.03	0.09	0.55	0.14	0.00	0.04	0.03	213.63
LDGT	60.32	1128.56	18686.25	995.87	13.68	34.20	15.05	706000.91
LDDT	0.2	1.78	3.21	2.09	0.03	0.27	0.20	2717.76
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	117.63	1237.94	38.78	0.13	1.59	0.90	7643.94
Total Existing, tons/year		0.86545308	14.9201074	0.71216834	0.00989952	0.02869528	0.01277218	515.019458
Proposed Action (Year 2018) (1)								
LDGV	37.55	367.88	9103.28	275.91	5.96	21.29	9.37	313377.51
LDDT	0.03	0.06	0.47	0.06	0.00	0.03	0.02	213.70
LDGT	60.32	905.59	16292.33	745.53	13.68	34.20	15.05	706684.89
LDDT	0.2	1.38	2.72	1.44	0.03	0.21	0.15	2715.04
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	117.63	1237.94	38.78	0.13	1.59	0.90	7643.94
Total Proposed Action, tons/year		0.69626905	13.3183681	0.53086038	0.00989952	0.02866069	0.0127402	515.317541

Table D3.3-22. Annual Air Operations for Aircraft at Pease - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	884	3536	8840

Table D3.3-23. KC-46A Aircraft Closed Pattern Operations at Pease - KC-46A Proposed Scenarios

Scenario/Operation	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)						
	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	68%	73%	83%	85%
KC-46A VFR Profile	0.8924	3156	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A IFR Profile	0.1076	380	5.24755579	1.580018	4.11836013	1.16386557	0.06861792	0.39455307	0.33222512
Total Ops		3536							

Table D3.3-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

Factor			Engine Setting/Time in Mode per Operation (Minutes)						
			55%	58%	60%	68%	73%	83%	85%
Fuel Use, lbs/hr			22572	23688.8	24805.6	28379.36	30389.6	34928	36116
Emission Factors, lbs/1000 lbs									
VOC			0.0920	0.0909	0.0897	0.0860	0.0840	0.0819	0.0834
CO			1.2150	1.1435	1.0720	0.8432	0.7145	0.5138	0.5275
NOx			19.0750	19.7655	20.4560	22.6656	23.9085	27.0275	28.0750
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0600	0.0610	0.0620	0.0652	0.0670	0.0713	0.0725
PM2.5			0.0500	0.0510	0.0520	0.0552	0.0570	0.0613	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.3-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A CA VFR Right Turns South Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CC IFR Right Turns Southwest Side			0.4768	5.6496	109.9461	5.6344	0.3311	0.2780	17094.6253	0.4731	0.5315
Emissions, closed pattern ops, tons/year			0.4900	5.5504	117.5768	5.8407	0.3483	0.2932	17720.4935	0.4904	0.5510

Table D3.3-26. Annual Air Emissions for KC-46A Aircraft Operations at Pease - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	14.71	51.10	33.54	2.60	0.21	0.19	7879.51	0.22	0.25
KC-46A T&G	0.49	5.55	117.58	5.84	0.35	0.29	17720.49	0.49	0.55
APU	0.04	0.31	6.30	0.52	0.05	0.04	1286.56	0.00	0.00
Total Proposed Action	15.24	56.95	157.41	8.96	0.61	0.52	26886.56	0.71	0.80

Table D3.3-27. Annual HAP Emissions for KC-46A Aircraft Operations at Pease - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A LTOs	2.10	0.73	0.42	0.09	0.29	0.11	0.03	0.05	0.05	0.01	0.00	0.00	0.13	0.01
KC-46A Closed Pattern Ops	0.07	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.21	0.02
Total Proposed Action	2.17	0.75	0.43	0.10	0.30	0.11	0.03	0.05	0.05	0.01	0.01	0.00	0.34	0.02

Table D3.3-28. JP-8 AGE Equipment Emissions, Proposed Action, Pease

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	884																
	Hours/Sortie																
Generator A/M32A-86	10	8840.00	6.47	73856.77	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.19E+02	8.91E+00	5.73E+00	1.77E+00	1.73E+00	8.96E-01
Start Cart A/M32A-60A	1	884.00	10.16	8982.58	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	3.55E+00	1.07E+01	5.26E-01	4.11E-01	4.00E-01	1.40E-01
Start Cart A/M32A-95	0.1	88.40	8.75	773.50	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	2.86E-01	1.14E+00	1.36E-01	2.14E-02	2.09E-02	1.21E-02
Heater/AC Ace 802-993 AC	10	8840.00	6.80	135736.77	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	5.73E+01	2.92E+00	3.98E+00	3.86E+00	3.74E+00	9.35E-01
MA-3C Air Conditioner	2	1768.00	7.12	11976.77	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.62E+01	1.24E+00	2.07E-01	4.25E-01	4.09E-01	1.95E-01
H1	5	4420.00	0.39	1621.85	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.54E+00	1.76E+00	9.74E-01	1.06E+00	1.06E+00	2.92E-02
1H1	4	3536.00	0.39	1297.48	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.23E+00	1.41E+00	7.80E-01	8.50E-01	8.50E-01	2.34E-02
Light Cart NF-2	2	1768.00	1.02	1796.52	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	4.29E-01	3.12E-01	3.90E-02	3.90E-02	3.90E-02	2.80E-02
Air Compressor MC-1A	0.33	291.72	1.09	303.01	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	2.69E-01	1.72E-01	1.72E-01	4.57E-02	4.37E-02	5.15E-03
Total JP-8 AGE, Tons/year				hp-hrs	4186687.648							9.99E-02	1.43E-02	6.27E-03	4.24E-03	4.15E-03	1.13E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.3-29. AGE HAP Emissions, Proposed Action, Pease

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	2.26E+01	7.00E-02	
Acrolein		6.48E-04	2.71E+00		
Benzene	7.65E-03	6.50E-03	2.72E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.15E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	3.47E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	2.49E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	5.02E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.21E+01		
Xylenes		2.00E-03	8.37E+00		
Total			1.03E-02		

Table D3.3-30. JP-8 AGE Equipment GHG Emissions, Proposed Action, Pease

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46A AGE											
Sorties:	884										
	Hours/Sortie										
Generator A/M32A-86	10	8840.00	6.47	73856.77	148	2.11E+01	5.91E-04	6.80E-04	1.56E+06	4.36E+01	5.02E+01
Start Cart A/M32A-60A	1	884.00	10.16	8982.58	180	2.11E+01	5.91E-04	6.80E-04	1.90E+05	5.31E+00	6.11E+00
Start Cart A/M32A-95	0.1	88.40	8.75	773.50	155	2.11E+01	5.91E-04	6.80E-04	1.63E+04	4.57E-01	5.26E-01
Heater/AC Ace 802-993 AC	10	8840.00	6.80	135736.77	272	2.11E+01	5.91E-04	6.80E-04	2.86E+06	8.02E+01	9.23E+01
MA-3C Air Conditioner	2	1768.00	7.12	11976.77	120	2.11E+01	5.91E-04	6.80E-04	2.53E+05	7.08E+00	8.14E+00
H1	5	4420.00	0.39	1621.85	6.5	2.11E+01	5.91E-04	6.80E-04	3.42E+04	9.59E-01	1.10E+00
1H1	4	3536.00	0.39	1297.48	6.5	2.11E+01	5.91E-04	6.80E-04	2.74E+04	7.67E-01	8.82E-01
Light Cart NF-2	2	1768.00	1.02	1796.52	18	2.11E+01	5.91E-04	6.80E-04	3.79E+04	1.06E+00	1.22E+00
Air Compressor MC-1A	0.33	291.72	1.09	303.01	18.4	2.11E+01	5.91E-04	6.80E-04	6.39E+03	1.79E-01	2.06E-01
Total JP-8 AGE, Metric Tons/year									2.26E+03	6.34E-02	7.29E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.3-31. Aircraft Engine Emissions - Engine Tests, Proposed Action, Pease

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	22	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	228.49	779.56	69.16	19.39	2.01	1.83
Maintenance Run	88	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	1,218.61	4,157.65	368.83	103.43	10.73	9.76
TRT Run 1 Engine	10	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	34.62	118.11	10.48	2.94	0.30	0.28
	10	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.13	7.03	365.23	14.90	0.98	0.84
TRT Run 2 Engine	8	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	55.39	188.98	16.77	4.70	0.49	0.44
	8	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.81	11.25	584.36	23.84	1.57	1.35
												0.77	2.63	0.71	0.08	0.01	0.01

Table D3.3-32. HAP Emissions, Engine Tests, Proposed Action, Pease

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	22	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	88	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	10	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	10	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	8	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	8	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
11.32	6.49	1.43	4.46	1.70	0.46	0.75	0.82	0.06	0.02	0.02	1.23	0.09	0.09	
60.39	34.62	7.65	23.77	9.08	2.46	3.99	4.37	0.32	0.09	0.09	6.59	0.47	0.47	
1.72	0.98	0.22	0.68	0.26	0.07	0.11	0.12	0.01	0.00	0.00	0.19	0.01	0.01	
0.16	0.06	0.03	0.01	0.02	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.71	0.04	
2.74	1.57	0.35	1.08	0.41	0.11	0.18	0.20	0.01	0.00	0.00	0.30	0.02	0.02	
0.26	0.09	0.05	0.01	0.04	0.01	0.00	0.01	0.01	0.04	0.02	0.01	1.14	0.06	
0.03829426	0.02190906	0.00486654	0.01500001	0.00575329	0.00156476	0.00251865	0.00276341	0.00020897	8.83493E-05	7.40798E-05	0.004163144	0.0012232	0.00034488	0.09877262

Table D3.3-33. GHG Emissions, Engine Tests, Proposed Action, Pease

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	22	Idle	0.50	1	1,663	3,216.0	0.1	0.1	58,837.36	1.63	1.83
Maintenance Run	88	Idle	0.33	2	1,663	3,216.0	0.1	0.1	313,799.27	8.68	9.76
TRT Run 2 Engine	10	Idle	0.17	1	1,663	3,216.0	0.1	0.1	8,914.75	0.25	0.28
	10	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	45,210.53	1.25	1.41
TRT Run 4 Engine	8	Idle	0.17	2	1,663	3,216.0	0.1	0.1	14,263.60	0.39	0.44
	8	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	72,336.84	2.00	2.25
Total, tpy									233	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.3-34. Pease Comparison of Emissions

Annual Emissions, tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	2.41	36.29	73.94	6.29	0.33	0.33
AGE	0.00	0.01	0.07	0.00	0.00	0.00
Engine Tests	0.10	1.47	0.40	0.06	0.00	0.00
POVs	1.11	19.06	0.91	0.01	0.04	0.02
Total	3.62	56.84	75.32	6.36	0.37	0.35
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	15.24	56.95	157.41	8.96	0.61	0.52
AGE	0.01	0.01	0.10	0.00	0.00	0.00
Engine Tests	0.77	2.63	0.71	0.08	0.01	0.01
POVs	0.91	17.45	0.70	0.01	0.04	0.02
Total	16.93	77.05	158.92	9.06	0.66	0.55
Net Increase	13.31	20.21	83.60	2.70	0.28	0.19

Table D3.3-35. Pease Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.13	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.21	0.02
AGE	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.14	0.01	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.21	0.02
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	2.17	0.75	0.43	0.10	0.30	0.11	0.03	0.05	0.05	0.01	0.01	0.00	0.34	0.02
AGE	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.04	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.22	0.79	0.44	0.11	0.32	0.12	0.03	0.05	0.05	0.01	0.01	0.01	0.34	0.02
Net Increase	2.08	0.78	0.44	0.11	0.30	0.09	0.03	0.04	0.05	0.01	0.00	0.01	0.12	0.01

Table D3.3-36. Pease Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	17303	0.48	0.54	17480
AGE	1571	0.04	0.05	1588
Engine Tests	172	0.00	0.01	174
POVs	597	0.00	0.00	597
Total	19643	0.53	0.59	19839
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	24391	0.64	0.72	24629
AGE	2262	0.06	0.07	2286
Engine Tests	233	0.01	0.01	235
POVs	612	0.00	0.00	612
Total	27499	0.71	0.80	27762
Net Increase	7855	0.18	0.21	7924

Pittsburgh ANGS

Table D3.4-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle	1663.2	12.489	42.61	3.78	1.06	0.11	0.1	3216	8.90E-02	1.00E-01
Approach	5702.4	0.1035	1.93	12.17	1.06	0.05	0.04	3216	8.90E-02	1.00E-01
Climbout	16869.6	0.0805	0.5	25.98	1.06	0.07	0.06	3216	8.90E-02	1.00E-01
Take-Off	21621.6	0.092	0.61	34.36	1.06	0.08	0.07	3216	8.90E-02	1.00E-01
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table D3.4-2. HAP Emission Factors - KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135 has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table D3.4-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table D3.4-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table D3.4-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table D3.4-6. Annual Air Operations for Aircraft at Pittsburgh - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	926	2545.5	6943

Table D3.4-7. KC-135 Aircraft Closed Pattern Operations at Pittsburgh, Baseline

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)					
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	70%	73%	85%
KC-135 VFR Profile	1	2546	1.08073231	1.05954148	3.23876605	0.6250811	0.10721551	0.60319134
KC-135 IFR Profile	0	0	5.90400061	2.76893508	3.98841687	0.45137435	0.10721551	0.60319134
Total Ops		2545.5						

Table D3.4-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

			Engine Setting/Time in Mode per Operation (Minutes)					
Factor			55%	58%	60%	70%	73%	85%
Fuel Use, lbs/hr			19910.88	20916.72	21922.56	25945.92	27589.32	31204.8
Emission Factors, lbs/1000 lbs fuel								
VOC			0.0704	0.0683	0.0661	0.0575	0.0539	0.0460
CO			1.6313	1.3744	1.1175	0.0900	0.0900	0.0900
NOx			13.0750	13.5625	14.0500	16.0000	16.7813	18.5000
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
PM2.5			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
CO2			3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.4-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 CA VFR Right Turns South Side			0.1614	2.4721	37.2809	2.6974	0.1393	0.1393	8183.7166	0.2265	0.2545
KC-135 CC IFR Right Turns Southwest Side			0.3286	6.2014	68.9372	5.2364	0.2676	0.2676	15886.9857	0.4397	0.4940
Emissions, closed pattern ops, tons/year			0.2054	3.1464	47.4492	3.4331	0.1773	0.1773	10415.8252	0.2882	0.3239

Table D3.4-10. Annual Air Emissions for KC-135 Aircraft Operations at Pittsburgh - Baseline

	Annual Emissions, Tons/year								
Aircraft	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	3.21	47.54	20.34	2.71	0.15	0.15	8223.46	0.23	0.26
KC-135 T&G	0.21	3.15	47.45	3.43	0.18	0.18	10415.83	0.29	0.32
Total Existing	3.42	50.69	67.79	6.14	0.33	0.33	18639.28	0.52	0.58

Table D3.4-11. Annual HAP Emissions for KC-135 Aircraft Operations at Pittsburgh - Baseline

	Annual Emissions, Tons/year													
Aircraft	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.15	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.14	0.01
KC-135 Closed Pattern Ops	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01
Total Existing	0.18	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.26	0.02

Table D3.4-12. JP-8 AGE Equipment Emissions, Pittsburgh, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	926																
	Hours/Sortie																
Generator A/M32A-86	10	9260.00	6.47	77365.81	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.25E+02	9.33E+00	6.00E+00	1.86E+00	1.82E+00	9.39E-01
Start Cart A/M32A-60A	1	926.00	10.16	9409.35	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	3.72E+00	1.12E+01	5.51E-01	4.31E-01	4.19E-01	1.47E-01
Start Cart A/M32A-95	0.1	92.60	8.75	810.25	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	3.00E-01	1.20E+00	1.43E-01	2.25E-02	2.18E-02	1.26E-02
Heater/AC Ace 802-993 AC	10	9260.00	6.80	142185.81	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	6.00E+01	3.06E+00	4.16E+00	4.04E+00	3.92E+00	9.80E-01
MA-3C Air Conditioner	2	1852.00	7.12	12545.81	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.70E+01	1.29E+00	2.16E-01	4.45E-01	4.29E-01	2.04E-01
H1	5	4630.00	0.39	1698.91	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.61E+00	1.85E+00	1.02E+00	1.11E+00	1.11E+00	3.06E-02
1H1	4	3704.00	0.39	1359.13	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.29E+00	1.48E+00	8.17E-01	8.90E-01	8.90E-01	2.45E-02
Light Cart NF-2	2	1852.00	1.02	1881.87	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	4.49E-01	3.27E-01	4.08E-02	4.08E-02	4.08E-02	2.93E-02
Air Compressor MC-1A	0.33	305.58	1.09	317.41	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	2.82E-01	1.80E-01	1.80E-01	4.78E-02	4.58E-02	5.39E-03
Total JP-8 AGE, Tons/year				hp-hrs	4385602.672							1.05E-01	1.50E-02	6.57E-03	4.44E-03	4.35E-03	1.19E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.4-13. AGE HAP Emissions, Pittsburgh, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	2.37E+01	7.00E-02	
Acrolein		6.48E-04	2.84E+00		
Benzene	7.65E-03	6.50E-03	2.85E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.20E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	3.64E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	2.61E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	5.26E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.27E+01		
Xylenes		2.00E-03	8.77E+00		
Total			1.07E-02		

Table D3.4-14. JP-8 AGE Equipment GHG Emissions, Pittsburgh, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	926										
	Hours/Sortie										
Generator A/M32A-86	10	9260.00	6.47	77365.81	148	2.11E+01	5.91E-04	6.80E-04	1.63E+06	4.57E+01	5.26E+01
Start Cart A/M32A-60A	1	926.00	10.16	9409.35	180	2.11E+01	5.91E-04	6.80E-04	1.99E+05	5.56E+00	6.40E+00
Start Cart A/M32A-95	0.1	92.60	8.75	810.25	155	2.11E+01	5.91E-04	6.80E-04	1.71E+04	4.79E-01	5.51E-01
Heater/AC Ace 802-993 AC	10	9260.00	6.80	142185.81	272	2.11E+01	5.91E-04	6.80E-04	3.00E+06	8.40E+01	9.67E+01
MA-3C Air Conditioner	2	1852.00	7.12	12545.81	120	2.11E+01	5.91E-04	6.80E-04	2.65E+05	7.41E+00	8.53E+00
H1	5	4630.00	0.39	1698.91	6.5	2.11E+01	5.91E-04	6.80E-04	3.58E+04	1.00E+00	1.16E+00
1H1	4	3704.00	0.39	1359.13	6.5	2.11E+01	5.91E-04	6.80E-04	2.87E+04	8.03E-01	9.24E-01
Light Cart NF-2	2	1852.00	1.02	1881.87	18	2.11E+01	5.91E-04	6.80E-04	3.97E+04	1.11E+00	1.28E+00
Air Compressor MC-1A	0.33	305.58	1.09	317.41	18.4	2.11E+01	5.91E-04	6.80E-04	6.70E+03	1.88E-01	2.16E-01
Total JP-8 AGE, Metric Tons/year									2.37E+03	6.64E-02	7.64E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.4-15. Aircraft Engine Emissions - Engine Tests, Pittsburgh, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	17	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	18.13	264.54	34.47	9.13	1.05	1.05
Maintenance Run	69	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	196.28	2,863.26	373.06	98.86	11.36	11.36
TRT Run 2 Engine	8	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	5.69	82.99	10.81	2.87	0.33	0.33
	8	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.48	0.94	192.43	11.03	1.14	1.14
TRT Run 4 Engine	6	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	8.53	124.49	16.22	4.30	0.49	0.49
	6	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.72	1.40	288.64	16.54	1.71	1.71
												0.11	1.67	0.46	0.07	0.01	0.01

Table D3.4-16. HAP Emissions, Engine Tests, Pittsburgh, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	17	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	69	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	8	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	8	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	6	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	6	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
0.82	0.00	0.00	0.02	0.02	0.08	0.01	0.01	0.01	0.02	0.01	0.01	0.58	0.04	
8.87	0.00	0.00	0.27	0.18	0.84	0.06	0.15	0.14	0.22	0.09	0.09	6.30	0.45	
0.26	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.18	0.01	
0.07	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.03	
0.39	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.27	0.02	
0.11	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.01	0.03	0.04	
0.00525704	0	0	0.00015753	0.00011764	0.00050169	3.7155E-05	9.3998E-05	8.0395E-05	0.000140823	5.39764E-05	5.88753E-05	0.00369213	0.00029492	0.01048617

Table D3.4-17. GHG Emissions, Engine Tests, Pittsburgh, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	17	Idle	0.50	1	1,014	3,216.0	0.1	0.1	27,712.14	0.77	0.86
Maintenance Run	69	Idle	0.33	4	1,014	3,216.0	0.1	0.1	299,943.20	8.30	9.33
TRT Run 2 Engine	8	Idle	0.17	2	1,014	3,216.0	0.1	0.1	8,694.01	0.24	0.27
	8	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	33,451.55	0.93	1.04
TRT Run 4 Engine	6	Idle	0.17	4	1,014	3,216.0	0.1	0.1	13,041.01	0.36	0.41
	6	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	50,177.32	1.39	1.56
Total, tpy									196	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.4-18. Annual Worker Population and VMT at Pittsburgh - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT	Annual Off-Base VMT
Existing	1014	263640	4734974.4
Proposed Action	1037	269620	4842375.2

[1]On-Base mileage based on 1.00 miles from 2009 AEI; assume 260 days/year

[2]Off-Base mileage based on distance to downtown Pittsburgh, 17.96 miles; assume 260 days/year

Table D3.4-19. Annual Average On-Road Vehicle Emission Factors - Pittsburgh

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.586	10.45	0.446	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.831	12.34	0.707	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.066	28.64	1.21	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	2.75	27.81	0.87	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.446	9.55	0.318	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.668	10.77	0.53	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.773	26.93	0.682	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	2.75	27.81	0.87	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table D3.4-20. Annual Average On-Base Vehicle Emissions, Pittsburgh

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	127.90	2280.73	97.34	1.53	5.46	2.40	80338.48
LDDT	0.03	0.02	0.14	0.03	0.00	0.01	0.01	54.75
LDGT	60.32	291.35	4326.38	247.87	3.51	8.76	3.86	180943.52
LDDT	0.2	0.46	0.82	0.53	0.01	0.07	0.05	696.55
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	30.37	307.12	9.61	0.03	0.41	0.23	1959.09
Total Existing, tons/year		0.23	3.46	0.18	0.00	0.01	0.00	132.00
Proposed Action (Year 2018) (1)								
LDGV	37.55	99.55	2131.58	70.98	1.56	5.58	2.46	82138.43
LDDT	0.03	0.02	0.12	0.02	0.00	0.01	0.00	56.01
LDGT	60.32	239.51	3861.59	190.03	3.59	8.96	3.94	185227.03
LDDT	0.2	0.36	0.71	0.38	0.01	0.06	0.04	711.63
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	31.06	314.08	9.83	0.03	0.42	0.24	2003.53
Total Proposed Action, tons/year		0.19	3.15	0.14	0.00	0.01	0.00	135.07

Table D3.4-21. Annual Average Off-Base Vehicle Emissions, Pittsburgh

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	2297.00	40961.93	1748.23	27.44	98.00	43.12	1442879.03
LDDT	0.03	0.41	2.53	0.63	0.01	0.17	0.12	983.34
LDGT	60.32	5232.59	77701.72	4451.79	62.97	157.42	69.26	3249745.54
LDDT	0.2	8.20	14.78	9.60	0.13	1.25	0.92	12509.96
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	545.43	5515.80	172.55	0.60	7.34	4.17	35185.31
Total Existing, tons/year		4.04	62.10	3.19	0.05	0.13	0.06	2370.65
Proposed Action (Year 2018) (1)								
LDGV	37.55	1748.23	37434.11	1246.50	27.44	98.00	43.12	1442487.05
LDDT	0.03	0.27	2.17	0.28	0.01	0.12	0.07	983.66
LDGT	60.32	4206.22	67815.85	3337.27	62.97	157.42	69.26	3252893.90
LDDT	0.2	6.37	12.53	6.62	0.13	0.98	0.67	12497.43
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	545.43	5515.80	172.55	0.60	7.34	4.17	35185.31
Total Proposed Action, tons/year		3.25	55.39	2.38	0.05	0.13	0.06	2372.02

Table D3.4-22. Annual Air Operations for Aircraft at Pittsburgh - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	1186	3427	9226

Table D3.4-23. KC-46A Aircraft Closed Pattern Operations at Pittsburgh - KC-46A Proposed Scenarios

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)						
Scenario/Operation	**Fraction of Ops**	**Total Ops per Pattern**	**55%**	**58%**	**60%**	**68%**	**73%**	**83%**	**85%**
KC-46A VFR Profile	1	3427	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A IFR Profile	0	0	5.24755579	1.580018	4.11836013	1.16386557	0.06861792	0.39455307	0.33222512
Total Ops		**3427**							

Table D3.4-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

			Engine Setting/Time in Mode per Operation (Minutes)						
Factor			**55%**	**58%**	**60%**	**68%**	**73%**	**83%**	**85%**
Fuel Use, lbs/hr			22572	23688.8	24805.6	28379.36	30389.6	34928	36116
Emission Factors, lbs/1000 lbs									
VOC			0.0920	0.0909	0.0897	0.0860	0.0840	0.0819	0.0834
CO			1.2150	1.1435	1.0720	0.8432	0.7145	0.5138	0.5275
NOx			19.0750	19.7655	20.4560	22.6656	23.9085	27.0275	28.0750
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0600	0.0610	0.0620	0.0652	0.0670	0.0713	0.0725
PM2.5			0.0500	0.0510	0.0520	0.0552	0.0570	0.0613	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.4-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			**VOC**	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**
KC-46A CA VFR Right Turns South Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CC IFR Right Turns Southwest Side			0.4768	5.6496	109.9461	5.6344	0.3311	0.2780	17094.6253	0.4731	0.5315
Emissions, closed pattern ops, tons/year			**0.4336**	**4.8607**	**104.9769**	**5.1791**	**0.3099**	**0.2610**	**15713.2056**	**0.4348**	**0.4886**

Table D3.4-26. Annual Air Emissions for KC-46A Aircraft Operations at Pittsburgh - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	19.74	68.55	45.00	3.48	0.28	0.25	10571.39	0.29	0.33
KC-46A T&G	0.43	4.86	104.98	5.18	0.31	0.26	15713.21	0.43	0.49
APU	0.05	0.41	8.45	0.70	0.06	0.05	1726.08	0.00	0.00
Total Proposed Action	20.22	73.83	158.42	9.37	0.66	0.56	28010.67	0.73	0.82

Table D3.4-27. Annual HAP Emissions for KC-135 Aircraft Operations at Pittsburgh - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46 LTOs	2.82	0.98	0.56	0.12	0.39	0.15	0.04	0.06	0.07	0.01	0.00	0.00	0.17	0.01
KC-46 Closed Pattern Ops	0.06	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.20	0.01
Total Proposed Action	2.88	1.00	0.57	0.13	0.39	0.15	0.04	0.07	0.07	0.02	0.01	0.01	0.37	0.03

Table D3.4-28. JP-8 AGE Equipment Emissions, Pittsburgh, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	1186																
	Hours/Sortie																
Generator A/M32A-86	10	11860.00	6.47	99088.39	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.60E+02	1.19E+01	7.69E+00	2.38E+00	2.33E+00	1.20E+00
Start Cart A/M32A-60A	1	1186.00	10.16	12051.29	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	4.76E+00	1.43E+01	7.06E-01	5.52E-01	5.36E-01	1.88E-01
Start Cart A/M32A-95	0.1	118.60	8.75	1037.75	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	3.84E-01	1.53E+00	1.83E-01	2.88E-02	2.80E-02	1.62E-02
Heater/AC Ace 802-993 AC	10	11860.00	6.80	182108.39	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	7.68E+01	3.92E+00	5.33E+00	5.18E+00	5.02E+00	1.26E+00
MA-3C Air Conditioner	2	2372.00	7.12	16068.39	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.18E+01	1.66E+00	2.77E-01	5.70E-01	5.49E-01	2.61E-01
H1	5	5930.00	0.39	2175.93	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.07E+00	2.37E+00	1.31E+00	1.43E+00	1.43E+00	3.92E-02
1H1	4	4744.00	0.39	1740.74	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.65E+00	1.89E+00	1.05E+00	1.14E+00	1.14E+00	3.14E-02
Light Cart NF-2	2	2372.00	1.02	2410.26	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	5.75E-01	4.18E-01	5.23E-02	5.23E-02	5.23E-02	3.76E-02
Air Compressor MC-1A	0.33	391.38	1.09	406.53	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	3.62E-01	2.30E-01	2.30E-01	6.13E-02	5.87E-02	6.90E-03
Total JP-8 AGE, Tons/year				hp-hrs	5616981.392							1.34E-01	1.91E-02	8.41E-03	5.69E-03	5.57E-03	1.52E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.4-29. AGE HAP Emissions, Pittsburgh, Proposed Action

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.03E+01	7.00E-02	
Acrolein		6.48E-04	3.64E+00		
Benzene	7.65E-03	6.50E-03	3.65E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.54E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	4.66E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	3.34E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	6.74E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.63E+01		
Xylenes		2.00E-03	1.12E+01		
Total			1.38E-02		

Table D3.4-30. JP-8 AGE Equipment GHG Emissions, Pittsburgh, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46 AGE											
Sorties:	1186										
	Hours/Sortie										
Generator A/M32A-86	10	11860.00	6.47	99088.39	148	2.11E+01	5.91E-04	6.80E-04	2.09E+06	5.86E+01	6.74E+01
Start Cart A/M32A-60A	1	1186.00	10.16	12051.29	180	2.11E+01	5.91E-04	6.80E-04	2.54E+05	7.12E+00	8.19E+00
Start Cart A/M32A-95	0.1	118.60	8.75	1037.75	155	2.11E+01	5.91E-04	6.80E-04	2.19E+04	6.13E-01	7.06E-01
Heater/AC Ace 802-993 AC	10	11860.00	6.80	182108.39	272	2.11E+01	5.91E-04	6.80E-04	3.84E+06	1.08E+02	1.24E+02
MA-3C Air Conditioner	2	2372.00	7.12	16068.39	120	2.11E+01	5.91E-04	6.80E-04	3.39E+05	9.50E+00	1.09E+01
H1	5	5930.00	0.39	2175.93	6.5	2.11E+01	5.91E-04	6.80E-04	4.59E+04	1.29E+00	1.48E+00
1H1	4	4744.00	0.39	1740.74	6.5	2.11E+01	5.91E-04	6.80E-04	3.67E+04	1.03E+00	1.18E+00
Light Cart NF-2	2	2372.00	1.02	2410.26	18	2.11E+01	5.91E-04	6.80E-04	5.09E+04	1.42E+00	1.64E+00
Air Compressor MC-1A	0.33	391.38	1.09	406.53	18.4	2.11E+01	5.91E-04	6.80E-04	8.58E+03	2.40E-01	2.76E-01
Total JP-8 AGE, Metric Tons/year									3.03E+03	8.50E-02	9.78E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.4-31. Aircraft Engine Emissions - Engine Tests, Pittsburgh, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	23	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	238.87	814.99	72.30	20.27	2.10	1.91
Maintenance Run	92	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	1,274.00	4,346.63	385.60	108.13	11.22	10.20
TRT Run 1 Engine	11	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	38.08	129.93	11.53	3.23	0.34	0.30
	11	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.24	7.73	401.75	16.39	1.08	0.93
TRT Run 2 Engine	8	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	55.39	188.98	16.77	4.70	0.49	0.44
	8	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.81	11.25	584.36	23.84	1.57	1.35
												0.80	2.75	0.74	0.09	0.01	0.01

Table D3.4-32. HAP Emissions, Engine Tests, Pittsburgh, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	23	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	92	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	11	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	11	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	8	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	8	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
11.84	6.79	1.50	4.66	1.78	0.48	0.78	0.86	0.06	0.02	0.02	1.29	0.09	0.09	
63.13	36.20	8.00	24.85	9.49	2.58	4.17	4.57	0.34	0.09	0.10	6.89	0.49	0.49	
1.89	1.08	0.24	0.74	0.28	0.08	0.12	0.14	0.01	0.00	0.00	0.21	0.01	0.01	
0.18	0.06	0.04	0.01	0.02	0.01	0.00	0.00	0.00	0.03	0.01	0.01	0.78	0.04	
2.74	1.57	0.35	1.08	0.41	0.11	0.18	0.20	0.01	0.00	0.00	0.30	0.02	0.02	
0.26	0.09	0.05	0.01	0.04	0.01	0.00	0.01	0.01	0.04	0.02	0.01	1.14	0.06	
0.04001785	0.02289548	0.00508548	0.015675625	0.00601226	0.00163517	0.00263209	0.00288785	0.00021835	9.21172E-05	7.73212E-05	0.004350612	0.00127221	0.00036011	0.10321253

Table D3.4-33. GHG Emissions, Engine Tests, Pittsburgh, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)			Actual Emissions (lb/yr)		
						CO2	CH4	N2O			
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	23	Idle	0.50	1	1,663	3,216.0	0.1	0.1	61,511.79	1.70	1.91
Maintenance Run	92	Idle	0.33	2	1,663	3,216.0	0.1	0.1	328,062.87	9.08	10.20
TRT Run 2 Engine	11	Idle	0.17	1	1,663	3,216.0	0.1	0.1	9,806.23	0.27	0.30
	11	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	49,731.58	1.38	1.55
TRT Run 4 Engine	8	Idle	0.17	2	1,663	3,216.0	0.1	0.1	14,263.60	0.39	0.44
	8	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	72,336.84	2.00	2.25
Total, tpy									243	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.4-34. Pittsburgh Comparison of Emissions

Annual Emissions, tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	3.42	50.69	67.79	6.14	0.33	0.33
AGE	0.01	0.01	0.10	0.00	0.00	0.00
Engine Tests	0.11	1.67	0.46	0.07	0.01	0.01
POVs	4.27	65.56	3.37	0.05	0.14	0.06
Total	7.81	117.93	71.72	6.26	0.48	0.40
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	20.22	73.83	158.42	9.37	0.66	0.56
AGE	0.01	0.02	0.13	0.00	0.01	0.01
Engine Tests	0.80	2.75	0.74	0.09	0.01	0.01
POVs	3.44	58.54	2.52	0.05	0.14	0.06
Total	24.48	135.14	161.81	9.51	0.81	0.64
Net Increase	16.67	17.21	90.09	3.24	0.33	0.24

Table D3.4-35. Pittsburgh Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.18	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.26	0.02
AGE	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.20	0.01	0.00	0.01	0.02	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.27	0.02
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	2.88	1.00	0.57	0.13	0.39	0.15	0.04	0.07	0.07	0.02	0.01	0.01	0.37	0.03
AGE	0.02	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.04	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.95	1.04	0.58	0.14	0.42	0.16	0.04	0.07	0.07	0.02	0.01	0.01	0.38	0.03
Net Increase	2.74	1.03	0.58	0.14	0.39	0.12	0.04	0.06	0.07	0.01	0.00	0.01	0.11	0.01

Table D3.4-36. Pittsburgh Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	16909	0.47	0.53	17082
AGE	2370	0.07	0.08	2395
Engine Tests	196	0.01	0.01	198
POVs	2270	0.00	0.00	2270
Total	21746	0.54	0.61	21946
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	25411	0.66	0.74	25655
AGE	3035	0.09	0.10	3067
Engine Tests	243	0.01	0.01	245
POVs	2274	0.00	0.00	2274
Total	30963	0.75	0.85	31242
Net Increase	9218	0.21	0.24	9296

Rickenbacker ANGS

Table D3.5-1. Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle	1663.2	12.489	42.61	3.78	1.06	0.11	0.1	3216	8.90E-02	1.00E-01
Approach	5702.4	0.1035	1.93	12.17	1.06	0.05	0.04	3216	8.90E-02	1.00E-01
Climbout	16869.6	0.0805	0.5	25.98	1.06	0.07	0.06	3216	8.90E-02	1.00E-01
Take-Off	21621.6	0.092	0.61	34.36	1.06	0.08	0.07	3216	8.90E-02	1.00E-01
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table D3.5-2. HAP Emission Factors - KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table D3.5-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table D3.5-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table D3.5-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table D3.5-6. Annual Air Operations for Aircraft at Rickenbacker - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	1289	1933.5	6445

Table D3.5-7. KC-135 Aircraft Closed Pattern Operations at Rickenbacker, Baseline

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)					
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	70%	73%	85%
KC-136 VFR Profile	1	1934	1.08073231	1.05954148	3.23876605	0.6250811	0.10721551	0.60319134
KC-135 IFR Profile	0	0	5.90400061	2.76893508	3.98841687	0.45137435	0.10721551	0.60319134
Total Ops		1933.5						

Table D3.5-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

			Engine Setting/Time in Mode per Operation (Minutes)					
Factor			55%	58%	60%	70%	73%	85%
Fuel Use, lbs/hr			19910.88	20916.72	21922.56	25945.92	27589.32	31204.8
Emission Factors, lbs/1000 lbs fuel								
VOC			0.0704	0.0683	0.0661	0.0575	0.0539	0.0460
CO			1.6313	1.3744	1.1175	0.0900	0.0900	0.0900
NOx			13.0750	13.5625	14.0500	16.0000	16.7813	18.5000
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
PM2.5			0.0538	0.0531	0.0525	0.0500	0.0563	0.0700
CO2			3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.5-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 CA VFR Right Turns South Side			0.1614	2.4721	37.2809	2.6974	0.1393	0.1393	8183.7166	0.2265	0.2545
KC-135 CC IFR Right Turns Southwest Side			0.3286	6.2014	68.9372	5.2364	0.2676	0.2676	15886.9857	0.4397	0.4940
Emissions, closed pattern ops, tons/year			0.1560	2.3899	36.0413	2.6077	0.1346	0.1346	7911.6080	0.2189	0.2460

Table D3.5-10. Annual Air Emissions for KC-135 Aircraft Operations at Rickenbacker - Baseline

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	4.47	66.18	28.31	3.77	0.21	0.21	11447.12	0.32	0.36
KC-135 T&G	0.16	2.39	36.04	2.61	0.13	0.13	7911.61	0.22	0.25
Total Existing	4.63	68.57	64.35	6.38	0.34	0.34	19358.73	0.54	0.60

Table D3.5-11. Annual HAP Emissions for KC-135 Aircraft Operations at Rickenbacker - Baseline

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.21	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.20	0.01
KC-135 Closed Pattern Ops	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
Total Existing	0.23	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02

Table D3.5-12. JP-8 AGE Equipment Emissions, Rickenbacker, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	1289																
	Hours/Sortie																
Generator A/M32A-86	10	12890.00	6.47	107693.87	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.73E+02	1.30E+01	8.35E+00	2.59E+00	2.53E+00	1.31E+00
Start Cart A/M32A-60A	1	1289.00	10.16	13097.90	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	5.17E+00	1.56E+01	7.67E-01	6.00E-01	5.83E-01	2.04E-01
Start Cart A/M32A-95	0.1	128.90	8.75	1127.88	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	4.18E-01	1.67E+00	1.99E-01	3.13E-02	3.04E-02	1.76E-02
Heater/AC Ace 802-993 AC	10	12890.00	6.80	197923.87	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	8.35E+01	4.26E+00	5.80E+00	5.63E+00	5.46E+00	1.36E+00
MA-3C Air Conditioner	2	2578.00	7.12	17463.87	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.37E+01	1.80E+00	3.01E-01	6.20E-01	5.97E-01	2.84E-01
H1	5	6445.00	0.39	2364.90	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.25E+00	2.57E+00	1.42E+00	1.55E+00	1.55E+00	4.26E-02
1H1	4	5156.00	0.39	1891.92	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.80E+00	2.06E+00	1.14E+00	1.24E+00	1.24E+00	3.41E-02
Light Cart NF-2	2	2578.00	1.02	2619.58	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	6.25E-01	4.55E-01	5.68E-02	5.68E-02	5.68E-02	4.08E-02
Air Compressor MC-1A	0.33	425.37	1.09	441.84	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	3.93E-01	2.50E-01	2.50E-01	6.66E-02	6.38E-02	7.50E-03
Total JP-8 AGE, Tons/year				hp-hrs	6104796.808							1.46E-01	2.08E-02	9.14E-03	6.19E-03	6.05E-03	1.65E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.5-13. AGE HAP Emissions, Rickenbacker, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.30E+01	7.00E-02	
Acrolein		6.48E-04	3.96E+00		
Benzene	7.65E-03	6.50E-03	3.97E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.67E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	5.07E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	3.63E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	7.33E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.77E+01		
Xylenes		2.00E-03	1.22E+01		
Total			1.50E-02		

Table D3.5-14. JP-8 AGE Equipment GHG Emissions, Rickenbacker, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	1289										
	Hours/Sortie										
Generator A/M32A-86	10	12890.00	6.47	107693.87	148	2.11E+01	5.91E-04	6.80E-04	2.27E+06	6.36E+01	7.32E+01
Start Cart A/M32A-60A	1	1289.00	10.16	13097.90	180	2.11E+01	5.91E-04	6.80E-04	2.76E+05	7.74E+00	8.91E+00
Start Cart A/M32A-95	0.1	128.90	8.75	1127.88	155	2.11E+01	5.91E-04	6.80E-04	2.38E+04	6.67E-01	7.67E-01
Heater/AC Ace 802-993 AC	10	12890.00	6.80	197923.87	272	2.11E+01	5.91E-04	6.80E-04	4.18E+06	1.17E+02	1.35E+02
MA-3C Air Conditioner	2	2578.00	7.12	17463.87	120	2.11E+01	5.91E-04	6.80E-04	3.68E+05	1.03E+01	1.19E+01
H1	5	6445.00	0.39	2364.90	6.5	2.11E+01	5.91E-04	6.80E-04	4.99E+04	1.40E+00	1.61E+00
1H1	4	5156.00	0.39	1891.92	6.5	2.11E+01	5.91E-04	6.80E-04	3.99E+04	1.12E+00	1.29E+00
Light Cart NF-2	2	2578.00	1.02	2619.58	18	2.11E+01	5.91E-04	6.80E-04	5.53E+04	1.55E+00	1.78E+00
Air Compressor MC-1A	0.33	425.37	1.09	441.84	18.4	2.11E+01	5.91E-04	6.80E-04	9.32E+03	2.61E-01	3.00E-01
Total JP-8 AGE, Metric Tons/year									3.30E+03	9.24E-02	1.06E-01

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.5-15. Aircraft Engine Emissions - Engine Tests, Rickenbacker, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	16	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	17.07	248.98	32.44	8.60	0.99	0.99
Maintenance Run	64	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	182.06	2,655.78	346.03	91.70	10.54	10.54
TRT Run 2 Engine	7	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	4.98	72.62	9.46	2.51	0.29	0.29
	7	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.42	0.82	168.38	9.65	1.00	1.00
TRT Run 4 Engine	6	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	8.53	124.49	16.22	4.30	0.49	0.49
	6	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.72	1.40	288.64	16.54	1.71	1.71
												0.11	1.55	0.43	0.07	0.01	0.01

Table D3.5-16. HAP Emissions, Engine Tests, Rickenbacker, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	16	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	64	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	7	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	7	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	6	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	6	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
0.77	0.00	0.00	0.02	0.02	0.07	0.01	0.01	0.01	0.02	0.01	0.01	0.55	0.04	
8.23	0.00	0.00	0.25	0.16	0.78	0.06	0.14	0.13	0.20	0.08	0.08	5.84	0.42	
0.22	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.16	0.01	
0.06	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.02	
0.39	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.27	0.02	
0.11	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.01	0.03	0.04	
0.00489095	0	0	0.000146505	0.0001097	0.00046687	3.4555E-05	8.7507E-05	7.4768E-05	0.000131274	5.02865E-05	5.48808E-05	0.00343424	0.00027491	0.00975644

Table D3.5-17. GHG Emissions, Engine Tests, Rickenbacker, Baseline

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	16	Idle	0.50	1	1,014	3,216.0	0.1	0.1	26,082.02	0.72	0.81
Maintenance Run	64	Idle	0.33	4	1,014	3,216.0	0.1	0.1	278,208.18	7.70	8.65
TRT Run 2 Engine	7	Idle	0.17	2	1,014	3,216.0	0.1	0.1	7,607.26	0.21	0.24
	7	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	29,270.10	0.81	0.91
TRT Run 4 Engine	6	Idle	0.17	4	1,014	3,216.0	0.1	0.1	13,041.01	0.36	0.41
	6	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	50,177.32	1.39	1.56
Total, tpy									183	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.5-18. Annual Worker Population and VMT at Rickenbacker - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT	Annual Off-Base VMT
Existing	1174	305240	4993726.4
Proposed Action	1358	353080	5776388.8

[1]On-Base mileage based on 1.00 miles from 2009 AEI; assume 260 days/year

[2]Off-Base mileage based on distance to downtown Columbus, 16.36 miles; assume 260 days/year

Table D3.5-19. Annual Average On-Road Vehicle Emission Factors - Rickenbacker

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.589	10.11	0.445	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.833	11.95	0.701	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.078	28.36	1.206	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	2.85	27.61	0.86	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.448	9.22	0.318	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.782	10.43	0.527	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.305	26.67	0.68	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	2.85	27.61	0.86	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table D3.5-20. Annual Average On-Base Vehicle Emissions, Rickenbacker

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	148.83	2554.70	112.45	1.77	6.32	2.78	93015.16
LDDT	0.03	0.03	0.16	0.04	0.00	0.01	0.01	63.39
LDGT	60.32	338.13	4850.73	284.55	4.06	10.15	4.47	209494.76
LDDT	0.2	0.53	0.95	0.62	0.01	0.08	0.06	806.45
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	36.44	353.02	11.00	0.04	0.47	0.27	2268.22
Total Existing, tons/year		0.26	3.88	0.20	0.00	0.01	0.00	152.82
Proposed Action (Year 2018) (1)								
LDGV	37.55	130.95	2694.95	92.95	2.05	7.31	3.22	107564.11
LDDT	0.03	0.02	0.16	0.02	0.00	0.01	0.01	73.35
LDGT	60.32	367.18	4897.28	247.45	4.70	11.74	5.16	242563.46
LDDT	0.2	0.47	0.93	0.49	0.01	0.07	0.05	931.92
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	42.15	408.35	12.72	0.04	0.55	0.31	2623.72
Total Proposed Action, tons/year		0.27	4.00	0.18	0.00	0.01	0.00	176.88

Table D3.5-21. Annual Average Off-Base Vehicle Emissions, Rickenbacker

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	2434.93	41794.81	1839.63	28.94	103.35	45.47	1521728.00
LDDT	0.03	0.44	2.67	0.66	0.01	0.18	0.12	1037.08
LDGT	60.32	5531.81	79357.96	4655.22	66.41	166.02	73.05	3427334.28
LDDT	0.2	8.65	15.59	10.13	0.13	1.32	0.97	13193.59
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	596.16	5775.39	179.89	0.63	7.74	4.39	37108.08
Total Existing, tons/year		4.29	63.47	3.34	0.05	0.14	0.06	2500.20
Proposed Action (Year 2018) (1)								
LDGV	37.55	1852.04	38115.55	1314.61	28.94	103.35	45.47	1521314.60
LDDT	0.03	0.29	2.29	0.29	0.01	0.13	0.08	1037.41
LDGT	60.32	5193.13	69263.90	3499.72	66.41	166.02	73.05	3430654.70
LDDT	0.2	6.72	13.21	6.98	0.13	1.03	0.70	13180.38
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	596.16	5775.39	179.89	0.63	7.74	4.39	37108.08
Total Proposed Action, tons/year		3.82	56.59	2.50	0.05	0.14	0.06	2501.65

Table D3.5-22. Annual Air Operations for Aircraft at Rickenbacker - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	1286	2142.5	6857

Table D3.5-23. KC-46A Aircraft Closed Pattern Operations at Rickenbacker - KC-46A Proposed Scenarios

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)						
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	55%	58%	60%	68%	73%	83%	85%
KC-46A VFR Profile	1	2143	1.52770185	1.04541426	2.57545944	0.66856113	0.06861792	0.3602441	0.39626852
KC-46A IFR Profile	0	0	5.24755579	1.03333177	6.83322258	1.16386557	0.06861792	0.39455307	0.33222512
Total Ops		2143							

Table D3.5-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

			Engine Setting/Time in Mode per Operation (Minutes)						
Factor			55%	58%	60%	68%	73%	83%	85%
Fuel Use, lbs/hr			22572	23688.8	24805.6	28379.36	30389.6	34928	36116
Emission Factors, lbs/1000 lbs									
VOC			0.0920	0.0909	0.0897	0.0860	0.0840	0.0819	0.0834
CO			1.2150	1.1435	1.0720	0.8432	0.7145	0.5138	0.5275
NOx			19.0750	19.7655	20.4560	22.6656	23.9085	27.0275	28.0750
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0600	0.0610	0.0620	0.0652	0.0670	0.0713	0.0725
PM2.5			0.0500	0.0510	0.0520	0.0552	0.0570	0.0613	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table D3.5-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A CA VFR Right Turns South Side			0.2531	2.8367	61.2646	3.0225	0.1809	0.1523	9170.2396	0.2538	0.2851
KC-46A CC IFR Right Turns Southwest Side			0.5579	6.6060	128.6396	6.5954	0.3876	0.3254	20010.1143	0.5538	0.6222
Emissions, closed pattern ops, tons/year			0.2711	3.0388	65.6297	3.2379	0.1937	0.1632	9823.6192	0.2719	0.3055

Table D3.5-26. Annual Air Emissions for KC-46A Aircraft Operations at Rickenbacker - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	21.40	74.33	48.79	3.78	0.31	0.27	11462.73	0.32	0.36
KC-46A T&G	0.27	3.04	65.63	3.24	0.19	0.16	9823.62	0.27	0.31
APU	0.05	0.45	9.16	0.76	0.07	0.05	1871.62	0.00	0.00
Total Proposed Action	21.73	77.82	123.58	7.78	0.57	0.49	23157.97	0.59	0.66

Table D3.5-27. Annual HAP Emissions for KC-46A Aircraft Operations at Rickenbacker - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A LTOs	3.06	1.06	0.61	0.13	0.42	0.16	0.04	0.07	0.08	0.01	0.00	0.00	0.19	0.01
KC-46A Closed Pattern Ops	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.12	0.01
Total Proposed Action	3.10	1.07	0.62	0.14	0.42	0.16	0.04	0.07	0.08	0.01	0.01	0.00	0.31	0.02

Table D3.5-28. JP-8 AGE Equipment Emissions, Rickenbacker, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	1286																
	Hours/Sortie																
Generator A/M32A-86	10	12860.00	6.47	107443.23	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.73E+02	1.30E+01	8.34E+00	2.58E+00	2.52E+00	1.30E+00
Start Cart A/M32A-60A	1	1286.00	10.16	13067.42	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	5.16E+00	1.55E+01	7.65E-01	5.98E-01	5.81E-01	2.04E-01
Start Cart A/M32A-95	0.1	128.60	8.75	1125.25	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	4.17E-01	1.66E+00	1.98E-01	3.12E-02	3.03E-02	1.75E-02
Heater/AC Ace 802-993 AC	10	12860.00	6.80	197463.23	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	8.33E+01	4.25E+00	5.78E+00	5.61E+00	5.44E+00	1.36E+00
MA-3C Air Conditioner	2	2572.00	7.12	17423.23	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.36E+01	1.80E+00	3.01E-01	6.18E-01	5.95E-01	2.84E-01
H1	5	6430.00	0.39	2359.40	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.24E+00	2.57E+00	1.42E+00	1.55E+00	1.55E+00	4.25E-02
1H1	4	5144.00	0.39	1887.52	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.79E+00	2.05E+00	1.13E+00	1.24E+00	1.24E+00	3.40E-02
Light Cart NF-2	2	2572.00	1.02	2613.48	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	6.24E-01	4.54E-01	5.67E-02	5.67E-02	5.67E-02	4.07E-02
Air Compressor MC-1A	0.33	424.38	1.09	440.81	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	3.92E-01	2.50E-01	2.50E-01	6.64E-02	6.36E-02	7.48E-03
Total JP-8 AGE, Tons/year				hp-hrs	6090588.592							1.45E-01	2.08E-02	9.12E-03	6.17E-03	6.04E-03	1.65E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.5-29. AGE HAP Emissions, Rickenbacker, Proposed Action

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.29E+01	7.00E-02	
Acrolein		6.48E-04	3.95E+00		
Benzene	7.65E-03	6.50E-03	3.96E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.67E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	5.06E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	3.62E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	7.31E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.77E+01		
Xylenes		2.00E-03	1.22E+01		
Total			1.49E-02		

Table D3.5-30. JP-8 AGE Equipment GHG Emissions, Rickenbacker, Proposed Action

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46A AGE											
Sorties:	1286										
	Hours/Sortie										
Generator A/M32A-86	10	12860.00	6.47	107443.23	148	2.11E+01	5.91E-04	6.80E-04	2.27E+06	6.35E+01	7.31E+01
Start Cart A/M32A-60A	1	1286.00	10.16	13067.42	180	2.11E+01	5.91E-04	6.80E-04	2.76E+05	7.72E+00	8.89E+00
Start Cart A/M32A-95	0.1	128.60	8.75	1125.25	155	2.11E+01	5.91E-04	6.80E-04	2.37E+04	6.65E-01	7.65E-01
Heater/AC Ace 802-993 AC	10	12860.00	6.80	197463.23	272	2.11E+01	5.91E-04	6.80E-04	4.17E+06	1.17E+02	1.34E+02
MA-3C Air Conditioner	2	2572.00	7.12	17423.23	120	2.11E+01	5.91E-04	6.80E-04	3.68E+05	1.03E+01	1.18E+01
H1	5	6430.00	0.39	2359.40	6.5	2.11E+01	5.91E-04	6.80E-04	4.98E+04	1.39E+00	1.60E+00
1H1	4	5144.00	0.39	1887.52	6.5	2.11E+01	5.91E-04	6.80E-04	3.98E+04	1.12E+00	1.28E+00
Light Cart NF-2	2	2572.00	1.02	2613.48	18	2.11E+01	5.91E-04	6.80E-04	5.51E+04	1.54E+00	1.78E+00
Air Compressor MC-1A	0.33	424.38	1.09	440.81	18.4	2.11E+01	5.91E-04	6.80E-04	9.30E+03	2.61E-01	3.00E-01
Total JP-8 AGE, Metric Tons/year									3.29E+03	9.22E-02	1.06E-01

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table D3.5-31. Aircraft Engine Emissions - Engine Tests, Rickenbacker, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	17	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	176.56	602.39	53.44	14.99	1.56	1.41
Maintenance Run	68	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	941.65	3,212.73	285.01	79.92	8.29	7.54
TRT Run 1 Engine	8	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	27.70	94.49	8.38	2.35	0.24	0.22
	8	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	0.91	5.62	292.18	11.92	0.79	0.67
TRT Run 2 Engine	6	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	41.54	141.74	12.57	3.53	0.37	0.33
	6	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	1.36	8.43	438.27	17.88	1.18	1.01
												0.59	2.03	0.54	0.07	0.01	0.01

Table D3.5-32. HAP Emissions, Engine Tests, Rickenbacker, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	17	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	68	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	8	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	8	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	6	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	6	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
8.75	5.02	1.11	3.44	1.32	0.36	0.58	0.63	0.05	0.01	0.01	0.95	0.07	0.07	
46.66	26.75	5.91	18.37	7.01	1.90	3.08	3.38	0.25	0.07	0.07	5.09	0.37	0.37	
1.37	0.79	0.17	0.54	0.21	0.06	0.09	0.10	0.01	0.00	0.00	0.15	0.01	0.01	
0.13	0.04	0.03	0.01	0.02	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.57	0.03	
2.06	1.18	0.26	0.81	0.31	0.08	0.14	0.15	0.01	0.00	0.00	0.22	0.02	0.02	
0.19	0.07	0.04	0.01	0.03	0.01	0.00	0.00	0.00	0.03	0.01	0.01	0.85	0.04	
0.02958249	0.016925	0.00375938	0.011587815	0.00444445	0.00120878	0.00194571	0.00213478	0.00016142	6.81459E-05	5.71806E-05	0.003216092	0.0009419	0.00026628	0.07629942

Table D3.5-33. GHG Emissions, Engine Tests, Rickenbacker, Proposed Action

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	17	Idle	0.50	1	1,663	3,216.0	0.1	0.1	45,465.24	1.26	1.41
Maintenance Run	68	Idle	0.33	2	1,663	3,216.0	0.1	0.1	242,481.25	6.71	7.54
TRT Run 2 Engine	8	Idle	0.17	1	1,663	3,216.0	0.1	0.1	7,131.80	0.20	0.22
	8	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	36,168.42	1.00	1.12
TRT Run 4 Engine	6	Idle	0.17	2	1,663	3,216.0	0.1	0.1	10,697.70	0.30	0.33
	6	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	54,252.63	1.50	1.69
Total, tpy									180	0.00	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table D3.5-34. Rickenbacker Comparison of Emissions

Annual Emissions, tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	4.63	68.57	64.35	6.38	0.34	0.34
AGE	0.01	0.02	0.15	0.00	0.01	0.01
Engine Tests	0.11	1.55	0.43	0.07	0.01	0.01
POVs	4.55	67.35	3.55	0.05	0.15	0.07
Total	9.29	137.50	68.48	6.50	0.51	0.42
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	21.73	77.82	123.58	7.78	0.57	0.49
AGE	0.01	0.02	0.15	0.00	0.01	0.01
Engine Tests	0.59	2.03	0.54	0.07	0.01	0.01
POVs	4.09	60.59	2.68	0.05	0.15	0.07
Total	26.43	140.46	126.95	7.90	0.73	0.57
Net Increase	17.13	2.96	58.47	1.40	0.23	0.15

Table D3.5-35. Rickenbacker Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.23	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
AGE	0.03	0.02	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.26	0.02	0.00	0.01	0.03	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	3.10	1.07	0.62	0.14	0.42	0.16	0.04	0.07	0.08	0.01	0.01	0.00	0.31	0.02
AGE	0.03	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.03	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.15	1.11	0.62	0.15	0.45	0.17	0.05	0.07	0.08	0.01	0.01	0.01	0.31	0.02
Net Increase	2.89	1.09	0.62	0.14	0.42	0.13	0.04	0.06	0.07	0.00	0.00	0.00	0.02	0.00

Table D3.5-36. Rickenbacker Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	17562	0.49	0.55	17742
AGE	3298	0.09	0.11	3333
Engine Tests	183	0.01	0.01	185
POVs	2407	0.00	0.00	2407
Total	23451	0.58	0.66	23667
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	21009	0.53	0.60	21206
AGE	3291	0.09	0.11	3326
Engine Tests	180	0.00	0.01	182
POVs	2430	0.00	0.00	2430
Total	26909	0.63	0.71	27143
Net Increase	3458	0.05	0.05	3476

Appendix E

Special Status Species Lists

APPENDIX E SPECIAL STATUS SPECIES LISTS

Special Status Species Observed or Potentially Occurring in the Vicinity of Forbes ANGS

Common Name	*Scientific Name*	*Status*	*Occurrence on Forbes Field Airport*
Birds			
Eskimo Curlew	*Numenius borealis*	FE, SE	U
Least Tern	*Sternula antillarum*	FE, SE	U
Piping Plover	*Charadrius melodus*	FT, ST	U
Snowy Plover	*Charadrius alexandrinus*	ST	U
Whooping Crane	*Grus americana*	FE, SE	U
Mammals			
Eastern spotted skunk	*Spilogale putorius*	ST	U
Amphibians and Reptiles			
Smooth earth snake	*Virginia valeriae*	ST	U
Fish			
Silver chub	*Macrhybopsis storeriana*	SE	U
Sturgeon chub	*Macrhybopsis gelida*	FC, ST	U
Topeka shiner	*Notropis topeka*	FE, ST	U
Invertebrates			
American burying beetle	*Nicrophorus americanus*	FE, SE	U

Notes: FT = Federal Threatened, FE = Federal Endangered, FC = Federal Candidate, ST = State Threatened, SE = State Endangered, U = Unlikely

Sources: 190th Air Refueling Wing 2004; Kansas Department of Wildlife, Parks and Tourism 2005, 2013.

Special Status Species Observed or Potentially Occurring in the Vicinity of JB MDL

Common Name	*Scientific Name*	*Federal Status/State Status*	*Occurrence On McGuire Field*
Birds			
American Bittern	*Botaurus lentiginosus*	SE	P
American Kestrel	*Falco sparverius*	ST	O
Bald Eagle	*Haliaeetus leucocephalus*	ST/SE	P
Barred Owl	*Strix varia*	ST	P
Black-crowned Night Heron	*Nycticorax nycticorax*	ST	P
Grasshopper Sparrow	*Ammodramus savannarum*	ST	O
Henslow's Sparrow	*Ammodramus henslowii*	SE	P
Horned Lark	*Eremophila alpestris*	ST	P
Long-eared Owl	*Asio otus*	ST	P
Northern Goshawk	*Accipiter gentilis*	SE	P
Northern Harrier	*Circus cyaneus*	SE	O
Osprey	*Pandion haliaetus*	ST	P
Pied-billed Grebe	*Podilymbus podiceps*	SE	O
Red-headed Woodpecker	*Malanerpes erythrocephalus*	ST	P
Red-shouldered Hawk	*Buteo lineatus*	ST/SE	P
Savannah Sparrow	*Passerculus sandwichensis*	ST	O
Sedge Wren	*Cistothorus platensis*	SE	P
Upland Sandpiper	*Bartramia longicauda*	SE	O
Vesper Sparrow	*Pooecetes gramineus*	SE	P
Mammals			
Bobcat	*Lynx rufus*	SE	P
Amphibians and Reptiles			
Bog turtle	*Clemmys muhlenbergii*	FT, SE	P
Corn snake	*Elaphe guttata*	SE	P
Eastern mud salamander	*Pseudotriton montanus montanus*	ST	P
Northern pine snake	*Pituophis melanoleucus melanoleucus*	ST	P
Southern gray treefrog	*Hyla chrysoscelis*	SE	P
Timber rattlesnake	*Crotalus horridus*	SE	P
Pine Barrens treefrog	*Hyla andersonii*	ST	P
Wood turtle	*Glyptemys insculpta*	ST	P
Invertebrates			
Arogos skipper	*Atrytone arogos*	SE	P
Frosted elfin	*Callophrys irus*	ST	P
Silver-bordered fritillary	*Boloria selene*	ST	P
Plants			
American chaffseed	*Schwalbea americana*	FE, SE	P
Bog (Yellow) asphodel	*Narthecium americanum*	C, SE	P
Knieskern's beaked-rush	*Rhynchospora knieskernii*	FT, SE	P
Swamp pink	*Helonias bullata*	FT, SE	P

Notes: FE = Federally Endangered, FT = Federally Threatened, C = Candidate Species, SE = State Endangered, ST = State Threatened, P = Potential, O = Observed

Source: 87th Civil Engineer Squadron 2012, Air Mobility Command 2008, New Jersey Department of Environmental Protection 2013.

Special Status Species Observed or Potentially Occurring in the Vicinity of Pease ANGS

Common Name	*Scientific Name*	*Federal Status/State Status*	*Occurrence On Portsmouth International Airport*
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	ST	O
Common Loon	*Gavia immer*	ST	O
Common Nighthawk	*Chordeiles minor*	SE	O
Common Tern	*Sterna hirundo*	ST	O
Northern Harrier	*Circus cyaneus*	SE	O
Peregrine Falcon	*Falco peregrinus*	ST	O
Upland Sandpiper	*Bartramia longicauda*	SE	O
Mammals			
New England cottontail	*Sylvilagus transitionalis*	C, SE	P
Amphibians and Reptiles			
Blanding's turtle	*Emydoidea blandingii*	SE	P
Plants			
Large bur-reed	*Sparganium eurycarpum*	ST	P
Northern blazing star	*Liatris scariosa* var. *novae-angliae*	SE	P
Seaside mallow	*Hibiscus moscheutos*	SE	P
Small whorled pogonia	*Isotria medeoloides*	FT, ST	U

Notes: FT = Federally Threatened, C = Candidate Species, SE = State Endangered, ST = State Threatened, O = Observed, P = Potential; U = Unlikely

Source: 157th Air Refueling Wing 2013, New Hampshire Fish and Game 2013, New Hampshire Natural Heritage Bureau 2013.

Special Status Species Observed or Potentially Occurring in the Vicinity of Pittsburgh ANGS

Common Name	*Scientific Name*	*Federal Status/State Status*	*Occurrence On Pittsburgh International Airport*
Birds			
Short-eared Owl	*Asio flammeus*	SE	P
Northern Harrier	*Circus cyaneus*	ST	P
Peregrine Falcon	*Falco peregrinus*	SE	P
Bald Eagle	*Haliaeetus leucocephalus*	ST	P
Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	SE	P
Mammals			
Indiana bat	*Myotis sodalis*	FE	P
Amphibians and Reptiles			
Northern cricket frog	*Acris crepitans*	SE	P
Kirtland's snake	*Clonophis kirtlandii*	SE	P
Eastern massasauga	*Sistrurus catenatus catenatus*	C, SE	P
Fish			
Warmouth	*Chaenobryttus gulosus*	SE	U
Ghost shiner	*Notropis buchanani*	SE	U
Bluebreast darter	*Etheostoma camurum*	ST	U
Tippecanoe darter	*Etheostoma tippecanoe*	ST	U
Southern redbelly dace	*Phoxinus erythrogaster*	ST	U
Plants			
Northern water plantain	*Alisma triviale*	SE	P
Scarlet ammannia	*Ammannia coccinea*	SE	P
Carey's sedge	*Carex careyana*	SE	P
Cattail sedge	*Carex typhina*	SE	P
Vasevine leather-flower	*Clematis viorna*	SE	P
Small yellow lady's-slipper	*Cypripedium parviflorum* var. *parviflorum*	SE	P
Tall larkspur	*Delphinium exaltatum*	SE	P
Common shootingstar	*Dodecatheon meadia*	SE	P
Four-angled spike-rush	*Eleocharis quadrangulata*	SE	P
Cluster fescue	*Festuca paradoxa*	SE	P
Bicknell's hoary rockrose	*Helianthemum bicknellii*	SE	P
Purple rocket	*Iodanthus pinnatifidus*	SE	P
Crested dwarf iris	*Iris cristata*	SE	P
Forked rush	*Juncus dichotomus*	SE	P
American gromwell	*Lithospermum latifolium*	SE	P
Large-flowered marshallia	*Marshallia grandiflora*	SE	P
Oblique milkvine	*Matelea obliqua*	SE	P
Spotted beebalm	*Monarda punctata*	SE	P
Northern watermilfoil	*Myriophyllum exalbescens*	SE	P
Round hickorynut	*Obovaria subrotunda*	SE	P
False gromwell	*Onosmodium molle*	SE	P
Passionflower	*Passiflora lutea*	SE	P
Balsam poplar	*Populus balsamifera*	SE	P
Tennessee pondweed	*Potamogeton tennesseensis*	SE	P
Crepis rattlesnake-root	*Prenanthes crepidinea*	SE	P

Special Status Species Observed or Potentially Occurring in the Vicinity of Pittsburgh ANGS

Common Name	*Scientific Name*	*Federal Status/State Status*	*Occurrence On Pittsburgh International Airport*
Eastern blue-eyed grass	*Sisyrinchium atlanticum*	SE	P
Wild hyacinth	*Triteleia hyacinthina*	ST	P
Harbinger of spring	*Erigenia bulbosa*	ST	P
Torrey's rush	*Juncus torreyi*	ST	O
Common hoptree	*Ptelea trifoliata*	ST	P
Limestone petunia	*Ruellia strepens*	ST	P
Invertebrates			
Sheepnose mussel	*Plethobasus cyphyus*	FE, ST	U
Snuffbox	*Epioblasma triquetra*	SE	U
Gravel chub	*Erimystax x-punctatus*	SE	U
Rabbitsfoot	*Quadrula cylindrica*	C, SE	U
Pistolgrip mussel	*Quadrula verrucosa*	SE	U

Notes: FE = Federally Endangered, C = Candidate Species, SE = State Endangered, ST = State Threatened, O = Observed, P = Potential; U = Unlikely

Source: Pennsylvania Natural Heritage Program 2013, 171st Air Refueling Wing 2012.

Special Status Species Observed or Potentially Occurring in the Vicinity of Rickenbacker ANGS

Common Name	*Scientific Name*	*Status*	*Occurrence on Rickenbacker International Airport*
Birds			
Short-eared Owl	*Asio flammeus*	SE	P
Northern Harrier	*Circus cyaneus*	SE	O
Barn Owl	*Tyto alba*	ST	P
Peregrine Falcon	*Falco peregrinus*	FSC, ST	P
Upland Sandpiper	*Bartramia longicauda*	SE	P
Bald Eagle	*Haliaeetus leucocephalus*	ST	P
Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	SE	P
Mammals			
Indiana bat	*Myotis sodalis*	FE, SE	P
Amphibians and Reptiles			
Kirtland's snake	*Clonophis kirtlandii*	SE	P
Eastern massasauga	*Sistrurus catenatus catenatus*	C, SE	P
Fish			
Warmouth	*Chaenobryttus gulosus*	SE	U
Gravel chub	*Erimystax x-punctatus*	SE	U
Ghost shiner	*Notropis buchanani*	SE	U
Bluebreast darter	*Etheostoma camurum*	ST	U
Tippecanoe darter	*Etheostoma tippecanoe*	ST	U
Southern redbelly dace	*Phoxinus erythrogaster*	ST	U
Invertebrates			
Snuffbox	*Epioblasma triquetra*	FE, SE	U
Rabbitsfoot	*Quadrula cylindrica*	C, SE	U
Pistolgrip mussel	*Quadrula verrucosa*	SE	U
Sheepnose mussel	*Plethobasus cyphyus*	FE, ST	U
Plants			
Gattinger's-foxglove	*Acorus americanus*	ST	P
Spreading rockcress	*Arabis patens*	SE	P
Northern water plantain	*Alisma triviale*	SE	P
Scarlet ammannia	*Ammannia coccinea*	SE	P
Carey's sedge	*Carex careyana*	SE	P
Cattail sedge	*Carex typhina*	SE	P
Vasevine leather-flower	*Clematis viorna*	SE	P
Small yellow lady's-slipper	*Cypripedium parviflorum* var. *parviflorum*	SE	P
Tall larkspur	*Delphinium exaltatum*	SE	P
Common shootingstar	*Dodecatheon meadia*	SE	P
Four-angled spike-rush	*Eleocharis quadrangulata*	SE	P
Cluster fescue	*Festuca paradoxa*	SE	P
Bicknell's hoary rockrose	*Helianthemum bicknellii*	SE	P
Purple rocket	*Iodanthus pinnatifidus*	SE	P
Crested dwarf iris	*Iris cristata*	SE	P
Forked rush	*Juncus dichotomus*	SE	P
American gromwell	*Lithospermum latifolium*	SE	P

Special Status Species Observed or Potentially Occurring in the Vicinity of Rickenbacker ANGS

Common Name	*Scientific Name*	*Status*	*Occurrence on Rickenbacker International Airport*
Large-flowered marshallia	*Marshallia grandiflora*	SE	P
Oblique milkvine	*Matelea obliqua*	SE	P
Spotted beebalm	*Monarda punctata*	SE	P
Northern watermilfoil	*Myriophyllum exalbescens*	SE	P
Round hickorynut	*Obovaria subrotunda*	SE	P
False gromwell	*Onosmodium molle*	SE	P
Passionflower	*Passiflora lutea*	SE	P
Balsam poplar	*Populus balsamifera*	SE	P
Tennessee pondweed	*Potamogeton tennesseensis*	SE	P
Crepis rattlesnakeroot	*Prenanthes crepidinea*	SE	P
Eastern blue-eyed grass	*Sisyrinchium atlanticum*	SE	P
Wild hyacinth	*Triteleia hyacinthina*	ST	P
Harbinger of spring	*Erigenia bulbosa*	ST	P
Torrey's rush	*Juncus torreyi*	ST	P
Common hoptree	*Ptelea trifoliata*	ST	P
Limestone petunia	*Ruellia strepens*	ST	P

Notes FT = Federal Threatened, FE = Federal Endangered, FC = Federal Candidate, ST = State Threatened, SE = State Endangered, O = Observed, P = Potential, U = Unlikely; FSC = Federal Species of Concern

Sources: Ohio Department of Natural Resources 2012; United States Fish and Wildlife Service 2005, 2010.

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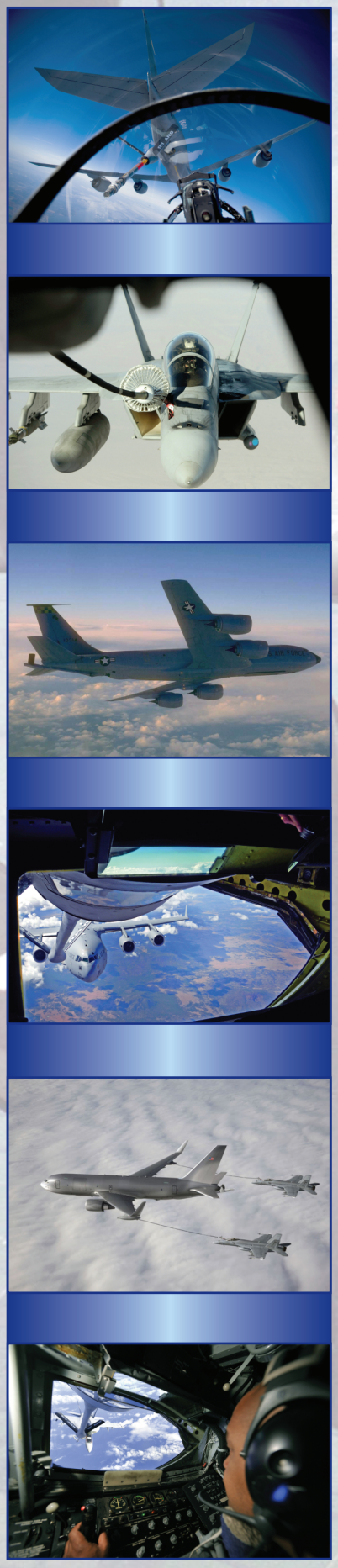
Appendix F

Final General Conformity Determination for KC-46A Alternative Beddown Location



Final General Conformity Determination for KC-46A Alternative Beddown Location

108th Wing, Joint Base McGuire-Dix-Lakehurst, New Jersey

May 2014

ACRONYMS AND ABBREVIATIONS

°F	degree Fahrenheit
108 WG	108th Wing
AAQS	Ambient Air Quality Standards
AFB	Air Force Base
AFCEC	Air Force Civil Engineering Center
AFI	Air Force Instruction
AGE	Aerospace Ground Equipment
AGL	Above Ground Level
ANGS	Air National Guard Station
ARW	Air Refueling Wing
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
EDMS	Emissions and Dispersion Modeling System
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
JB MDL	Joint Base McGuire-Dix-Lakehurst
MOB	Main Operating Base
MOB 2	Second Main Operating Base
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NJANG	New Jersey Air National Guard
NJDEP	New Jersey Department of Environmental Protection
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
PAA	Primary Aerospace Vehicles Authorized
Pb	Lead
PM_{10}	Particulate Matter Less Than or Equal to 10 Microns in Diameter
$PM_{2.5}$	Particulate Matter Less Than or Equal to 2.5 Microns in Diameter
POV	Privately-Owned Vehicle
ROI	Region of Influence
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_x	Oxides of Sulfur
tpy	Tons Per Year
U.S.	United States
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

GENERAL CONFORMITY DETERMINATION FOR THE KC-46A ALTERNATIVE BEDDOWN LOCATION, 108TH WING JOINT BASE MCGUIRE-DIX-LAKEHURST, NEW JERSEY

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EXECUTIVE SUMMARY

PROPOSED ACTION

The United States Air Force (USAF) plans to replace existing KC-135s with the KC-46A, which will be a new aircraft to the USAF's fleet. This action would involve the beddown of one KC-46A squadron consisting of 12 Primary Aerospace Vehicles Authorized (PAA), and establishing a KC-46A Main Operating Base (MOB). The Secretary of the Air Force proposes to beddown KC-46A aircraft for the Second Main Operating Base (MOB 2) at one of five alternative locations:

- Alternative #1 – 190th Air Refueling Wing (ARW), Forbes Air National Guard Station (ANGS), Kansas;
- Alternative #2 – 108th Wing (108 WG) , Joint Base McGuire-Dix-Lakehurst (JB MDL), New Jersey;
- Alternative #3 – 157th ARW, Pease ANGS, New Hampshire;
- Alternative #4 – 171st ARW, Pittsburgh ANGS, Pennsylvania; and
- Alternative #5 – 121st ARW, Rickenbacker ANGS, Ohio.

As stated above, the Secretary of the Air Force proposes to beddown KC-46A aircraft for the MOB 2 at one of five alternative locations. One of these alternative locations is the 108 WG, located at JB MDL, New Jersey. Alternative #2 proposes to replace the existing KC-135 aircraft with the KC-46A at JB MDL, which is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. If this location is chosen, the Proposed Action would contribute to regional air emissions at JB MDL, New Jersey.

CONFORMITY BACKGROUND

Air quality at a specific location is described by the concentration of various pollutants in the atmosphere, and is determined by local and regional emissions, the size and topography of the air basin, and local and regional meteorological influences. The significance of a pollutant concentration in a region or geographical area is determined by comparing it to federal and/or state ambient air quality standards (AAQS). Under the authority of the Clean Air Act (CAA) and subsequent amendments, the United States Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) to protect public health and welfare, with an adequate margin of safety. These NAAQS represent the maximum allowable atmospheric concentrations and were established for seven "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). Oxides of nitrogen (NO_x) include nitric oxide, NO_2, and other nitrogen compounds. Because volatile organic compounds (VOCs) and NO_x are

precursors to the formation of O_3 in the atmosphere, control of these pollutants is the primary method of reducing O_3 concentrations in the atmosphere.

Should Alternative #2 be implemented, the KC-46A aircraft would be beddown at the 108 WG installation at JB MDL in New Jersey. The USEPA has classified the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey as nonattainment for the 8-hour O_3 (marginal nonattainment) and $PM_{2.5}$ NAAQS, and a maintenance area for CO. The region is designated as an attainment/unclassified area for all other pollutants. While General Conformity applicability analyses and determinations are not required for those criteria pollutants that are designated as being in attainment of the NAAQS, implementation of this alternative would be subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Implementing regulations were revised by the USEPA on April 5, 2010, and changed the existing regulations found in 40 Code of Federal Regulations (CFR) Part 51, Subpart W and Part 93, Subpart B (USEPA 2010).

Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (NO_x and VOCs), $PM_{2.5}$, and CO emissions are all 100 tons per year (tpy). According to the CAA general conformity rule, a federal agency (in this case, the National Guard Bureau [NGB]) must assess whether their Proposed Action would contribute to the further degradation of air quality or prevent attainment of air quality standards in areas that are designated as nonattainment or maintenance.

Therefore, the NGB is conducting this review to document whether the Proposed Action meets the conformity rule. There are two main components to this documentation of conformity: 1) an applicability analysis to determine whether a conformity determination is required, and if it is, 2) a conformity determination to evaluate whether the action conforms to the attainment plans in the applicable State Implementation Plan (SIP).

Under the General Conformity Rule, air emissions from a Proposed Action must be below *de minimis* levels for nonattainment or maintenance pollutants to be exempt from a formal conformity determination. Proposed Actions that equal or exceed these thresholds in any given year must undergo a detailed analysis, and a formal conformity determination is required. General Conformity applicability analyses and determinations are not required for those criteria pollutants that are designated as being in attainment of the NAAQS.

EMISSIONS EVALUATION

The 108 WG currently flies and maintains eight KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 108 WG include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations

involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

Alternative #2 involves both construction of new facilities to accommodate the KC-46A aircraft, and operational emissions associated with the KC-46A aircraft. The KC-46A beddown at JB MDL would require construction and renovation of existing airfield facilities, including hangars, buildings, and aprons and ramps. Air quality impacts resulting from the proposed construction activities would be below the applicable *de minimis* thresholds for all pollutants. Table ES-1 provides a summary of the construction emissions for the proposed action.

Table ES-1. Annual Construction Emissions Under Alternative #2

Construction Project	*CO*	*NO_x*	*VOC*	*$PM_{2.5}$*
Project #1 - Addition to Hangar 3333	1.43	2.28	0.40	1.77
Project #2 - Addition to Hangar 3336	1.46	2.32	0.41	1.80
Project #3 - Internal Renovations to Hangar 3322	0.30	0.47	0.06	0.04
Project #4 - New Simulator Building	0.54	0.85	0.15	0.63
Project #5 - Modifications to Existing Parking Ramp and Taxiway	4.28	10.18	1.06	3.00
Project #6 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	0.01	0.01	0.00	0.00
Total Option 1	**8.01**	**16.11**	**2.08**	**7.23**
***De minimis* Threshold**	**100**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide.

Emissions sources associated with operation of the proposed KC-46A beddown at the 108 WG installation include (1) operations and engine maintenance/testing of aircraft; (2) on-site privately-owned vehicles (POVs); (3) off-site POV commutes; and (4) Aerospace Ground Equipment (AGE). It was assumed that other sources, including non-road mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged.

Table ES-2 summarizes the annual operational emissions that would result from KC-46A operations at the 108 WG installation. Table ES-2 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at JB MDL. As shown in Table ES-2, the net emissions increases are below the *de minimis* thresholds for all pollutants except NO_x. Emissions of NO_x would exceed the *de minimis* threshold, and this alternative would therefore require a Conformity Determination under the General Conformity Rule.

Table ES-2. Comparison of Baseline and Proposed Annual Operational Emissions of Non-Attainment and Maintenance Criteria Pollutants, 108 WG Installation

	ANNUAL EMISSIONS, TONS/YEAR			
Baseline	***VOC***	***CO***	***NO_x***	***$PM_{2.5}$***
KC-135 Aircraft Operations	3.21	49.03	83.34	0.39
AGE	0.01	0.01	0.09	0.00
Engine Tests	0.14	2.01	0.55	0.01
POVs	5.12	110.72	5.20	0.12
Total	**8.48**	**161.78**	**89.18**	**0.53**
Proposed Action	***VOC***	***CO***	***NOx***	***$PM_{2.5}$***
KC-46A Aircraft Operations	26.19	100.37	294.03	0.96
AGE	0.01	0.02	0.17	0.01
Engine Tests	1.53	5.23	1.38	0.01
POVs	4.75	126.34	3.97	0.12
Total	**32.48**	**231.97**	**299.54**	**1.11**
Net Increase	**24.01**	**70.19**	**210.36**	**0.58**
***De minimis* Threshold**	**100**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately-owned vehicle.

In accordance with 40 CFR Part 93, Subpart B, 40 CFR Part 51, Subpart W and the 2010 Air Force Conformity Guide, the incremental increase in emissions above the existing conditions due to Alternative #2 was considered and includes reasonable foreseeable direct and indirect emissions. The applicability analysis has found that this federal action is subject to general conformity, so the federal agency must demonstrate conformity to the SIP.

Based on the evaluation of the emissions associated with the implementation of Alternative #2, the estimated annual net increase in NO_x emissions from operations would be 210.36 tpy. Therefore, a positive conformity determination is required. To demonstrate positive conformity, the NGB has reviewed the emissions budget in the applicable SIP.

The New Jersey Department of Environmental Protection (NJDEP) has included an emissions budget for McGuire Air Force Base (AFB) and Lakehurst Naval Air Station (NAS) within its currently approved SIP. The emission budget for NO_x from the currently approved SIP for McGuire AFB is 1,534 tpy (NJDEP 2007). The USAF has calculated actual emissions for calendar year 2011 from McGuire AFB based on current operations using the Emissions and Dispersion Modeling System (EDMS) software (Federal Aviation Administration [FAA] 2013). Table ES-3 presents the actual emissions for 2011 in comparison with the SIP emissions budget.

Table ES-3. Comparison of Baseline Actual Emissions and McGuire AFB SIP Budget

Emission Source	ANNUAL EMISSIONS, TONS/YEAR
	NO_x
McGuire Stationary Sources (Title V), CY2011	23.24
Air Operations (Based and Transient Aircraft, CY2011)	959.4
Non-road Vehicles (2005)	92.65
Other point sources	7.6
Capital Improvements Plan, annual	10.29
Total	**1093.2**
Remaining Emissions Budget	**1534.0**
Additional Emissions Budget	**440.8**

As shown in Table ES-3, the amount of NO_x emissions accounted for in the SIP for McGuire AFB exceeds the actual emissions by 440.8 tpy; thus, the net emissions increase (210.36 tpy) that would be associated with Alternative #2 is accommodated within the existing SIP budget by 230.44 tpy. The net NO_x emissions from the USAF action would therefore not exceed the emissions budgets in the applicable SIP, and Alternative #2 would conform to the SIP.

CONCLUSIONS OF THE GENERAL CONFORMITY DETERMINATION

Based on the evaluation of the emissions associated with the implementation of Alternative #2, the estimated annual net increase in NO_x emissions from operations would be 210.36 tpy. Therefore, a conformity determination was conducted, and it was found that the emissions increase in NO_x associated with Alternative #2 is accounted for in the currently approved SIP emissions budget. Accordingly, Alternative #2 will conform to the currently approved SIP.

FINDING OF CONFORMITY

The USAF has reviewed and evaluated the conformity applicability analysis and documentation, and it has determined that a draft positive general conformity may be made based on the identification and accounting for the emissions within the McGuire AFB emissions budget in the SIP per 40 CFR § 93.158(a)(5)(i)(A).

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1.0 INTRODUCTION

The United States Air Force (USAF) plans to replace existing KC-135s with the KC-46A, which will be a new aircraft to the USAF's fleet. This action would involve the beddown of one KC-46A squadron consisting of 12 Primary Aerospace Vehicles Authorized (PAA), and establishing a KC-46A Main Operating Base (MOB). The Secretary of the Air Force proposes to beddown KC-46A aircraft for the Second Main Operating Base (MOB 2) at one of five alternative locations:

- Alternative #1 – 190th Air Refueling Wing (ARW), Forbes Air National Guard Station (ANGS), Kansas;
- Alternative #2 – 108th Wing (108 WG) , Joint Base McGuire-Dix-Lakehurst (JB MDL), New Jersey;
- Alternative #3 – 157th ARW, Pease ANGS, New Hampshire;
- Alternative #4 – 171st ARW, Pittsburgh ANGS, Pennsylvania; and
- Alternative #5 – 121st ARW, Rickenbacker ANGS, Ohio.

In accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321-4347), Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of NEPA* (40 Code of Federal Regulations [CFR] Parts 1500-1508), and 32 CFR Part 989 *et seq.*, *Environmental Impact Analysis Process* (formerly promulgated as Air Force Instruction [AFI] 32-7061), the National Guard Bureau (NGB) has prepared an Environmental Impact Statement (EIS), which considers the potential consequences to the human and natural environment that may result from implementation of this action. This Conformity Determination is included as Appendix F of the EIS.

This document addresses the United States Environmental Protection Agency's (USEPA) General Conformity Rule requirements and how they relate to implementation of the Proposed Action or alternatives. The Clean Air Act (CAA) requires any federal agency, such as the NGB, to assess whether their proposed action would contribute to further degradation of air quality or prevent the attainment of air quality standards. As an alternative to the Preferred Alternative analyzed in the EIS, the NGB would propose to implement a major federal action that would contribute to regional air emissions at JB MDL, New Jersey. JB MDL is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. Therefore, the Region of Influence (ROI) for this alternative includes the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey. The ROI is classified as nonattainment for the 8-hour ozone (O_3) (marginal nonattainment) National Ambient Air Quality Standards (NAAQS), and a maintenance area for carbon monoxide (CO) and particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$).

2.0 AIR QUALITY STANDARDS

Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with regulatory standards. The New Jersey Department of Environmental Protection (NJDEP) is the agency responsible for the regulation of air quality within the state of New Jersey. The State of New Jersey regulates air quality through the New Jersey Administrative Code, Title 7:27A through 7:27D. The State of New Jersey has adopted additional ambient air quality standards (AAQS) that apply within the state. The NAAQS and state AAQS are summarized in Table 1.

2.1 AIR QUALITY DESIGNATIONS

As part of the CAA, the USEPA has established criteria for seven major pollutants of concern, called "criteria pollutants." These criteria pollutants include CO, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), O_3, particulate matter less than or equal to 10 microns in diameter (PM_{10}), $PM_{2.5}$, and lead (Pb). Emissions of Pb are not addressed because the affected areas contain no significant sources of this criteria pollutant, and 108 WG operations would not result in substantial emissions of Pb. The criteria set for these pollutants, the NAAQS, represent maximum levels of background pollution that are considered safe, with an adequate margin of safety to protect the public health and welfare. Based on measured ambient criteria pollutant data, the USEPA designates areas in the United States (U.S.) as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. Areas that lack monitoring data to demonstrate attainment or nonattainment status are designated as unclassified and are treated as attainment areas for regulatory purposes. Once a nonattainment area meets the standards and additional redesignation requirements in the CAA (Section 107(d)(3)(E), USEPA will designate the area as a "maintenance area." Maintenance areas are subject to the requirements of maintenance plans that are designed to ensure that the area continues to meet the standards. A maintenance area remains subject to the General Conformity Rule. Varying levels of attainment have been established for O_3, CO, and PM_{10} to indicate the severity of the air quality problem (i.e., the classification runs from moderate to serious for CO and PM_{10} and from marginal to extreme for O_3). As stated in Chapter 1.0, the ROI is classified as nonattainment for the 8-hour O_3 (marginal nonattainment) NAAQS, and a maintenance area for CO and $PM_{2.5}$. Accordingly, this Conformity Determination addresses emissions of O_3 precursors (oxides of nitrogen [NO_x] and volatile organic compounds [VOCs]), and emissions of CO and $PM_{2.5}$.

Table 1. Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards [a]		New Jersey Standards	
		Primary [b,c]	Secondary [b,d]	Primary [b,c]	Secondary [b,d]
O_3	8-hour	0.075 ppm (147 µg/m^3)	Same as primary	—	—
	1-hour	—	—	0.12 ppm (235 µg/m^3)	0.08 ppm (160 µg/m^3)
CO	8-hour	9 ppm (10 mg/m^3)	—	9 ppm (10 mg/m^3)	Same as primary
	1-hour	35 ppm (40 mg/m^3)	—	35 ppm (40 mg/m^3)	Same as primary
NO_2	Annual	0.053 ppm (100 µg/m^3)	Same as primary	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.100 ppm (188 µg/m^3)	—	—	—
SO_2	Annual	—	—	0.03 ppm (80 µg/m^3)	0.02 ppm (60 µg/m^3)
	24-hour	—	—	0.14 ppm (365 µg/m^3)	0.1 ppm (260 µg/m^3)
	3-hour	—	0.5 ppm (1,300 µg/m^3)	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.075 ppm (189 µg/m^3)	—	—	—
Total Suspended Particulate	Annual	—	—	75 µg/m^3	60 µg/m^3
	24-hour	—	—	260 µg/m^3	150 µg/m^3
PM_{10}	Annual	—	Same as primary	—	—
	24-hour	150 µg/m^3	Same as primary	—	—
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	—	—
	24-hour	35 µg/m^3	Same as primary	—	—
Pb	Rolling 3-month period	0.15 µg/m^3	Same as primary	1.5 µg/m^3	Same as primary

Notes:
a Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.
b Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
c Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
d Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

µg/m^3 = micrograms per cubic meter; CO = carbon monoxide; mg/m^3 = milligrams per cubic meter; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppm = parts per million; SO_2 = sulfur dioxide

2.2 FEDERAL REQUIREMENTS

The CAA (42 USC §§ 7401-7671q, as amended) provided the authority for the USEPA to establish nationwide air quality standards to protect public health and welfare. Federal standards, known as the NAAQS, were developed for six criteria pollutants: O_3, NO_2, CO, SO_2, particulate matter (both coarse [PM_{10}] and fine inhalable particulate matter [$PM_{2.5}$]), and Pb (refer to Table 1). The Act also requires that each state prepare a State Implementation Plan (SIP) for maintaining and improving air quality and eliminating violations of the NAAQS. In nonattainment and maintenance areas, the CAA requires federal agencies to determine whether their proposed actions conform with the applicable SIP and demonstrate that their actions will not (1) cause or contribute to a new violation of the NAAQS, (2) increase the frequency or severity of any existing violation, or (3) delay timely attainment of any standard, emission reduction, or milestone contained in the SIP.

2.3 STATE REQUIREMENTS

The CAA requires each state to develop, adopt, and implement a SIP to achieve, maintain, and enforce federal air quality standards throughout the state. States develop SIPs on a pollutant-by-pollutant basis whenever there is a violation of one or more air quality standards. New Jersey State standards are established by the NJDEP. The state standards must be at least as restrictive as the NAAQS (refer to Table 1).

2.4 GENERAL CONFORMITY REGULATIONS

The General Conformity Rule was promulgated by the USEPA on November 30, 1993 at 40 CFR Part 93, Subpart B *"Determining Conformity of General Federal Actions to State or Federal Implementation Plans"* for all federal activities except those covered under transportation conformity (USEPA 1993). The General Conformity Regulations were revised by the USEPA on April 5, 2010 (75 *Federal Register* 17253-17279) and changed the existing regulations found in 40 CFR Part 51, Subpart W, and Part 93, Subpart B (USEPA 2010). The USEPA's modifications to 40 CFR Part 51, Subpart W, changed State or Tribal adoption and submittal of general conformity SIPs from a requirement to a voluntary measure in 40 CFR § 51.851(a). In addition, USEPA provided in 40 CFR § 51.851(b) that until such time as USEPA approves a State's or Tribe's revision to the conformity implementation plan permitted under this section, that federal agencies must meet the requirements of 40 CFR Part 93, Subpart B.

The General Conformity Rule requires any federal agency responsible for an action in a nonattainment or maintenance area to determine that the action conforms to the applicable SIP. Emissions of attainment pollutants are exempt from conformity analysis. Actions would conform to a SIP if their annual direct and indirect emissions would remain less than the applicable *de minimis* thresholds. Formal conformity determinations are required for any actions that would equal or exceed these thresholds.

General Conformity analyses focus on the net increase in air emissions from a Proposed Action compared to ongoing historical conditions. Existing SIPs are presumed to have accounted for routine, ongoing federal agency activities. Conformity analyses are further limited to those direct and indirect emissions over which the federal agency has continuing program responsibility and control. General conformity analyses are not required to analyze emission sources beyond the responsibility and control of the federal agency, nor are they required to address emissions that are not reasonably foreseeable or reasonably quantifiable.

2.5 GENERAL CONFORMITY ANALYSIS PROCEDURES

The USEPA General Conformity Regulations incorporate a stepwise process, beginning with an applicability analysis (USEPA 1993, 2010). According to USEPA guidance, before any approval is given for a federal action to go forward, the regulating federal agency must apply the applicability requirements found at 40 CFR § 93.153(b) to the federal action to evaluate whether, on a pollutant-by-pollutant basis, a determination of general conformity is required. If the regulating federal agency determines that the General Conformity Regulations do not apply to the federal action, no further analysis or documentation is required. However, if the General Conformity Regulations do apply to a federal action, the action proponent must make its own conformity determination in accordance with the criteria and procedures outlined in the implementing regulations, publish a draft determination of general conformity for public review, consider comments from interested parties, and then publish the final determination of general conformity.

3.0 SUMMARY OF ALTERNATIVE #2

3.1 LOCATION OF ALTERNATIVE #2

The 108 WG of the New Jersey Air National Guard (NJANG) is based at McGuire AFB in New Jersey, at JB MDL. JB MDL is located in the central portion of the state of New Jersey, in Ocean and Burlington counties (Figure 1).

3.2 ALTERNATIVE #2 DESCRIPTION

As an alternative to the Preferred Alternative analyzed in the EIS, the NGB would propose to implement an aircraft conversion for the 108 WG at JB MDL in the state of New Jersey. The 108 WG currently flies and maintains eight KC-135 refueler aircraft to support its air refueling mission. The primary support operations performed at the 108 WG include aircraft fueling, aircraft deicing, aircraft maintenance, aircraft support equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance. These operations involve activities such as corrosion control, non-destructive inspection, fuel cell maintenance, engine maintenance, hydraulics, and wheel and tire maintenance.

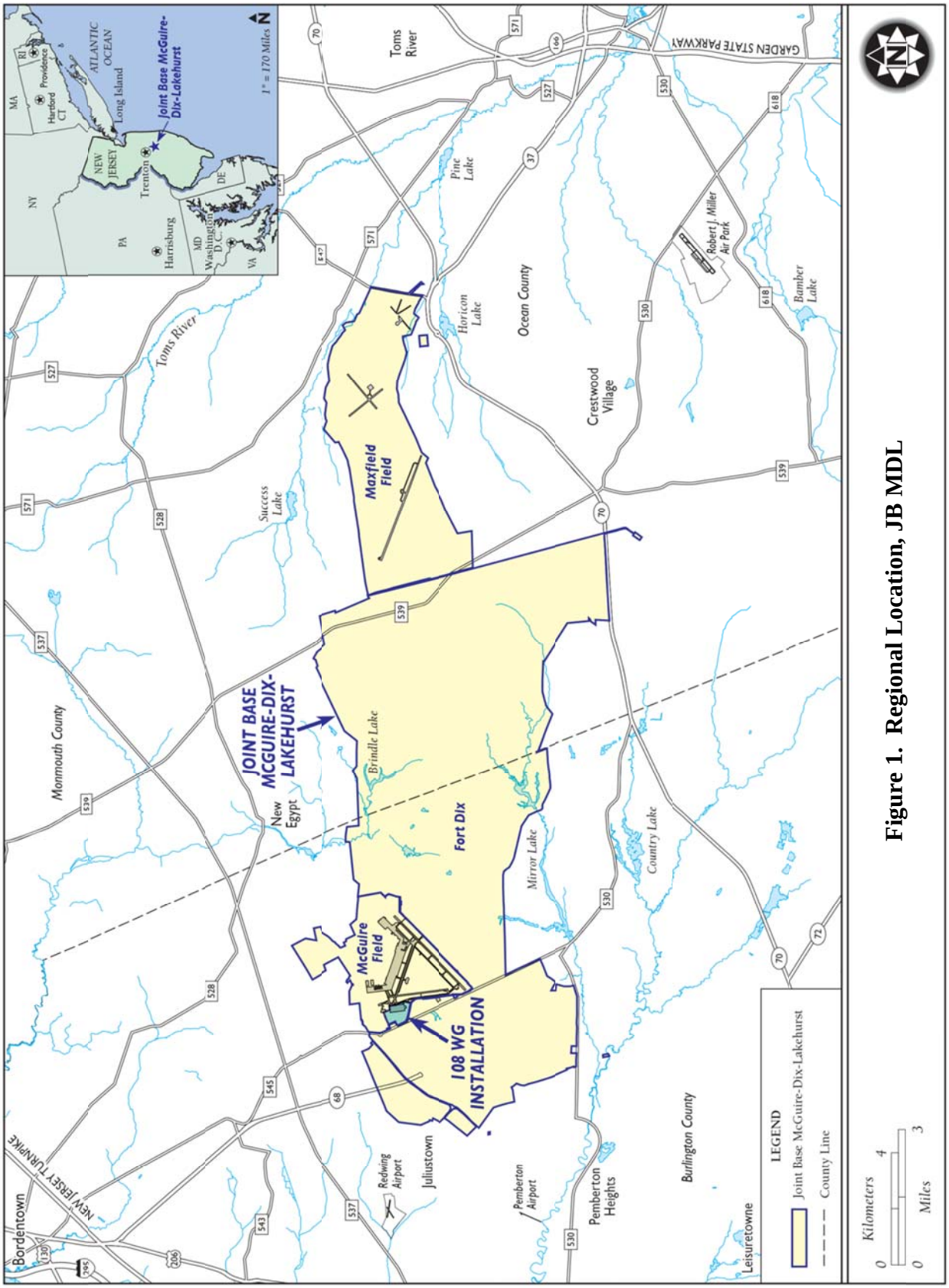

Figure 1. Regional Location, JB MDL

Alternative #2 would involve the beddown of one KC-46A squadron consisting of 12 PAA, and establishing a MOB 2 at JB MDL. Alternative #2 would convert the existing KC-135 unit to the KC-46A aircraft. In addition, the 108 WG would implement construction projects associated with aircraft conversion at JB MDL. The 108 WG currently provides support for federal, state, and community interests by maintaining highly trained, well-equipped, military forces to provide combat-ready support elements in response to wartime and peacetime tasking; protecting life and property; and preserving peace, order, and public safety.

Should Alternative #2 be implemented, there would be a change to the type of aircraft based at JB MDL; a change to the type of aircraft using the associated airspace; changes to staffing and manpower at the 108 WG; as well as some proposed construction, building renovation, and facility demolition. There would be no new airspace required to implement Alternative #2. The proposed conversion is estimated to commence in 2018. It is likely that construction would begin as early as 2015 and be completed by the time the aircraft conversion takes place.

3.3 ELEMENTS OF ALTERNATIVE #2 RESULTING IN INCREASED EMISSIONS

Alternative #2 involves both construction of new facilities to accommodate the KC-46A aircraft, and operational emissions associated with the KC-46A aircraft.

Under Alternative #2 the 108 WG would convert from 8 KC-135 aircraft to 12 KC-46A aircraft. There would be an increase in the number of airfield operations for the KC-46A aircraft at JB MDL, which would result in an increase in air emissions. Table 2 provides a summary of the changes to 108 WG airfield operations under Alternative #2.

Table 2. Changes to 108 WG Airfield Operations with Proposed KC-46A Aircraft

	DEPARTURES		ARRIVALS		TOTALS[1]		Grand
Operations	*Day*	*Night*[2]	*Day*	*Night*[2]	*Day*	*Night*[2]	*Total*
Current KC-135 Operations	3,346	815	3,325	854	6,671	1,669	8,340
Proposed KC-46A Operations	8,047	764	7,863	934	15,910	1,698	17,608
Net Change to Airfield Operations							9,268

[1]Includes Closed Patterns (which count as two airfield operations).
[2]Night – Between 10 p.m. and 7 a.m. for environmental night.

3.4 EXISTING CONDITIONS – CLIMATE

JB MDL is located in the central portion of the state of New Jersey, in Ocean and Burlington counties. The climate in the central portion of New Jersey is influenced by its vegetation, with moderation due to its proximity to the Atlantic Ocean. Scrub pine and oak forests dominate the interior southern portion of New Jersey, hence the name, Pine Barrens. Sandy soils, which are porous and not very fertile, have a major effect on the climate of this region. On clear nights, solar radiation absorbed during the day is quickly radiated back into space, resulting in remarkably low minimum temperatures. The porous soil permits any precipitation to rapidly

infiltrate and leave surfaces quite dry. Drier conditions allow for a wider range between the daily maximum and minimum temperatures, and make the area vulnerable to forest fires.

The warmest month of the year is July with an average maximum temperature of 87 degrees Fahrenheit (ºF), while the coldest month of the year is January with an average minimum temperature of 22ºF. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 24ºF, and during winter with an average difference of 20ºF. The annual average precipitation at Fort Dix is 47.12 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is August with an average rainfall of 5.16 inches (Northeast Regional Climate Center 2013). Prevailing winds in New Jersey are from the southwest in summer and from the northwest in winter.

3.5 EXISTING AIR QUALITY ATTAINMENT STATUS

Should Alternative #2 be implemented, the KC-46A aircraft would be beddown at the 108 WG installation at JB MDL in New Jersey. The USEPA has classified the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey as nonattainment for the 8-hour O_3 (marginal nonattainment) NAAQS, and a maintenance area for $PM_{2.5}$ and CO. The region is designated attainment/unclassified area for all other criteria pollutants. Implementation of this alternative is therefore subject to the requirements of Section 176(c) of the CAA, as articulated in the USEPA General Conformity Rule. Based on the nonattainment classification for the region, the *de minimis* emission thresholds for the General Conformity Rule for O_3 precursors (oxides of nitrogen [NO_x] and VOCs), $PM_{2.5,}$ and CO emissions are all 100 tons per year (tpy).

The applicable *de minimis* thresholds for the affected air basins are listed in Table 3.

Table 3. *De Minimis* Thresholds

Affected Air Basin	*CO*	*NO_x*	*VOCs*	*$PM_{2.5}$*
Philadelphia-Wilmington-Atlantic City	100	100	100	100

Notes: Based on the federal *de minimis* threshold for NO_x, VOCs, CO, and $PM_{2.5}$. CO = carbon monoxide; NO_x = oxides of nitrogen; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; VOC = volatile organic compound

4.0 GENERAL CONFORMITY DETERMINATION

4.1 APPLICABILITY ANALYSIS

The first step in a general conformity determination is an analysis of whether the requirements apply to the federal action that is proposed in a nonattainment or a maintenance area. Unless exempted by the regulations or otherwise presumed to conform, a federal action requires a general conformity determination for each pollutant where the total of direct and indirect emissions caused by the federal action would equal or exceed an annual *de minimis* emission rate for any given maintenance or nonattainment pollutant (or precursor). For Alternative #2, the pollutants that are evaluated in this General Conformity Determination are NO_x, VOCs, CO, and $PM_{2.5}$. If a Proposed Action would result in emission increases less than the identified applicable *de minimis* thresholds, then no conformity determination is required.

4.2 EXEMPTIONS FROM GENERAL CONFORMITY REQUIREMENTS

The general conformity requirements apply to a federal action if the net project emissions equal or exceed certain *de minimis* emission rates established in the General Conformity Regulations. The *de minimis* thresholds differ based on the severity of the nonattainment status. The only exceptions to this applicability criterion include certain federal actions that are presumed to conform because of the thorough air quality analysis required to comply with other statutory requirements. Examples of these actions include those subject to the New Source Review program and remedial activities under the Comprehensive Environmental Response, Compensation, and Liability Act. Other federal actions exempt from the conformity process include those actions that would result in no increase in emissions, or an increase in emissions that is clearly *de minimis*. Examples include continuing or recurring activities, routine maintenance and repair, and administrative and planning actions; however, the emissions that would result from this federal action do not meet any of these exempt categories.

4.3 EMISSION ESTIMATES

Existing emissions quantified in the Air Emissions Inventory include emissions from the existing operations of the KC-135 aircraft, which would be replaced under Alternative #2 by the KC-46A aircraft. The emissions in the Air Emissions Inventory were not used for aircraft operations in the baseline analysis because they reflect existing emissions for all aircraft operating at the 108 WG (including transient aircraft) and therefore do not provide a baseline for Alternative #2. Further, the emissions estimates relied on default times in mode for aircraft operations rather than site-specific flight tracks used for the noise analysis in the EIS.

To provide a baseline for evaluating the net emissions increases/decreases associated with Alternative #2, emissions from the KC-135 aircraft operations, aircraft refueling, KC-135 engine testing, KC-135-related Aerospace Ground Equipment (AGE), and privately-owned vehicles

(POVs) associated with KC-135 flight operations were evaluated. Emissions from the KC-135 aircraft operations were calculated based on 2012 aircraft operations utilizing site-specific flight profiles to calculate aircraft operations below a default mixing height of 3,000 feet above ground level (AGL). A discussion of the methodology for quantifying emissions is provided in Appendix A of the EIS. Emissions associated with baseline operations of the KC-135 aircraft are provided in Table 4.

Table 4. 108 WG Baseline Emissions at JB MDL

Emission Source	EMISSIONS, TONS/YEAR			
	VOCs	*CO*	*NO_x*	*$PM_{2.5}$*
KC-135 Baseline Aircraft Operations	3.21	49.03	83.34	0.39
AGE	0.01	0.01	0.09	0.00
Engine Testing	0.14	2.01	0.55	0.01
POVs	5.12	110.72	5.20	0.12
Total Baseline Emissions	**8.48**	**161.78**	**89.18**	**0.53**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately-owned vehicle.

Alternative #2 was assumed to commence in 2015 with construction activities. The following construction projects are proposed under this alternative:

1. Addition to Hangar 3333 - 17,892 square foot addition to existing Maintenance Hangar 3333.
2. Addition to Hangar 3336 - 18,206 square foot addition to existing Fuel Cell Hangar 3336.
3. Renovation of Hangar 3322 - Internal renovations.
4. New Simulator Building - Construction of a new 6,700 square foot simulator building.
5. Modifications to Existing Parking Ramp and Taxiway - Option 1 would add 160,074 square feet of concrete and asphalt to the existing parking ramp; Option 2 would add 14,091 square feet of concrete and asphalt to the existing parking ramp.
6. New Hydrants and Fuel Lines - Addition of 8 new fuel hydrants and lines and demolition of existing hydrants.

Construction emissions include emissions from heavy equipment, construction trucks, worker trips, and fugitive dust. The details of the construction emission calculations are provided in Appendix A. Table 5 summarizes the annual and total construction emissions associated with Alternative #2. The data in Table 5 show that annual emissions for proposed construction activities would not exceed the General Conformity Rule *de minimis* thresholds as set forth in the CAA.

Table 5. Annual Construction Emissions Under Alternative #2

Construction Project	*CO*	*NO_x*	*VOC*	*$PM_{2.5}$*
Project #1 - Addition to Hangar 3333	1.43	2.28	0.40	1.77
Project #2 - Addition to Hangar 3336	1.46	2.32	0.41	1.80
Project #3 - Internal Renovations to Hangar 3322	0.30	0.47	0.06	0.04
Project #4 - New Simulator Building	0.54	0.85	0.15	0.63
Project #5 - Modifications to Existing Parking Ramp and Taxiway	4.28	10.18	1.06	3.00
Project #6 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	0.01	0.01	0.00	0.00
Total Option 1	**8.01**	**16.11**	**2.08**	**7.23**
***De minimis* Threshold**	**100**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; NO_x = oxides of nitrogen; VOC = volatile organic compound; SO_x = oxides of sulfur; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; CO_2 = carbon dioxide.

Sources associated with operation of the proposed KC-46A beddown at the 108 WG installation include (1) operations and engine maintenance/testing of aircraft; (2) onsite POVs; (3) offsite POV commuting; and (4) AGE. It was assumed that other sources, including non-road mobile equipment, mobile fuel transfer, and stationary source emissions would be unchanged. In the event that construction of additional facilities requires installation of a new stationary source such as a boiler, it was assumed that the stationary source would be subject to the New Source Review permitting requirements of the NJDEP and would therefore not be subject to the General Conformity Rule under §93.153(d)(1).

Operational data used to calculate projected KC-46A aircraft emissions were obtained from the data used in the project noise analysis. Factors used to calculate combustion emissions for the KC-46A aircraft are based on emissions data developed by Pratt and Whitney for the PW4062 engine (International Civil Aviation Organization 2013). The operational times in mode for the KC-46A engine are based on those currently used for the KC-135 aircraft (Air Force Civil Engineer Center [AFCEC] 2013). The analysis of proposed aircraft operations is limited to operations that occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Emissions from AGE were estimated based on the methodology recommended in the *Air Emissions Guide for Air Force Mobile Sources* (AFCEC 2013). Emissions from POVs were estimated based on total personnel for the existing and proposed scenarios, using emission factors for vehicles from this emissions guide.

Table 6 summarizes the annual operational emissions that would result from KC-46A operations at the 108 WG installation. Table 6 also presents the net emissions increase associated with the beddown of the KC-46A aircraft at JB MDL. As shown in Table 6, the net emissions increases

are below the *de minimis* thresholds for all pollutants except NO_x. Emissions of NO_x would exceed the *de minimis* threshold, and this alternative would therefore require a Conformity Determination under the General Conformity Rule.

Table 6. Comparison of Baseline and Proposed Annual Operational Emissions, 108 WG Installation

	ANNUAL EMISSIONS, TONS/YEAR			
Baseline	***VOC***	***CO***	***NO_x***	***$PM_{2.5}$***
KC-135 Aircraft Operations	3.21	49.03	83.34	0.39
AGE	0.01	0.01	0.09	0.00
Engine Tests	0.14	2.01	0.55	0.01
POVs	5.12	110.72	5.20	0.12
Total	**8.48**	**161.78**	**89.18**	**0.53**
Proposed Action	***VOC***	***CO***	***NOx***	***$PM_{2.5}$***
KC-46A Aircraft Operations	26.19	100.37	294.03	0.96
AGE	0.01	0.02	0.17	0.01
Engine Tests	1.53	5.23	1.38	0.01
POVs	4.75	126.34	3.97	0.12
Total	**32.48**	**231.97**	**299.54**	**1.11**
Net Increase	**24.01**	**70.19**	**210.36**	**0.58**
***De minimis* Threshold**	**100**	**100**	**100**	**100**

Notes: Numbers may not add precisely due to rounding.
CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NO_x = oxides of nitrogen; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound; AGE = aerospace ground equipment; POV = privately-owned vehicle.

4.4 APPLICABILITY OF GENERAL CONFORMITY TO THIS FEDERAL ACTION

The applicability of the General Conformity requirements to Alternative #2 was determined by comparing the federal action emissions to the conformity *de minimis* thresholds for all nonattainment and maintenance pollutants in the Philadelphia-Wilmington-Atlantic City area of the states of Pennsylvania, Delaware, and New Jersey. As shown in Table 5, construction emissions are below the applicable *de minimis* thresholds for all nonattainment and maintenance pollutants. As shown in Table 6, the net operational emissions increase of all pollutants, except for NO_x, are below the applicable *de minimis* thresholds. Consequently, a conformity determination is only needed for NO_x, as the estimated annual NO_x emissions are projected to exceed the applicable 100 tpy *de minimis* threshold for that pollutant. This increase in NO_x emissions is primarily due to increases in aircraft operations related to training activities. Therefore, the NGB must make a positive conformity determination for NO_x using one of the criteria under 40 CFR § 93.158 should Alternative #2 be selected.

4.5 GENERAL CONFORMITY DETERMINATION

In accordance with 40 CFR Part 93, Subpart B and the 2010 Air Force Conformity Guide, the incremental increase in emissions above the existing conditions due to Alternative #2 was considered and includes reasonable foreseeable direct and indirect emissions. The applicability

analysis has found that this federal action is subject to general conformity, so the federal agency must demonstrate conformity to the SIP.

SIP Baseline Emissions

Based on the evaluation of the emissions associated with the implementation of Alternative #2, the estimated annual net increase in NO_x emissions from operations would equal 210.36 tpy. Therefore, a positive conformity determination is required. To demonstrate positive conformity, the NGB has reviewed the emissions budget in the applicable SIP.

The emission budget for NO_x from the currently approved SIP for McGuire Air Force Base (AFB) is 1,534 tpy (NJDEP 2007). The USAF has calculated actual emissions for calendar year 2011 from McGuire AFB based on current operations using the Emissions and Dispersion Modeling System (EDMS) software (Federal Aviation Administration [FAA] 2013). Table 7 presents the actual emissions for 2011 in comparison with the SIP emissions budget.

Table 7. Comparison of Baseline Actual Emissions and McGuire AFB SIP Budget

Emission Source	ANNUAL EMISSIONS, TONS/YEAR *NO_x*
McGuire Stationary Sources (Title V), CY2011	23.24
Air Operations (Based and Transient Aircraft, CY2011)	959.4
Non-road Vehicles (2005)	92.65
Other point sources	7.6
Capital Improvements Plan, annual	10.29
Total	**1093.2**
McGuire SIP Budget	**1534.0**
Remaining Emissions Budget	**440.8**

As shown in Table 7, the amount of NO_x emissions accounted for in the SIP emissions budget for McGuire AFB exceeds the actual emissions by 440.8 tpy; thus, the net emissions increase (210.36 tpy) that would be associated with Alternative #2 is accommodated within the existing SIP budget by 230.44 tpy. The net NO_x emissions from the USAF action would therefore not exceed the emissions budgets in the applicable SIP, and Alternative #2 would conform to the SIP.

JB MDL and the U.S. Army Corps of Engineers have entered into a Memorandum of Agreement that would allow temporary use of a portion of the NO_x SIP emissions budget for calendar years 2014 through 2016 to allow the Corps to proceed with construction projects to repair, restore, and fortify the coastline in the state of New Jersey in response to damage during Hurricane Sandy (JBMDL-U.S. Army Corps of Engineers 2013). The Corps projects will be completed prior to implementation of Alternative 2 at JB MDL, should this alternative be selected; therefore, the temporary use of NO_x emissions within the SIP would be complete by the time the emissions associated with Alternative 2 would occur, which is scheduled to commence in 2018.

Conclusion

Based on the evaluation of the emissions associated with the implementation of Alternative #2, the estimated annual net increase in NO_x emissions from operations would be 210.36 tpy. Therefore, a conformity determination was conducted, and it was found that the emissions increase in NO_x associated with Alternative #2 is accounted for in the currently approved SIP emissions budget. Accordingly, should Alternative #2 be selected, it would conform to the currently approved SIP.

5.0 FINDING OF CONFORMITY

The USAF has reviewed and evaluated the conformity applicability analysis and documentation, and it has determined that a draft positive general conformity may be made based on the identification and accounting for the emissions within the McGuire AFB emissions budget in the SIP per 40 CFR § 93.158(a)(5)(i)(A). The NGB has provided an opportunity for regulating agencies and the public to comment on the Draft Conformity Determination.

A copy of the Draft Conformity Determination was made available for a 30-day public and agency review. Regulatory agency and public comments provided on the Draft Conformity Determination will be reviewed and addressed appropriately in the Final Conformity Determination. All comments received on the Draft Conformity Determination will be included in the Final Conformity Determination.

6.0 LIST OF PREPARERS AND CONTRIBUTORS

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APPENDIX A

Emission Calculations

Table A-1 Engine Emission Factors by Throttle Setting - KC-135 and KC-46A Aircraft

Engine Type/Throttle Setting	Fuel Flow (Pounds/Hour)	Emission Factors, lbs/1000 lbs fuel								
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
F-108-CF-100 (2)										
Idle	1013.76	2.1045	30.7	4	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Approach	2463.12	0.092	4.2	8.2	1.06	0.06	0.06	3216	8.90E-02	1.00E-01
Intermediate	6486.48	0.0575	0.09	16	1.06	0.05	0.05	3216	8.90E-02	1.00E-01
Military	7801.2	0.046	0.09	18.5	1.06	0.07	0.07	3216	8.90E-02	1.00E-01
P&W 4062 (3)										
Idle	1663.2	12.489	42.61	3.78	1.06	0.11	0.1	3216	8.90E-02	1.00E-01
Approach	5702.4	0.1035	1.93	12.17	1.06	0.05	0.04	3216	8.90E-02	1.00E-01
Climbout	16869.6	0.0805	0.5	25.98	1.06	0.07	0.06	3216	8.90E-02	1.00E-01
Take-Off	21621.6	0.092	0.61	34.36	1.06	0.08	0.07	3216	8.90E-02	1.00E-01
		Emissions, Pounds/Hour								
APU Use - P&W 4062		0.04	0.33	6.72	0.56	0.05	0.04	1373		

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013).
(3) ICAO Engine Exhaust Emissions Data Bank - Subsonic Engines - (ICAO 2013).

Table A-2. HAP Emission Factors - KC-135 and KC-46A Aircraft

Engine Type	Emission Factor (lb/1000 lb fuel) (1)													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
F108-CF-100														
Idle	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.50E-02	0.00E+00	0.00E+00	0.00E+00	3.22E-03	6.23E-03	5.53E-04	1.61E-03	0.00E+00	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	5.58E-03	0.00E+00	0.00E+00	0.00E+00	4.25E-04	1.42E-03	0.00E+00	5.42E-04	0.00E+00	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
P&W 4062 (3)														
Idle	1.78E+00	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Approach	1.48E-02	5.13E-03	2.94E-03	6.50E-04	2.02E-03	7.71E-04	2.09E-04	3.39E-04	3.71E-04	1.85E-03	8.63E-04	7.63E-04	4.46E-02	3.81E-03
Intermediate	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
Military	1.31E-02	4.56E-03	2.61E-03	5.78E-04	1.79E-03	6.85E-04	1.86E-04	3.01E-04	3.30E-04	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Notes: (1) Data are for one engine. The KC-135R has 4 engines and the KC-46A has 2 engines.
(2) Data from *Air Emissions Factor Guide to Air Force Mobile Sources* (AFCEC 2013), Table 2-9.

Table A-3. Land and Take-off/Touch and Go Times in Mode and Fuel Usages - KC-135 and KC-46A Aircraft

	LTO			Touch & Go	
	Time in Mode (TIM)		Fuel Usage	TIM	Fuel Usage
Aircraft/Mode (Engine Throttle Setting)	Minutes	Hours	Pounds	Hours	Pounds
KC-135 (2)					
Taxi Out (Idle)	32.8	0.55	2217		
Take-off (Military)	0.7	0.01	364	0.01	364
Climbout (Intermediate)	2.5	0.04	1081	0.04	1081
Approach	5.2	0.09	854	0.09	854
Taxi In (Idle)	14.9	0.25	1007		
Totals	56.1	0.94	5523	0.14	2299
KC-46A (2)					
Taxi Out (Idle)	32.8	0.55	1818		
Take-off (Military)	0.7	0.01	505	0.01	505
Climbout (Intermediate)	2.5	0.04	1406	0.04	1406
Approach	5.2	0.09	988	0.09	988
Taxi In (Idle)	14.9	0.25	826		
Totals	56.1	0.94	5543	0.14	2899
APU Use, KC-46A (3)		Hours			
Pre-Flight - OBIGGS + Electric + Max ECS		1.50			
Pre-Flight - Main Engine Start + Electric		0.03			
Post-Flight - Electric + Min ECS		0.58			
Total Hours per LTO		2.12			

Notes: (1) Fuel usage per aircraft.

(2) TIM Data from Table 2-4, Transport Aircraft (AFCEC 2013).

(3) APU use from FTU/MOB1 Draft EIS.

Table A-4. Land and Take-off/Touch and Go Total Fuel Usages and Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)								
LTOs	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Taxi Out (Idle)	32.8	0.55	2217	4.67	68.05	8.87	2.35	0.13	0.13	7129.08	0.20	0.22
Take-off (Military)	0.7	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.5	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.2	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Taxi In (Idle)	14.9	0.25	1007	2.12	30.91	4.03	1.07	0.06	0.06	3238.52	0.09	0.10
Totals	56.1	0.935	5523	6.94	102.69	43.93	5.85	0.32	0.32	17761.24	0.49	0.55
KC-46A (2)												
Taxi Out (Idle)	32.8	0.55	1818	22.71	77.48	6.87	1.93	0.20	0.18	5848.08	0.16	0.18
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Taxi In (Idle)	14.9	0.25	826	10.32	35.20	3.12	0.88	0.09	0.08	2656.60	0.07	0.08
Totals	56.1	0.935	5543	33.29	115.60	75.88	5.88	0.48	0.42	17826.96	0.49	0.55

Aircraft/Mode	Touch and Go			Emissions (Pounds)								
Touch and Go	Time in Mode (TIM)		Fuel Usage	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
	Minutes	Hours	Pounds									
KC-135 (2)												
Take-off (Military)	0.70	0.01	364	0.02	0.03	6.74	0.39	0.03	0.03	1170.80	0.03	0.04
Climbout (Intermediate)	2.50	0.04	1081	0.06	0.10	17.30	1.15	0.05	0.05	3476.75	0.10	0.11
Approach	5.20	0.09	854	0.08	3.59	7.00	0.91	0.05	0.05	2746.08	0.08	0.09
Totals	8.40	0.14	2299	0.16	3.72	31.03	2.44	0.13	0.13	7393.64	0.20	0.23
KC-46A (2)												
Take-off (Military)	0.7	0.01	505	0.05	0.31	17.33	0.53	0.04	0.04	1622.48	0.04	0.05
Climbout (Intermediate)	2.5	0.04	1406	0.11	0.70	36.52	1.49	0.10	0.08	4521.05	0.13	0.14
Approach	5.2	0.09	988	0.10	1.91	12.03	1.05	0.05	0.04	3178.75	0.09	0.10
Totals	8.40	0.14	2899	0.26	2.92	65.89	3.07	0.19	0.16	9322.28	0.26	0.29

Table A-5. Land and Take-off/Touch and Go Total Fuel Usages and HAP Emissions - KC-135 and KC-46A Aircraft

Aircraft/Mode	LTO			Emissions (Pounds)													
LTOs	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Taxi Out (Idle)	32.8	0.55	2217	0.21	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.15	0.01
Take-off (Military)	0.7	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.2	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	1007	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Totals	56.1	0.94	5523	0.33	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.31	0.02
KC-46A (2)																	
Taxi Out (Idle)	32.8	0.55	1818	3.24	1.13	0.65	0.14	0.44	0.17	0.05	0.07	0.08	0.01	0.00	0.00	0.12	0.01
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Taxi In (Idle)	14.9	0.25	826	1.47	0.51	0.29	0.06	0.20	0.08	0.02	0.03	0.04	0.00	0.00	0.00	0.06	0.00
Totals	56.1	0.94	5543	4.75	1.65	0.95	0.21	0.65	0.25	0.07	0.11	0.12	0.01	0.00	0.00	0.29	0.02

Aircraft/Mode	Touch and Go			Emissions (Pounds)													
Touch and Go	Time in Mode (TIM)		Fuel Usage	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
	Minutes	Hours	Pounds														
KC-135 (2)																	
Take-off (Military)	0.70	0.01	364	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.50	0.04	1081	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Approach	5.20	0.09	854	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2299	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01
KC-46A (2)																	
Take-off (Military)	0.7	0.01	505	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climbout (Intermediate)	2.5	0.04	1406	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Approach	5.2	0.09	988	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Totals	8.40	0.14	2899	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.01

Table A-6. Annual Air Operations for Aircraft at McGuire - Baseline

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-135	834	3336	8340

Table A-7. KC-135 Aircraft Closed Pattern Operations at McGuire, Baseline

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)									
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
CR01 IFR to RWY06 on South Side	0.0530	177	2.1406		8.5008		0.1362	2.0365	1.5710		0.7596	0.4919
CR02 TACAN RWY06 VFR Circle	0.0035	12	0.6319	0.8571	7.1268		0.1362	2.9128	1.5710		0.7596	0.4919
CR03 North Radar Track	0.0141	47	2.1406		5.0742		0.1362	1.6240	1.5710		0.7596	0.4919
CR04 Radar Track on 18C3	0.0059	20	2.1406		8.2663		0.1362	2.1209	1.5710		0.7596	0.4919
CR05 Radar Track on 18C4	0.0059	20	2.1406		6.8000		0.0681	2.1209	1.5710		0.7596	0.5567
CR06 Radar Track Continuous turn 150HDG to 90 HDG	0.0919	307	2.1406		7.4803		0.1362	2.1209	1.5712		0.7594	0.4919
CR07 Radar Track 150HDG for Crosswind	0.0141	47	2.1406		7.6444		0.1362	2.1209	1.5710		0.7596	0.4919
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18	0.0071	24	0.6319	1.0058	7.2052	1.6424	0.1362	2.1650	1.5710		0.7596	0.4919
CR09 Radar track to North	0.0283	94	2.1406		6.5939		0.1362	3.9770	1.5710		0.7596	0.4919
CR10 Radar track on 36C3	0.0059	20	2.1406		7.3686		0.1362		3.6919		0.7596	0.4919
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6	0.0059	20	0.6948	0.8238	7.2755	1.9866	0.1362	1.2953	1.5710		0.7596	0.4919
CV01 - North VFR	0.2122	708	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV02 - West VFR on 18C2	0.0353	118	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV03 - North VFR Inside Housing	0.0382	127	0.7645	1.1669	0.7397	0.7516	0.1362		0.7571		0.3668	0.4919
CV04 - North VFR Outside Housing	0.3775	1259	0.7645	1.1669	0.9721	1.5196	0.0681		0.7571		0.3668	0.5567
CV05 - VFR With Breakout	0.0657	219	0.7645	1.1670	0.6680		0.1362	0.6419	0.7571	2.9350	0.3668	0.4919
CV06 - West VFR on 36C2	0.0353	118	0.7645	1.1669	0.7397	0.8613	0.1362		0.7571		0.3668	0.4919
Total Ops		3336										

Table A-8. KC-135 Aircraft Closed Pattern Operations - Fuel Use and Emission Factors, Baseline

			Engine Setting/Time in Mode per Operation (Minutes)									
Factor			48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	**75.0**
Fuel Use, lbs/hr			17295.696	18905.04	19910.88	20916.72	21319.056	21922.56	22123.728	22928.4	26274.6	29232.72
Emission Factors, lbs/1000 lbs fuel												
VOC			0.0760	0.0726	0.0704	0.0683	0.0674	0.0661	0.0657	0.0640	0.0568	0.0503
CO			2.2991	1.8881	1.6313	1.3744	1.2716	1.1175	1.0661	0.8606	0.0900	0.0900
NOx			11.8075	12.5875	13.0750	13.5625	13.7575	14.0500	14.1475	14.5375	16.1563	17.5625
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0554	0.0544	0.0538	0.0531	0.0529	0.0525	0.0524	0.0519	0.0513	0.0625
PM2.5			0.0554	0.0544	0.0538	0.0531	0.0529	0.0525	0.0524	0.0519	0.0513	0.0625
CO2			3216	3216	3216	3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table A-9. KC-135 Aircraft Closed Pattern Operations - Emissions Per Operation, Baseline

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
CR01 IFR to RWY06 on South Side			0.3671	7.5825	73.0690	5.7050	0.2898	0.2898	17308.8124	0.4790	0.5382
CR02 TACAN RWY06 VFR Circle			0.3427	6.7066	69.8701	5.3864	0.2727	0.2727	16342.0124	0.4523	0.5081
CR03 North Radar Track			0.2770	5.5592	56.0837	4.3399	0.2208	0.2208	13167.1627	0.3644	0.4094
CR04 Radar Track on 18C3			0.3636	7.4901	72.4847	5.6552	0.2872	0.2872	17157.7017	0.4748	0.5335
CR05 Radar Track on 18C4			0.3293	6.6684	66.3436	5.1472	0.2618	0.2618	15616.4405	0.4322	0.4856
CR06 Radar Track Continuous turn 150HDG to 90 HDG			0.3453	7.0646	69.0735	5.3787	0.2732	0.2732	16318.7065	0.4516	0.5074
CR07 Radar Track 150HDG for Crosswind			0.3491	7.1534	69.7860	5.4364	0.2761	0.2761	16493.9067	0.4565	0.5129
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18			0.3689	7.3190	74.7264	5.7809	0.2927	0.2927	17538.9678	0.4854	0.5454
CR09 Radar track to North			0.3694	7.3426	74.7566	5.7858	0.2930	0.2930	17553.8740	0.4858	0.5458
CR10 Radar track on 36C3			0.3428	6.9719	68.7658	5.3470	0.2715	0.2715	16222.5155	0.4489	0.5044
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6			0.3550	7.1003	71.6865	5.5544	0.2815	0.2815	16851.8535	0.4664	0.5240
CV01 - North VFR			0.1240	2.4040	25.9387	1.9732	0.1017	0.1017	5986.4890	0.1657	0.1861
CV02 - West VFR on 18C2			0.1240	2.4040	25.9387	1.9732	0.1017	0.1017	5986.4890	0.1657	0.1861
CV03 - North VFR Inside Housing			0.1214	2.3566	25.4126	1.9328	0.0997	0.0997	5863.9644	0.1623	0.1823
CV04 - North VFR Outside Housing			0.1451	2.8224	30.2732	2.3061	0.1188	0.1188	6996.6470	0.1936	0.2176
CV05 - VFR With Breakout			0.1891	3.1850	41.1481	3.0673	0.1550	0.1550	9306.0728	0.2575	0.2894
CV06 - West VFR on 36C2			0.1240	2.4092	25.9314	1.9733	0.1017	0.1017	5986.9753	0.1657	0.1862
Emissions, closed pattern ops, tons/year			0.3160	6.2145	65.0183	4.9886	0.2551	0.2551	15135.2626	0.4189	0.4706

Table A-10. Annual Air Emissions for KC-135 Aircraft Operations at McGuire - Baseline

	Annual Emissions, Tons/year								
Aircraft	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-135 LTOs	2.89	42.82	18.32	2.44	0.14	0.14	7406.44	0.20	0.23
KC-135 T&G	0.32	6.21	65.02	4.99	0.26	0.26	15135.26	0.42	0.47
Total Existing	3.21	49.03	83.34	7.43	0.39	0.39	22541.70	0.62	0.70

Table A-11. Annual HAP Emissions for KC-135 Aircraft Operations at McGuire - Baseline

	Annual Emissions, Tons/year													
Aircraft	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135 LTOs	0.14	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.01
KC-135 Closed Pattern Ops	0.04	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.16	0.01
Total Existing	0.17	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02

Table A-12. JP-8 AGE Equipment Emissions, McGuire, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-135 AGE																	
Sorties:	834																
	Hours/Sortie																
Generator A/M32A-86	10	8340.00	6.47	69679.35	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	1.12E+02	8.40E+00	5.41E+00	1.67E+00	1.64E+00	8.46E-01
Start Cart A/M32A-60A	1	834.00	10.16	8474.52	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	3.35E+00	1.01E+01	4.96E-01	3.88E-01	3.77E-01	1.32E-01
Start Cart A/M32A-95	0.1	83.40	8.75	729.75	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	2.70E-01	1.08E+00	1.29E-01	2.02E-02	1.97E-02	1.14E-02
Heater/AC Ace 802-993 AC	10	8340.00	6.80	128059.35	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	5.40E+01	2.76E+00	3.75E+00	3.64E+00	3.53E+00	8.83E-01
MA-3C Air Conditioner	2	1668.00	7.12	11299.35	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	1.53E+01	1.17E+00	1.95E-01	4.01E-01	3.86E-01	1.84E-01
H1	5	4170.00	0.39	1530.12	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.45E+00	1.66E+00	9.19E-01	1.00E+00	1.00E+00	2.76E-02
1H1	4	3336.00	0.39	1224.10	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	1.16E+00	1.33E+00	7.35E-01	8.02E-01	8.02E-01	2.21E-02
Light Cart NF-2	2	1668.00	1.02	1694.90	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	4.05E-01	2.94E-01	3.68E-02	3.68E-02	3.68E-02	2.64E-02
Air Compressor MC-1A	0.33	275.22	1.09	285.87	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	2.54E-01	1.62E-01	1.62E-01	4.31E-02	4.13E-02	4.85E-03
Total JP-8 AGE, Tons/year				hp-hrs	3949884.048							9.42E-02	1.35E-02	5.92E-03	4.00E-03	3.92E-03	1.07E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table A-13. AGE HAP Emissions, McGuire, Baseline

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	2.13E+01	7.00E-02	
Acrolein		6.48E-04	2.56E+00		
Benzene	7.65E-03	6.50E-03	2.57E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.08E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	3.28E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	2.35E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	4.74E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	1.15E+01		
Xylenes		2.00E-03	7.90E+00		
Total			9.68E-03		

Table A-14. JP-8 AGE Equipment GHG Emissions, McGuire, Baseline

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-135 AGE											
Sorties:	834										
	Hours/Sortie										
Generator A/M32A-86	10	8340.00	6.47	69679.35	148	2.11E+01	5.91E-04	6.80E-04	1.47E+06	4.12E+01	4.74E+01
Start Cart A/M32A-60A	1	834.00	10.16	8474.52	180	2.11E+01	5.91E-04	6.80E-04	1.79E+05	5.01E+00	5.76E+00
Start Cart A/M32A-95	0.1	83.40	8.75	729.75	155	2.11E+01	5.91E-04	6.80E-04	1.54E+04	4.31E-01	4.96E-01
Heater/AC Ace 802-993 AC	10	8340.00	6.80	128059.35	272	2.11E+01	5.91E-04	6.80E-04	2.70E+06	7.57E+01	8.71E+01
MA-3C Air Conditioner	2	1668.00	7.12	11299.35	120	2.11E+01	5.91E-04	6.80E-04	2.38E+05	6.68E+00	7.68E+00
H1	5	4170.00	0.39	1530.12	6.5	2.11E+01	5.91E-04	6.80E-04	3.23E+04	9.04E-01	1.04E+00
1H1	4	3336.00	0.39	1224.10	6.5	2.11E+01	5.91E-04	6.80E-04	2.58E+04	7.23E-01	8.32E-01
Light Cart NF-2	2	1668.00	1.02	1694.90	18	2.11E+01	5.91E-04	6.80E-04	3.58E+04	1.00E+00	1.15E+00
Air Compressor MC-1A	0.33	275.22	1.09	285.87	18.4	2.11E+01	5.91E-04	6.80E-04	6.03E+03	1.69E-01	1.94E-01
Total JP-8 AGE, Metric Tons/year									2.13E+03	5.98E-02	6.88E-02

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table A-15. Aircraft Engine Emissions - Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-135																	
Defueling	21	Idle	0.50	1	1,014	2.1	30.7	4.0	1.1	0.1	0.1	22.40	326.79	42.58	11.28	1.30	1.30
Maintenance Run	83	Idle	0.33	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	236.10	3,444.22	448.76	118.92	13.67	13.67
TRT Run 2 Engine	10	Idle	0.17	2	1,014	2.1	30.7	4.0	1.1	0.1	0.1	7.11	103.74	13.52	3.58	0.41	0.41
	10	80% RPM	0.08	2	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.60	1.17	240.54	13.78	1.43	1.43
TRT Run 4 Engine	7	Idle	0.17	4	1,014	2.1	30.7	4.0	1.1	0.1	0.1	9.96	145.24	18.92	5.01	0.58	0.58
	7	80% RPM	0.08	4	7801.2	0.0	0.1	18.5	1.1	0.1	0.1	0.84	1.64	336.75	19.29	2.00	2.00
												0.14	2.01	0.55	0.09	0.01	0.01

Table A-16. HAP Emissions, Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-135																			
Defueling	21	Idle	0.50	1	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
Maintenance Run	83	Idle	0.33	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
TRT Run 2 Engine	10	Idle	0.17	2	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	10	80% RPM	0.08	2	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03
TRT Run 4 Engine	7	Idle	0.17	4	1,014	9.51E-02	0.00E+00	0.00E+00	2.90E-03	1.90E-03	8.97E-03	6.84E-04	1.65E-03	1.48E-03	2.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03
	7	80% RPM	0.08	4	7801.2	7.01E-03	0.00E+00	0.00E+00	0.00E+00	1.11E-03	1.11E-03	0.00E+00	3.36E-04	0.00E+00	1.18E-03	3.37E-04	4.84E-04	1.96E-03	2.42E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
1.01	0.00	0.00	0.03	0.02	0.10	0.01	0.02	0.02	0.02	0.01	0.01	0.72	0.05	
10.67	0.00	0.00	0.33	0.21	1.01	0.08	0.19	0.17	0.26	0.10	0.11	7.57	0.54	
0.32	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.01	0.01	0.00	0.00	0.23	0.02	
0.09	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.03	0.03	
0.45	0.00	0.00	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.00	0.32	0.02	
0.13	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.01	0.04	0.04	
0.00633576	0	0	0.000189869	0.00014172	0.0006046	4.4783E-05	0.00011327	9.6899E-05	0.000169651	6.50339E-05	7.09285E-05	0.00444994	0.0003553	0.01263775

Table A-17. GHG Emissions, Engine Tests, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)					
						CO2	CH4	N2O	Actual Emissions (lb/yr)		
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-135											
Defueling	21	Idle	0.50	1	1,014	3,216.0	0.1	0.1	34,232.65	0.95	1.06
Maintenance Run	83	Idle	0.33	4	1,014	3,216.0	0.1	0.1	360,801.24	9.98	11.22
TRT Run 2 Engine	10	Idle	0.17	2	1,014	3,216.0	0.1	0.1	10,867.51	0.30	0.34
	10	80% RPM	0.08	2	7801.2	3,216.0	0.1	0.1	41,814.43	1.16	1.30
TRT Run 4 Engine	7	Idle	0.17	4	1,014	3,216.0	0.1	0.1	15,214.51	0.42	0.47
	7	80% RPM	0.08	4	7801.2	3,216.0	0.1	0.1	58,540.20	1.62	1.82
Total, tpy									237	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table A-18. Annual Worker Population and VMT at McGuire - KC-46A Project Scenarios

Scenario	Total # of Workers	Annual On-Base VMT	Annual Off-Base VMT
Existing	1051	273260	4560709.4
Proposed Action	1306	339560	5667256.4

[1]On-Base mileage based on 1.00 miles from 2009 AEI; assume 260 days/year

[2]Off-Base mileage based on distance to downtown Burlington, 16.69 miles; assume 260 days/year

Table A-19. Annual Average On-Road Vehicle Emission Factors - McGuire

		Emission Factors (Grams/Mile)						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	0.587	9.65	0.442	0.007	0.025	0.011	368.1
LDDT	0.03	0.132	0.808	0.2	0.003	0.053	0.037	314
LDGT	60.32	0.826	11.45	0.694	0.01	0.025	0.011	516.1
LDDT	0.2	0.393	0.708	0.46	0.006	0.06	0.044	599.2
HDGV	0	1.081	28	1.201	0.017	0.049	0.032	905.3
HDDV	0	0.684	2.315	3.359	0.012	0.129	0.1	1245.6
MC	1.9	2.9	27.28	0.85	0.003	0.037	0.021	177.4
Proposed Action (Year 2018) (1)								
LDGV	37.55	0.446	8.78	0.316	0.007	0.025	0.011	368
LDDT	0.03	0.087	0.692	0.088	0.003	0.038	0.023	314.1
LDGT	60.32	0.664	10	0.521	0.01	0.025	0.011	516.6
LDDT	0.2	0.305	0.6	0.317	0.006	0.047	0.032	598.6
HDGV	0	0.784	26.32	0.677	0.017	0.04	0.025	904
HDDV	0	0.583	1.428	1.919	0.012	0.078	0.053	1245.9
MC	1.9	2.9	27.28	0.85	0.003	0.037	0.021	177.4

Notes: (1) Emission factors from AFCEC 2013, Table 5-13, for 2017 used to provide a conservative estimate of emissions for 2018

Table A-20. Annual Average On-Base Vehicle Emissions

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	132.79	2182.98	99.99	1.58	5.66	2.49	83269.96
LDDT	0.03	0.02	0.15	0.04	0.00	0.01	0.01	56.75
LDGT	60.32	300.16	4160.82	252.19	3.63	9.08	4.00	187545.99
LDDT	0.2	0.47	0.85	0.55	0.01	0.07	0.05	721.96
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	33.19	312.26	9.73	0.03	0.42	0.24	2030.58
Total Existing, tons/year		0.23	3.33	0.18	0.00	0.01	0.00	136.81
Proposed Action (Year 2018) (1)								
LDGV	37.55	125.37	2468.07	88.83	1.97	7.03	3.09	103445.31
LDDT	0.03	0.02	0.16	0.02	0.00	0.01	0.01	70.54
LDGT	60.32	299.84	4515.59	235.26	4.52	11.29	4.97	233275.32
LDDT	0.2	0.46	0.90	0.47	0.01	0.07	0.05	896.23
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	41.25	388.02	12.09	0.04	0.53	0.30	2523.25
Total Proposed Action, tons/year		0.23	3.69	0.17	0.00	0.01	0.00	170.11

Table A-21. Annual Average Off-Base Vehicle Emissions

		Emissions, lbs/year						
Scenario/Vehicle Class	POV Mix (%)	VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Existing (Year 2013)								
LDGV	37.55	3118.59	43229.91	2620.22	37.76	94.39	41.53	1948555.27
LDDT	0.03	1.19	2.14	1.39	0.02	0.18	0.13	1807.43
LDGT	60.32	6556.26	169819.79	7284.06	103.10	297.18	194.08	5490637.63
LDDT	0.2	13.75	46.55	67.55	0.24	2.59	2.01	25048.26
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	85.20	1677.32	60.37	1.34	4.78	2.10	70302.43
Total Existing, tons/year		4.89	107.39	5.02	0.07	0.20	0.12	3768.18
Proposed Action (Year 2018) (1)								
LDGV	37.55	3115.21	46915.82	2444.31	46.92	117.29	51.61	2423671.37
LDDT	0.03	1.14	2.25	1.19	0.02	0.18	0.12	2243.71
LDGT	60.32	5908.63	198361.15	5102.22	128.12	301.46	188.41	6813011.99
LDDT	0.2	14.57	35.68	47.95	0.30	1.95	1.32	31133.11
HDGV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HDDV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MC	1.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Proposed Action, tons/year		4.52	122.66	3.80	0.09	0.21	0.12	4635.03

Table A-22. Annual Air Operations for Aircraft at McGuire - Proposed Action

	Number of Operations		
Aircraft	LTO	TGO	Total
KC-46A	1508	7296	17608

Table A-23. KC-46A Aircraft Closed Pattern Operations at McGuire - KC-46A Proposed Scenarios

	Operations/Year		Engine Setting/Time in Mode per Operation (Minutes)									
Scenario/Operation	Fraction of Ops	Total Ops per Pattern	48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
CR01 IFR to RWY06 on South Side	0.0559	408	2.1406		8.5008		0.1362	2.0365	1.5710		0.7596	0.4919
CR02 TACAN RWY06 VFR Circle	0.0037	27	0.6319	0.8571	7.1268		0.1362	2.9128	1.5710		0.7596	0.4919
CR03 North Radar Track	0.0150	110	2.1406		5.0742		0.1362	1.6240	1.5710		0.7596	0.4919
CR04 Radar Track on 18C3	0.0063	46	2.1406		8.2663		0.1362	2.1209	1.5710		0.7596	0.4919
CR05 Radar Track on 18C4	0.0063	46	2.1406		6.8000		0.0681	2.1209	1.5710		0.7596	0.5567
CR06 Radar Track Continuous turn 150HDG to 90 HDG	0.0792	578	2.1406		7.4803		0.1362	2.1209	1.5712		0.7594	0.4919
CR07 Radar Track 150HDG for Crosswind	0.0150	110	2.1406		7.6444		0.1362	2.1209	1.5710		0.7596	0.4919
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18	0.0075	55	0.6319	1.0058	7.2052	1.6424	0.1362	2.1650	1.5710		0.7596	0.4919
CR09 Radar track to North	0.0300	219	2.1406		6.5939		0.1362	3.9770	1.5710		0.7596	0.4919
CR10 Radar track on 36C3	0.0063	46	2.1406		7.3686		0.1362		3.6919		0.7596	0.4919
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6	0.0063	46	0.6948	0.8238	7.2755	1.9866	0.1362	1.2953	1.5710		0.7596	0.4919
CV01 - North VFR	0.2135	1557	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV02 - West VFR on 18C2	0.0425	310	0.7645	1.1669	0.6817	0.9162	0.1362		0.7571		0.3668	0.4919
CV03 - North VFR Inside Housing	0.0502	366	0.7645	1.1669	0.7397	0.7516	0.1362		0.7571		0.3668	0.4919
CV04 - North VFR Outside Housing	0.3860	2816	0.7645	1.1669	0.9721	1.5196	0.0681		0.7571		0.3668	0.5567
CV05 - VFR With Breakout	0.0090	66	0.7645	1.1670	0.6680		0.1362	0.6419	0.7571	2.9350	0.3668	0.4919
CV06 - West VFR on 36C2	0.0675	493	0.7645	1.1669	0.7397	0.8613	0.1362		0.7571		0.3668	0.4919
Total Ops		7296										

Table A-24. KC-46A Aircraft Closed Pattern Operations - Fuel Use and Emission Factors

			Engine Setting/Time in Mode per Operation (Minutes)									
Factor			48.5	52.5	55.0	57.5	58.5	60.0	60.5	62.5	70.5	75.0
Fuel Use, lbs/hr			19668.32	21455.2	22572	23688.8	24135.52	24805.6	24894.944	25922.4	29496.16	31506.4
Emission Factors, lbs/1000 lbs fuel												
VOC			0.0950	0.0932	0.0920	0.0909	0.0904	0.0897	0.0896	0.0886	0.0849	0.0828
CO			1.4009	1.2865	1.2150	1.1435	1.1149	1.0720	1.0663	1.0005	0.7717	0.6430
NOx			17.2797	18.3845	19.0750	19.7655	20.0417	20.4560	20.5112	21.1465	23.3561	24.5990
SO2			1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600	1.0600
PM10			0.0574	0.0590	0.0600	0.0610	0.0614	0.0620	0.0621	0.0630	0.0662	0.0680
PM2.5			0.0474	0.0490	0.0500	0.0510	0.0514	0.0520	0.0521	0.0530	0.0562	0.0580
CO2			3216	3216	3216	3216	3216	3216	3216	3216	3216	3216
CH4			0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890	0.0890
N2O			0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000

Table A-25. KC-46A Aircraft Closed Pattern Operations - Emissions Per Operation

Emissions per operation, lbs			VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
CR01 IFR to RWY06 on South Side			0.5528	6.9815	119.8938	6.4448	0.3705	0.3097	19553.2901	0.5411	0.6080
CR02 TACAN RWY06 VFR Circle			0.5193	6.4433	114.5336	6.0816	0.3516	0.2942	18451.2142	0.5106	0.5737
CR03 North Radar Track			0.4189	5.2325	91.8159	4.8976	0.2826	0.2364	14859.1404	0.4112	0.4620
CR04 Radar Track on 18C3			0.5478	6.9117	118.9246	6.3883	0.3673	0.3071	19381.7711	0.5364	0.6027
CR05 Radar Track on 18C4			0.4974	6.2328	108.6896	5.8105	0.3349	0.2801	17628.9690	0.4879	0.5482
CR06 Radar Track Continuous turn 150HDG to 90 HDG			0.5206	6.5524	113.2829	6.0748	0.3496	0.2923	18430.6441	0.5101	0.5731
CR07 Radar Track 150HDG for Crosswind			0.5263	6.6274	114.4612	6.1402	0.3533	0.2954	18629.2587	0.5155	0.5793
CR08 TACAN to Rwy 24 then VFR Circle to RWY 18			0.5582	6.9576	122.5660	6.5288	0.3769	0.3153	19808.1470	0.5482	0.6159
CR09 Radar track to North			0.5588	6.9699	122.6205	6.5348	0.3772	0.3155	19826.2219	0.5487	0.6165
CR10 Radar track on 36C3			0.5170	6.4998	112.5958	6.0336	0.3473	0.2904	18305.8273	0.5066	0.5692
CR11 TACAN approach to RWY 36 VFR Circle to RWY 6			0.5366	6.7049	117.5614	6.2726	0.3618	0.3027	19030.9306	0.5267	0.5918
CV01 - North VFR			0.1889	2.3143	42.1492	2.2192	0.1288	0.1079	6732.8662	0.1863	0.2094
CV02 - West VFR on 18C2			0.1889	2.3143	42.1492	2.2192	0.1288	0.1079	6732.8662	0.1863	0.2094
CV03 - North VFR Inside Housing			0.1850	2.2666	41.2817	2.1735	0.1262	0.1057	6594.1730	0.1825	0.2050
CV04 - North VFR Outside Housing			0.2210	2.7109	49.2300	2.5945	0.1505	0.1261	7871.7252	0.2178	0.2448
CV05 - VFR With Breakout			0.2917	3.4477	67.1451	3.4557	0.2028	0.1702	10484.5776	0.2902	0.3260
CV06 - West VFR on 36C2			0.1890	2.3161	42.1379	2.2194	0.1288	0.1079	6733.4865	0.1863	0.2094
Emissions, closed pattern ops, tons/year			1.0238	12.6852	226.0694	11.9930	0.6937	0.5806	36386.3482	1.0070	1.1314

Table A-26. Annual Air Emissions for KC-46A Aircraft Operations at McGuire - Proposed Action

Aircraft	Annual Emissions, Tons/year								
	VOC	CO	NOx	SO2	PM10	PM2.5	CO2	CH4	N2O
KC-46A LTOs	25.10	87.16	57.22	4.43	0.36	0.32	13441.53	0.37	0.42
KC-46A T&G	1.02	12.69	226.07	11.99	0.69	0.58	36386.35	1.01	1.13
APU	0.06	0.53	10.74	0.90	0.08	0.06	2194.71	0.00	0.00
Total Proposed Action	26.19	100.37	294.03	17.32	1.13	0.96	52022.59	1.38	1.55

Table A-27. Annual HAP Emissions for KC-46A Aircraft Operations at McGuire - Proposed Action

Aircraft	Annual Emissions, Tons/year													
	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A LTOs	3.58	1.24	0.71	0.16	0.49	0.19	0.05	0.08	0.09	0.01	0.00	0.00	0.22	0.02
KC-46A Closed Pattern Ops	0.14	0.05	0.03	0.01	0.02	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.42	0.03
Total Proposed Action	3.72	1.29	0.74	0.16	0.51	0.19	0.05	0.09	0.09	0.03	0.01	0.01	0.65	0.05

Table A-28. JP-8 AGE Equipment Emissions, Proposed Action, McGuire

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/hr						Annual Emissions (lbs/yr)					
						NOx	CO	VOC	PM10	PM2.5	SO2	NOx	CO	VOC	PM10	PM2.5	SO2
KC-46A AGE																	
Sorties:	1508																
	Hours/Sortie																
Generator A/M32A-86	10	15080.00	6.47	125990.97	148	6.10E+00	4.57E-01	2.94E-01	9.10E-02	8.90E-02	4.60E-02	2.03E+02	1.52E+01	9.77E+00	3.03E+00	2.96E+00	1.53E+00
Start Cart A/M32A-60A	1	1508.00	10.16	15323.23	180	1.82E+00	5.48E+00	2.70E-01	2.11E-01	2.05E-01	7.18E-02	6.05E+00	1.82E+01	8.98E-01	7.01E-01	6.82E-01	2.39E-01
Start Cart A/M32A-95	0.1	150.80	8.75	1319.50	155	1.47E+00	5.86E+00	7.00E-01	1.10E-01	1.07E-01	6.19E-02	4.89E-01	1.95E+00	2.33E-01	3.66E-02	3.56E-02	2.06E-02
Heater/AC Ace 802-993 AC	10	15080.00	6.80	231550.97	272	2.94E+00	1.50E-01	2.04E-01	1.98E-01	1.92E-01	4.80E-02	9.77E+01	4.99E+00	6.78E+00	6.58E+00	6.38E+00	1.60E+00
MA-3C Air Conditioner	2	3016.00	7.12	20430.97	120	4.17E+00	3.17E-01	5.30E-02	1.09E-01	1.05E-01	5.00E-02	2.77E+01	2.11E+00	3.52E-01	7.25E-01	6.98E-01	3.32E-01
H1	5	7540.00	0.39	2766.69	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.63E+00	3.01E+00	1.66E+00	1.81E+00	1.81E+00	4.99E-02
1H1	4	6032.00	0.39	2213.35	6.5	1.58E-01	1.81E-01	1.00E-01	1.09E-01	1.09E-01	3.00E-03	2.10E+00	2.41E+00	1.33E+00	1.45E+00	1.45E+00	3.99E-02
Light Cart NF-2	2	3016.00	1.02	3064.65	18	1.10E-01	8.00E-02	1.00E-02	1.00E-02	1.00E-02	7.18E-03	7.31E-01	5.32E-01	6.65E-02	6.65E-02	6.65E-02	4.78E-02
Air Compressor MC-1A	0.33	497.64	1.09	516.90	18.4	4.19E-01	2.67E-01	2.67E-01	7.10E-02	6.80E-02	8.00E-03	4.60E-01	2.93E-01	2.93E-01	7.79E-02	7.46E-02	8.78E-03
Total JP-8 AGE, Tons/year				hp-hrs	7141996.576							1.70E-01	2.43E-02	1.07E-02	7.24E-03	7.08E-03	1.93E-03

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table A-29. AGE HAP Emissions, Proposed Action, McGuire

Pollutant	JP-8			Gasoline	
	Emission Factors		Actual Annual Emissions (lbs/yr)	Emission Factor (lb/MMBTU)	Annual Emissions (lbs/yr)
	Turbine (lb/1000 gal)	Reciprocating (lb/1000 hp-hr)			
Arsenic	1.53E-03				
Acetaldehyde		5.40E-03	3.86E+01	7.00E-02	
Acrolein		6.48E-04	4.63E+00		
Benzene	7.65E-03	6.50E-03	4.64E+01		
Beryllium	4.31E-05				
1,3-Butadiene	2.22E-03	2.74E-04	1.96E+00		
Cadmium	6.67E-04				
Chromium	1.53E-03				
Formaldehyde	3.89E-02	8.30E-03	5.93E+01		
Lead	1.95E-03				
Manganese	1.10E-01				
Mercury	1.67E-04				
Maphthalene	4.87E-03	5.94E-04	4.24E+00		
Nickel	6.39E-04				
POM	5.56E-03	1.20E-03	8.57E+00		
Selenium	3.48E-03				
Toluene		2.90E-03	2.07E+01		
Xylenes		2.00E-03	1.43E+01		
Total			1.75E-02		

Table A-30. JP-8 AGE Equipment GHG Emissions, Proposed Action, McGuire

AGE Type	Sorties	Total Run Time (hr/yr)	Fuel Use per Unit (gal/hr)	Fuel Use per Unit (gal/yr)	Engine Rating (hp)	Emission Factors, lbs/gal			Annual Emissions (lbs/yr)		
						CO2	CH4	N2O	CO2	CH4	N2O
KC-46A AGE											
Sorties:	1508										
	Hours/Sortie										
Generator A/M32A-86	10	15080.00	6.47	125990.97	148	2.11E+01	5.91E-04	6.80E-04	2.66E+06	7.45E+01	8.57E+01
Start Cart A/M32A-60A	1	1508.00	10.16	15323.23	180	2.11E+01	5.91E-04	6.80E-04	3.23E+05	9.06E+00	1.04E+01
Start Cart A/M32A-95	0.1	150.80	8.75	1319.50	155	2.11E+01	5.91E-04	6.80E-04	2.78E+04	7.80E-01	8.97E-01
Heater/AC Ace 802-993 AC	10	15080.00	6.80	231550.97	272	2.11E+01	5.91E-04	6.80E-04	4.89E+06	1.37E+02	1.57E+02
MA-3C Air Conditioner	2	3016.00	7.12	20430.97	120	2.11E+01	5.91E-04	6.80E-04	4.31E+05	1.21E+01	1.39E+01
H1	5	7540.00	0.39	2766.69	6.5	2.11E+01	5.91E-04	6.80E-04	5.84E+04	1.64E+00	1.88E+00
1H1	4	6032.00	0.39	2213.35	6.5	2.11E+01	5.91E-04	6.80E-04	4.67E+04	1.31E+00	1.51E+00
Light Cart NF-2	2	3016.00	1.02	3064.65	18	2.11E+01	5.91E-04	6.80E-04	6.47E+04	1.81E+00	2.08E+00
Air Compressor MC-1A	0.33	497.64	1.09	516.90	18.4	2.11E+01	5.91E-04	6.80E-04	1.09E+04	3.05E-01	3.51E-01
Total JP-8 AGE, Metric Tons/year									3.86E+03	1.08E-01	1.24E-01

Emission estimation methodology based AFCEC 2013, assuming Sortie/LTO method per AFCEC guidance.

Equipment from AFCEC 2013, Table 3-3. Emission Factors from AFCEC 2013, Table 3-4.

Table A-31. Aircraft Engine Emissions - Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factors (lb/1000 lb fuel)						Emissions (lbs/yr)					
						VOC	CO	NOx	SO2	PM10	PM2.5	VOC	CO	NOx	SO2	PM10	PM2.5
KC-46A																	
Defueling	44	Idle	0.50	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	456.98	1,559.12	138.31	38.79	4.02	3.66
Maintenance Run	175	Idle	0.33	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	2,423.37	8,268.04	733.47	205.68	21.34	19.40
TRT Run 1 Engine	20	Idle	0.17	1	1,663	12.5	42.6	3.8	1.1	0.1	0.1	69.24	236.23	20.96	5.88	0.61	0.55
	20	80% RPM	0.08	1	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	2.26	14.06	730.45	29.80	1.97	1.69
TRT Run 2 Engine	15	Idle	0.17	2	1,663	12.5	42.6	3.8	1.1	0.1	0.1	103.86	354.34	31.43	8.81	0.91	0.83
	15	80% RPM	0.08	2	16869.6	0.1	0.5	26.0	1.1	0.1	0.1	3.40	21.09	1,095.68	44.70	2.95	2.53
												1.53	5.23	1.38	0.17	0.02	0.01

Table A-32. HAP Emissions, Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor (lb/1000 lb fuel) (1)													
						Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
KC-46A																			
Defueling	44	Idle	0.50	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
Maintenance Run	175	Idle	0.33	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
TRT Run 2 Engine	20	Idle	0.17	1	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	20	80% RPM	0.08	1	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03
TRT Run 4 Engine	15	Idle	0.17	2	1,663	6.19E-01	3.55E-01	7.84E-02	2.44E-01	9.30E-02	2.52E-02	4.09E-02	4.48E-02	3.31E-03	9.13E-04	9.68E-04	6.75E-02	4.85E-03	4.85E-03
	15	80% RPM	0.08	2	16869.6	1.15E-02	3.99E-03	2.29E-03	5.05E-04	1.57E-03	6.00E-04	1.63E-04	2.63E-04	2.89E-04	1.76E-03	7.94E-04	5.09E-04	5.06E-02	2.54E-03

Emissions, lbs/yr														
Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate	Total HAPs, TPY
22.64	12.98	2.87	8.91	3.40	0.92	1.50	1.64	0.12	0.03	0.04	2.47	0.18	0.18	
120.09	68.85	15.21	47.27	18.05	4.90	7.93	8.70	0.64	0.18	0.19	13.10	0.94	0.94	
3.43	1.97	0.43	1.35	0.52	0.14	0.23	0.25	0.02	0.01	0.01	0.37	0.03	0.03	
0.32	0.11	0.06	0.01	0.04	0.02	0.00	0.01	0.01	0.05	0.02	0.01	1.42	0.07	
5.15	2.95	0.65	2.03	0.77	0.21	0.34	0.37	0.03	0.01	0.01	0.56	0.04	0.04	
0.48	0.17	0.10	0.02	0.07	0.03	0.01	0.01	0.01	0.07	0.03	0.02	2.13	0.11	
0.07605772	0.04351743	0.00966467	0.029796732	0.01142702	0.00310768	0.00500308	0.00548917	0.00041479	0.000173465	0.000146238	0.00826944	0.00237123	0.00068216	0.19612083

Table A-33. GHG Emissions, Engine Tests, Proposed Action, McGuire

Aircraft/Test Type	Number of Engine Tests	Power Setting	Duration (hrs)	Number of Engines	Fuel Flow Rate per Engine (lbs fuel/hr)	Emission Factor(1)			Actual Emissions (lb/yr)		
						CO2	CH4	N2O			
						(lb/1000 lb fuel)	(lb/1000 lb fuel)	(lb/1000 lb fuel)	CO2	CH4	N2O
KC-46A											
Defueling	44	Idle	0.50	1	1,663	3,216.0	0.1	0.1	117,674.73	3.26	3.66
Maintenance Run	175	Idle	0.33	2	1,663	3,216.0	0.1	0.1	624,032.64	17.27	19.40
TRT Run 2 Engine	20	Idle	0.17	1	1,663	3,216.0	0.1	0.1	17,829.50	0.49	0.55
	20	80% RPM	0.08	1	16869.6	3,216.0	0.1	0.1	90,421.06	2.50	2.81
TRT Run 4 Engine	15	Idle	0.17	2	1,663	3,216.0	0.1	0.1	26,744.26	0.74	0.83
	15	80% RPM	0.08	2	16869.6	3,216.0	0.1	0.1	135,631.58	3.75	4.22
Total, tpy									459	0.01	0.01

(1) CO2 emission factors obtained from AFCEC 2013.
CH4 and N2O emission factors were derived from Table A-101 for jet fuel in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005, using density of JP-8 as 6.8 lb/gallon.

Table A-34. McGuire Comparison of Emissions

Annual Emissions, Tons/year

Baseline	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	3.21	49.03	83.34	7.43	0.39	0.39
AGE	0.01	0.01	0.09	0.00	0.00	0.00
Engine Tests	0.14	2.01	0.55	0.09	0.01	0.01
POVs	5.12	110.72	5.20	0.07	0.21	0.12
Total	8.48	161.78	89.18	7.59	0.61	0.53
Proposed Action	VOC	CO	NOx	SO2	PM10	PM2.5
Aircraft Ops	26.19	100.37	294.03	17.32	1.13	0.96
AGE	0.01	0.02	0.17	0.00	0.01	0.01
Engine Tests	1.53	5.23	1.38	0.17	0.02	0.01
POVs	4.75	126.34	3.97	0.09	0.22	0.12
Total	32.48	231.97	299.54	17.58	1.38	1.11
Net Increase	24.01	70.19	210.36	9.99	0.77	0.58

Table A-35. McGuire Comparison of HAP Emissions

Annual HAP Emissions, tons/year

Baseline	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	0.17	0.00	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
AGE	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.20	0.01	0.00	0.01	0.02	0.03	0.00	0.01	0.00	0.01	0.00	0.00	0.29	0.02
Proposed Action	Form-aldehyde	Acet-aldehyde	Acrolein	Naphthalene	Benzene	Toluene	Ethyl-benzene	Xylenes	Styrene	Chloroform	Chloromethane	1,3-Dichloropropene	Methylene Chloride	Vinyl Acetate
Aircraft Ops	3.72	1.29	0.74	0.16	0.51	0.19	0.05	0.09	0.09	0.03	0.01	0.01	0.65	0.05
AGE	0.03	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engine Tests	0.08	0.04	0.01	0.03	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Total	3.83	1.35	0.75	0.20	0.54	0.20	0.06	0.09	0.09	0.03	0.01	0.02	0.65	0.05
Net Increase	3.63	1.34	0.75	0.19	0.52	0.17	0.06	0.08	0.09	0.02	0.01	0.01	0.36	0.03

Table A-36. McGuire Comparison of GHG Emissions

Annual GHG Emissions, metric tons/year

Baseline	CO2	CH4	N2O	CO2e
Aircraft Ops	20450	0.57	0.64	20659
AGE	2134	0.06	0.07	2157
Engine Tests	237	0.01	0.01	239
POVs	3543	0.00	0.00	3543
Total	26363	0.63	0.71	26597
Proposed Action	CO2	CH4	N2O	
Aircraft Ops	47195	1.25	1.41	47657
AGE	3859	0.11	0.12	3900
Engine Tests	459	0.01	0.01	464
POVs	4359	0.00	0.00	4359
Total	55872	1.37	1.54	56379
Net Increase	29509	0.74	0.83	29782

Table A-37. Emission Factors, AFCEC, 2015

2015							
On-Road Trucks	VOC	CO	NOx	SOx	PM	CO2	
Emission factor, heavy duty trucks, gm/mi	0.617	1.782	2.498	0.012	0.097	1243.4	

Table A-38. Emission Source Data for Construction - McGuire

Construction Activity/Equipment Type	HP Rating	Ave. Daily Load Factor	Number Active	Hours/ Day	Work Days	2015 (lb/day) ROG	(lb/day) CO	(lb/day) NOX	(lb/day) SOX	(lb/day) PM	(lb/day) CO2
Construction - Building Facilities											
Air Compressor - 100 CFM	50	0.6	1	6		0.09455048	0.47201897	1.59554327	0.044862233	0.10062742	236.289135
Concrete-Industrial Saw	84	0.73	1	6		0.27221926	2.35429505	2.68401671	0.094666023	0.36896764	482.735755
Crane	190	0.3	1	6		0.14924225	0.37005106	1.71237822	0.074866893	0.12148702	399.946309
Forklift	94	0.48	1	6		0.09577876	0.80888051	0.9060315	0.060326098	0.16169322	355.519511
Generator	45	0.6	1	8		0.11346058	0.56642277	1.91465192	0.053834679	0.12075291	283.546961
Concrete Trucks (1)	NA	NA	60	15		1.22423334	3.53579224	4.95645848	0.023810049	0.19246456	2467.11788
Supply Trucks (1)	NA	NA	60	20		1.63231112	4.71438965	6.6086113	0.031746732	0.25661941	3289.49051
Fugitive Dust (2)	NA	NA	2	8						13.45	
					250	3.58179579	12.8218502	20.3776914	0.384112707	14.7726122	7514.64606
Construction - Taxiways/Runway											
Haul Truck - 20 CY - Asphalt (1)	489	0.6	4	18		7.24234382	29.6497906	75.7847769	4.41365647	8.47649254	24979.5948
Asphalt Spreader - BG 240C	153	0.6	2	8		0.8617276	3.77851013	9.72207506	0.341440284	0.96065309	1735.73736
Compactive Roller	165	0.5	2	8		0.64270919	2.79649216	6.91528097	0.298821998	0.80700086	1560.29376
Fugitive Dust (2)	NA	NA	2	8						13.45	
Grader - 14H	215	0.5	2	8		0.67778145	2.3514555	6.91240052	0.366767542	0.73055537	2033.594
Loader - 938G	160	0.5	2	8		1.97248561	7.33701543	12.3406703	0.353825785	1.55146662	1762.08909
Oil Truck	300	0.4	1	8		0.31360677	0.58021071	2.40202138	0.183811512	0.31805625	1135.22529
Vibratory Compactor - CB 355D	105	0.75	2	8		1.54745487	7.01107023	13.1352397	0.351751219	1.07737943	1635.26332
					250	13.2581093	53.5045448	127.212465	6.31007481	27.3716042	34841.7976
Construction - Pad/Apron											
Haul Truck - 20 CY - Asphalt (1)	489	0.6	4	18		7.24234382	29.6497906	75.7847769	4.41365647	8.47649254	24979.5948
Asphalt Spreader - BG 240C	153	0.6	2	8		0.8617276	3.77851013	9.72207506	0.341440284	0.96065309	1735.73736
Compactive Roller	165	0.5	1	8		0.3213546	1.39824608	3.45764049	0.149410999	0.40350043	780.14688
Fugitive Dust (2)	NA	NA	2	8						13.45	
Grader - 14H	215	0.5	1	8		0.33889073	1.17572775	3.45620026	0.183383771	0.36527769	1016.797
Loader - 938G	160	0.5	1	8		0.9862428	3.66850772	6.17033515	0.176912892	0.77573331	881.044547
Oil Truck	300	0.4	1	8		0.31360677	0.58021071	2.40202138	0.183811512	0.31805625	1135.22529
Vibratory Compactor - CB 355D	105	0.75	2	8		1.54745487	7.01107023	13.1352397	0.351751219	1.07737943	1635.26332
					250	11.6116212	47.2620632	114.128289	5.800367147	25.8270927	32163.8092
Construction - Road/Bridge/Van Pad											
Haul Truck - 20 CY - Asphalt (1)	489	0.6	4	18		7.24234382	29.6497906	75.7847769	4.41365647	8.47649254	24979.5948
Asphalt Spreader - BG 240C	153	0.6	2	8		0.8617276	3.77851013	9.72207506	0.341440284	0.96065309	1735.73736
Compactive Roller	165	0.5	2	8		0.64270919	2.79649216	6.91528097	0.298821998	0.80700086	1560.29376
Fugitive Dust (2)	NA	NA	2	8						13.45	
Grader - 14H	215	0.5	2	8		0.67778145	2.3514555	6.91240052	0.366767542	0.73055537	2033.594
Loader - 938G	160	0.5	2	8		1.97248561	7.33701543	12.3406703	0.353825785	1.55146662	1762.08909
Oil Truck	300	0.4	1	8		0.31360677	0.58021071	2.40202138	0.183811512	0.31805625	1135.22529
Vibratory Compactor - CB 355D	105	0.75	2	8		1.54745487	7.01107023	13.1352397	0.351751219	1.07737943	1635.26332
					90	13.2581093	53.5045448	127.212465	6.31007481	27.3716042	34841.7976
Construction - Airfield Facilities - Other											
Air Compressor - 100 CFM	50	0.6	1	6		0.09455048	0.47201897	1.59554327	0.044862233	0.10062742	236.289135
Concrete-Industrial Saw	84	0.73	1	6		0.27221926	2.35429505	2.68401671	0.094666023	0.36896764	482.735755
Crane	190	0.3	1	6		0.14924225	0.37005106	1.71237822	0.074866893	0.12148702	399.946309
Forklift	94	0.48	1	6		0.09577876	0.80888051	0.9060315	0.060326098	0.16169322	355.519511
Generator	45	0.6	1	8		0.11346058	0.56642277	1.91465192	0.053834679	0.12075291	283.546961
Concrete Trucks (1)	NA	NA	60	15		1.22423334	3.53579224	4.95645848	0.023810049	0.19246456	2467.11788
Supply Trucks (1)	NA	NA	60	20		1.63231112	4.71438965	6.6086113	0.031746732	0.25661941	3289.49051
					250	3.58179579	12.8218502	20.3776914	0.384112707	1.32261218	7514.64606
Construction - Building Renovations											
Air Compressor - 100 CFM	50	0.6	1	6		0.09455048	0.47201897	1.59554327	0.044862233	0.10062742	236.289135
Concrete-Industrial Saw	84	0.73	1	6		0.27221926	2.35429505	2.68401671	0.094666023	0.36896764	482.735755
Forklift	94	0.48	1	6		0.09577876	0.80888051	0.9060315	0.060326098	0.16169322	355.519511
Generator	45	0.6	1	8		0.11346058	0.56642277	1.91465192	0.053834679	0.12075291	283.546961
Supply Trucks (1)	NA	NA	60	10		0.81615556	2.35719482	3.30430565	0.015873366	0.12830971	1644.74525
					90	1.39216464	6.55881212	10.4045491	0.2695624	0.88035089	3002.83662

Renovations require 90 days

Assumptions: work days calculated based on assumption that 20,000 sf buildings require 250 days; 340,000 sf of paving/apron requires 250 days.

(1) Number Active - miles/round trip, Hours/Day are daily trips

(2) Number Active is acres disturbed at one time; lbs/day is lbs/acre-day

(3) HP Rating = cubic feet of demolished buildings; lbs/day is lbs/1000 cf

Table A-39. Construction Emissions - McGuire

	Emissions, tons/year											
Construction Project	*Square feet of building/ square feet of paving*	*CO*	*NOx*	*VOC*	*SOx*	*PM10*	*PM2.5*	*Fugitive PM10*	*Fugitive PM2.5*	*Total PM10*	*Total PM2.5*	*Total CO2, Metric tons/year*
Option 1 - 2015												
Project #1 - Addition to Hangar 3333	17,892	1.43	2.28	0.40	0.04	1.65	1.64	0.62	0.13	2.27	1.77	762.34
Project #2 - Addition to Hangar 3336	18,206	1.46	2.32	0.41	0.04	1.68	1.66	0.64	0.13	2.32	1.80	775.72
Project #3 - Internal Renovations to Hangar 3322	0	0.30	0.47	0.06	0.01	0.04	0.04	0.00	0.00	0.04	0.04	122.59
Project #4 - New Simulator Building	6,700	0.54	0.85	0.15	0.02	0.62	0.61	0.09	0.02	0.71	0.63	285.47
Project #5 - (Option 1) Modifications to Existing Parking Ramp and Taxiway	160,074	4.28	10.18	1.06	0.51	2.19	2.17	3.96	0.83	6.15	3.00	2,529.83
Project #6 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	1,137	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.88
Total Option 1		8.01	16.11	2.08	0.62	6.18	6.12	5.30	1.11	11.48	7.23	4,479.82
Option 2 - 2015												
Project #1 - Addition to Hangar 3333	17,892	1.43	2.28	0.40	0.04	1.65	1.64	0.62	0.13	2.27	1.77	762.34
Project #2 - Addition to Hangar 3336	18,206	1.46	2.32	0.41	0.04	1.68	1.66	0.64	0.13	2.32	1.80	775.72
Project #3 - Internal Renovations to Hangar 3322	0	0.30	0.47	0.06	0.01	0.04	0.04	0.00	0.00	0.04	0.04	122.59
Project #4 - New Simulator Building	6,700	0.54	0.85	0.15	0.02	0.62	0.61	0.09	0.02	0.71	0.63	285.47
Project #5 - (Option 2) Modifications to Existing Parking Ramp and Taxiway	12,029	0.32	0.77	0.08	0.04	0.16	0.16	0.02	0.00	0.19	0.17	190.11
Project #6 - New Hydrants and Fuel Lines and Demolition of Existing Hydrants	1,137	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.88
Total Option 2		4.05	6.70	1.10	0.15	4.16	4.11	1.37	0.29	5.52	4.40	2,140.10

APPENDIX B

Agency Coordination

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY MANAGEMENT
BUREAU OF AIR QUALITY PLANNING
Mail Code 401-07H
P.O. BOX 420
Trenton, NJ 08625-0420
TEL (609) 292-6722
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CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

May 22, 2014

Kevin Shupe
Environmental Scientist
GS-13 National Guard Bureau
ANG Readiness Center NGB/A7AN Shepperd Hall
3501 Fetchet Ave Andrews AFB, MD 20762

Dear Mr. Shupe:

The purpose of this letter is to address the National Guard's May 6, 2014 email to Angela Skowronek, of my staff, requesting concurrence from the New Jersey Department of Environmental Protection (Department) that the Federal General Conformity requirements have been met for the proposed KC46-A Alternative Beddown Location project at Joint Base McGuire-Dix-Lakehurst (JB M-D-L). The Department has reviewed the proposed project to ensure its emissions conform to New Jersey's State Implementation Plan (SIP).

The Federal General Conformity regulations provide Federal agencies with the flexibility to establish General Conformity budgets with the State in order to meet the requirements of the regulation. General Conformity budgets for Volatile Organic Compounds (VOC's) and Oxides of Nitrogen (NOx) were established for McGuire Airforce Base (McGuire) in New Jersey's 8-hour Ozone State Implementation Plan (SIP) Revision dated October 29, 2007. The 2011 VOC and NOx General Conformity budgets included in the SIP for McGuire are in effect and will remain in effect until further notice. McGuire has confirmed that the VOC and NOx air emissions associated with the proposed KC46-A Alternative Beddown Location project at JB M-D-L will be included in the budget calculation for the base. Therefore, the Department concurs that the General Conformity requirements have been met for the proposed KC-46-A Alternative Beddown Location project at JB M-D-L.

If you have any questions concerning this matter, please contact Angela Skowronek, of my staff, at (609) 292-6722.

Sincerely,

Sharon Davis

Sharon Davis
Section Chief
Bureau of Air Quality Planning